EUROPEAN UNIVERSITY INSTITUTE
DEPARTMENT OF HISTORY & CIVILIZATION

# BETWEEN SPIRIT AND MATTER
# An Ethnographic History of British Zoology and Zoologists, ca. 1660-1800

Kirsten Winther JØRGENSEN

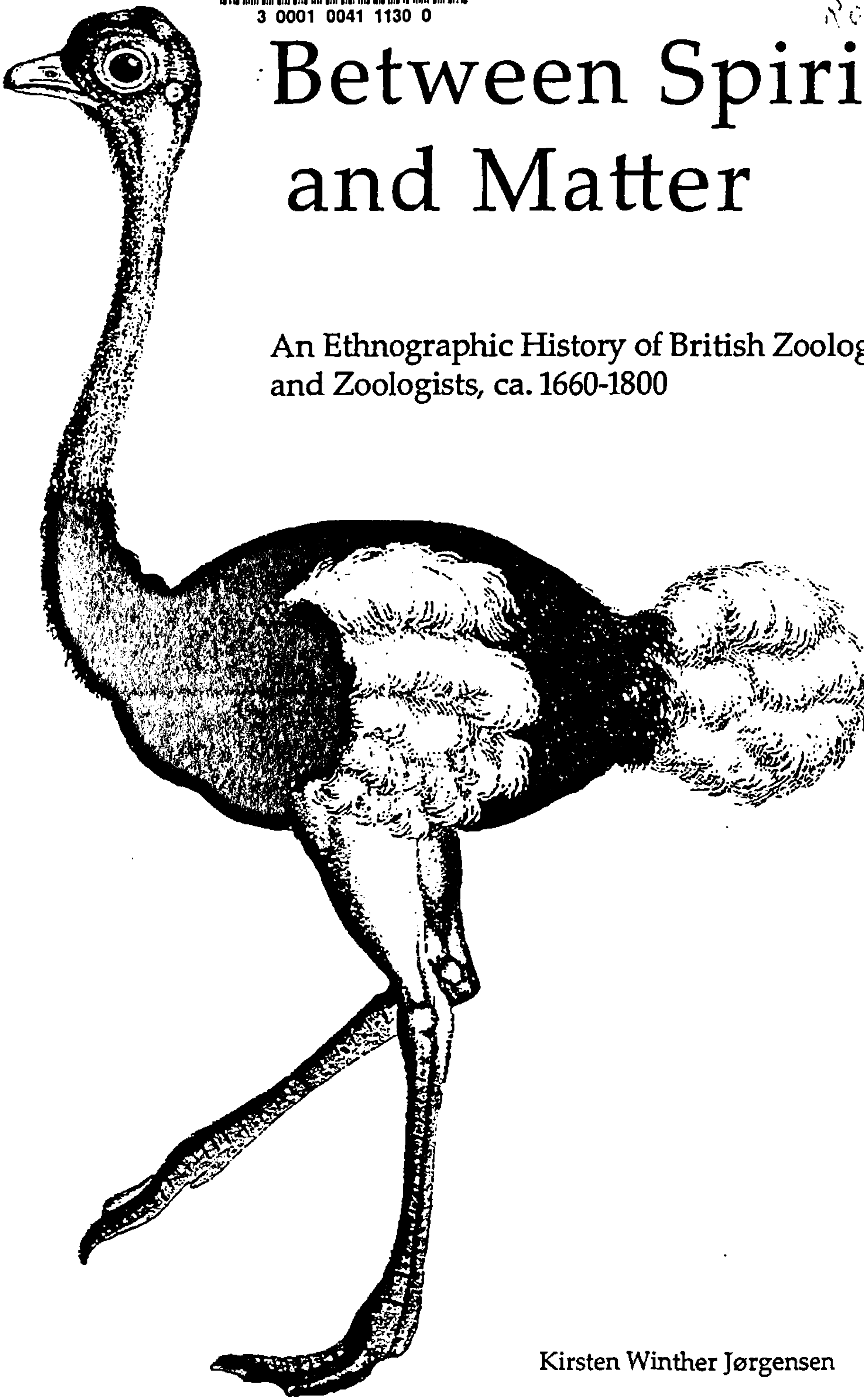
A thesis submitted with a view to assessing the PhD-degree in
History & Civilization

Jury members:

Prof. Peter Becker, EUI (supervisor)
Prof. Hans-Erich Bödeker, Max-Planck-Institut, Göttingen
Prof. Michael Harbsmeier, Roskilde University
Prof. Simon Schaffer, University of Cambridge

Florence, September 2003

B|C→D



# Between Spirit and Matter

## An Ethnographic History of British Zoology and Zoologists, ca. 1660-1800

Kirsten Winther Jørgensen

**A thesis submitted to the Department of History and Civilisation, the European University Institute, Italy, with a view to assessing the PhD-degree in History and Civilisation, 2003**

# Contents

EUROPEAN UNIVERSITY INSTITUTE
DEPARTMENT OF HISTORY & CIVILIZATION

# *BETWEEN SPIRIT AND MATTER*
# An Ethnographic History of British Zoology and Zoologists, ca. 1660-1800

**Kirsten Winther JØRGENSEN**

**A thesis submitted with a view to assessing the PhD-degree in History & Civilization**

Jury members:

Prof. Peter Becker, EUI (supervisor)
Prof. Hans-Erich Bödeker, Max-Planck-Institut, Göttingen
Prof. Michael Harbsmeier, Roskilde University
Prof. Simon Schaffer, University of Cambridge

Florence, September 2003

## List of Illustrations

## LIST OF TABLES

## Note on References and Quotations

Information in in-text citations of published works has been kept to a relative minimum in the present thesis. Adopting and adapting the citation practice of Steven Shapin & Simon Schaffer in *Leviathan and the Air Pump* (1985), only the author's name, title of published works in abridged form, and year of publication have been listed in the footnotes. In references to primary literature, the original date of publication of the edition referred to is also always given here, together with the actual year of publication; in references to secondary literature, the original date of publication is only given in the footnotes where it is essential to the argument. Full bibliographic details can be found in the bibliography at the end of this work. In the citations of manuscript sources, full bibliographic details are also given in the notes for the purposes of identification.

In the quotations, the original spelling, capitalisation and punctuation have been kept. Furthermore, in order to avoid too many *sics*, a *sic* has only been added where spelling has been judged to be outside the boundaries of seventeeth- and eighteenth-century orthography.

Chapter 1

# Twin Histories

As the seventeenth century approached its end, zoology emerged as an unprecedentedly popular field of study within Britain. Encouraged by more general transformations in the field of learning, which had been under way since the turn of the century, the exploration of the animal kingdom moved from the apothecaries' shops, the physicians' colleges, and the aristocrats' cabinets of curiosities where it had mainly been pursued during the Renaissance, into a much wider social terrain, centred on the Polite Society of the rising middle echelons. From the last decades of the seventeenth century and during the next century, an expanding group of men, principally from these middle echelons, began writing about zoological and, more generally, natural historical subjects. From the 1660s onwards, learned societies were established in London and later around the country, placing natural history and natural philosophy on the agenda. At the same time, it became fashionable for men and, to some extent, for women of Polite Society to spend part of their spare time in the bosom of nature, collecting flowers and hunting especially for the more picturesque branches of animals, such as butterflies. It became popular to collect stones, dried flowers and stuffed animals and to put them on display in the small, private cabinets which were found in many homes of gentlefolk during the eighteenth century. Natural history made its way into poetry in the shape of the very popular genre of natural history poems, in which both nature and the natural historians' 'discoveries' of 'her' secrets were celebrated. In a more popular context, museums such as, most notably, the Ashmolean, the Leverian, and the British Museum opened their doors to a general public, who seemed eager to gaze at the exotic animals in their collections. At coffee-houses, stuffed animals and other natural historical curiosities came to adorn the walls as part of the establishments' attraction. At market places, exotic animals – African elephants, Barbarian lions, and Siberian tigers – drew crowds of spectators; and books with titles such as

*British Zoology* or *The Aurelian: or, Natural History of English Insects*[1] became well-known best-sellers which could compete with the most famous travel accounts and most cherished novels of the day. '[N]atural history is now,' a writer at the *Critical Review* observed in 1763, 'by a kind of national establishment, become the favourite study of the times'.[2]

By the eighteenth century nature, it appears, had been turned into one 'Grand Museum', as Richard Kentish put it, where man could dwell on grand questions:

> When he beholds the productions of different climes, and sees the varied forms of nature; when he finds himself surrounded with the inhabitants of different elements, and divers countries; when he traces the variety of species, and infinitude of products; when he examines the contrast in size and shape of animals, the wonderful œconomy of Vegetables, and the properties of the Mineral kingdom, he is led into a thousand speculations on the appearances of life, the methods made use of to sustain the living principle, and the wonderful extent, and diversity of organized and unorganized matter.[3]

On this account, the zoologists were concerned, on one hand, with making a systematic inventory of this Museum. By describing the countless animals around in the world as accurately as humanly possible, by comparing them to each other and thereby finding such 'indelible marks'[4] as would allow the zoologists to classify them in immutable species, kinds, tribes, races, families, and kingdoms, the zoologist sought an order in that 'infinitude of products' in the empirical world which at first looked bewildering confusing. But the zoologists were also, on the other hand, concerned with the divine originator of the Grand Museum. The quest for order, which was central to the eighteenth-century zoological endeavour, was cast as, potentially, a disclosure of a divine order: 'Look thro' Nature, up to Nature's God,' Kentish, from Pope, choose as the bon mot for his book, like quite a few other authors from the period.[5] To 'penetrate' nature's 'sources, and trace it backwards, if possible to find out the First Cause and Mover of all things,' ought likewise, according to George Edwards, to be the ultimate purpose of any study of nature.[6] What the zoologists encountered when they approached nature, and what the general public could read about in their books, was not only animals, but animals divinely ordained. Studying the animal kingdom not only implied studying nature's order, but also the order of the universe.

The present thesis is a study of the zoological branch of 'the favourite study of the times', and of the men who pursued it. It is a study of how these men transformed raw nature into zoological knowledge, and of the content of that knowledge. It is, in a word, a study of the twin histories of British zoology and zoologists of the long eighteenth century.

Looking back in 1859 on this eighteenth-century zoological endeavour after yet another transformation had taken place in the field of natural studies in the first part of the nineteenth-

1 By, respectively, T. Pennant (1768-77), and M. Harris (1766).
2 *Critical Review*, vol. 16 (Oct, 1763), p. 312.
3 R. Kentish, *An Essay on the Method* (1787), pp. 8-9.
4 Ibid., pp. 71-2.
5 Ibid., Title page (unpaged).
6 G. Edwards, *A Natural History of Birds* (1743-51), vol. II, p. 108.


Ill. 1.1 GENTLEFOLK HUNTING BUTTERFLIES (M. Harris, *The Aurelian*, 1766). During the eighteenth-century, engaging in the zoological endeavour in a more leisurely manner became fashionable within Polite Society. In particular, the more picturesque branches of zoology, such as entomology, became popular, and books describing methods of collecting and objects to be collected, such as *The Aurelian*, from whence this plate is taken, found a wide audience among gentlemen and -ladies.

*British Zoology* or *The Aurelian: or, Natural History of English Insects*[1] became well-known best-sellers which could compete with the most famous travel accounts and most cherished novels of the day. '[N]atural history is now,' a writer at the *Critical Review* observed in 1763, 'by a kind of national establishment, become the favourite study of the times'.[2]

By the eighteenth century nature, it appears, had been turned into one 'Grand Museum', as Richard Kentish put it, where man could dwell on grand questions:

When he beholds the productions of different climes, and sees the varied forms of nature; when he finds himself surrounded with the inhabitants of different elements, and divers countries; when he traces the variety of species, and infinitude of products; when he examines the contrast in size and shape of animals, the wonderful œconomy of Vegetables, and the properties of the Mineral kingdom, he is led into a thousand speculations on the appearances of life, the methods made use of to sustain the living principle, and the wonderful extent, and diversity of organized and unorganized matter.[3]

On this account, the zoologists were concerned, on one hand, with making a systematic inventory of this Museum. By describing the countless animals around in the world as accurately as humanly possible, by comparing them to each other and thereby finding such 'indelible marks'[4] as would allow the zoologists to classify them in immutable species, kinds, tribes, races, families, and kingdoms, the zoologist sought an order in that 'infinitude of products' in the empirical world which at first looked bewildering confusing. But the zoologists were also, on the other hand, concerned with the divine originator of the Grand Museum. The quest for order, which was central to the eighteenth-century zoological endeavour, was cast as, potentially, a disclosure of a divine order: 'Look thro' Nature, up to Nature's God,' Kentish, from Pope, choose as the bon mot for his book, like quite a few other authors from the period.[5] To 'penetrate' nature's 'sources, and trace it backwards, if possible to find out the First Cause and Mover of all things,' ought likewise, according to George Edwards, to be the ultimate purpose of any study of nature.[6] What the zoologists encountered when they approached nature, and what the general public could read about in their books, was not only animals, but animals divinely ordained. Studying the animal kingdom not only implied studying nature's order, but also the order of the universe.

The present thesis is a study of the zoological branch of 'the favourite study of the times', and of the men who pursued it. It is a study of how these men transformed raw nature into zoological knowledge, and of the content of that knowledge. It is, in a word, a study of the twin histories of British zoology and zoologists of the long eighteenth century.

Looking back in 1859 on this eighteenth-century zoological endeavour after yet another transformation had taken place in the field of natural studies in the first part of the nineteenth-

1 By, respectively, T. Pennant (1768-77), and M. Harris (1766).
2 *Critical Review*, vol. 16 (Oct, 1763), p. 312.
3 R. Kentish, *An Essay on the Method* (1787), pp. 8-9.
4 Ibid., pp. 71-2.
5 Ibid., Title page (unpaged).
6 G. Edwards, *A Natural History of Birds* (1743-51), vol. II, p. 108.

The Works of the Lord are Great, sought out of all them
that have Pleasure therein. Ps CXI. v. 2.

Ill. 1.1 GENTLEFOLK HUNTING BUTTERFLIES (M. Harris, *The Aurelian*, 1766). During the eighteenth-century, engaging in the zoological endeavour in a more leisurely manner became fashionable within Polite Society. In particular, the more picturesque branches of zoology, such as entomology, became popular, and books describing methods of collecting and objects to be collected, such as *The Aurelian*, from whence this plate is taken, found a wide audience among gentlemen and -ladies.

century, Charles Darwin in *The Origin of Species* compared his evolutionary conception of living beings to that of his eighteenth-century forebearers, and found their notions rather peculiar. Referring to their idea of this divinely ordered universe – an idea which, as we will later see, implied ideas of providentially defined, immutable species created ca. 4004 BC, a Great Chain of Being connecting all living beings on an unchanging scale from plants and animals through man to the angels, and which, furthermore, implied an idea of the perfect zoologist as almost an angel – referring to these ideas, Darwin asserted that the eighteenth-century naturalists had 'look[ed] at an organic being as a savage looks at a ship, as at something wholly beyond his comprehension.'[7] With the idea of nature as not only corporeal, but also divine, and with the closely related ideas about the nature of animals, species and taxonomy, and about the zoologist himself, the eighteenth-century zoological endeavour, indeed, at a first glance appears exotic – possibly not only to Darwin, but also to a twenty-first century reader to whom the idea of man's decent from the apes and every living beings' origin from some primeval amoeba seems as if it was evident.

Darwin, of course, stopped short at noticing the strangeness of his forebearers' ideas (as also many more recent historians of an evolutionary bent, incidentally, have done) – his mentioning of them was only made in order to argue the case for his own biological system. Inspired by almost a century long tradition of ethnographic research, I shall here propose to start this study of the twin histories of eighteenth-century British zoology and zoologists where Darwin stopped: with the sense of the exotic.[8]

Since in the 1910s and 1920s, when Bronislaw Malinowski undertook his studies of the Trobriand Islands, the object of ethnographic studies has been defined to a very large extent in terms of such differences, which the sense of the exotic seems to intimate: 'They,' all the tribes throughout the world who have received a visit from an ethnographer, might look strange to the new-comer, but that is only because they are different.[9] An 'other' who conceptualises the world in different ways from us, who organises their social relations in other ways, and who entertains different ideas about the order of the universe.[10] Considering the 'difference' as the

---

7 C. Darwin, *Origin of Species* (1859/1979), p. 456.

8 Within history of science studies, Steven Shapin and Simon Schaffer have recently argued for a congenial approach to the study of 'science' in history with their advocacy for a 'stranger's account' of seventeenth-century experimental philosophy; S. Shapin and S. Schaffer, *Leviathan and the Air-Pump* (1985), pp. 4ff. and 12ff.

9 Cf. M. Augé, *A Sense for the Other* (1998), p. 109.

10 Within ethnography, this method of approaching natives as an 'other' has recently come under attack, and though I do acknowledge that we should be careful not to make the people of our study too exotic in our representations, and thereby overlook what they might have in common with 'us,' I do still find it fruitful to use the notion of the 'other' as a heuristic device, as a way of speaking which allows us to assume that everybody else in the world is not exactly like 'us,' nor merely a deviating form of 'us.' For critiques of the ethnographic concept of the 'other,' see J. Fabian, *Time and the Other* (1983); M.-R. Trouillot, 'Anthropology and the Savage Slot' (1991); L. Abu-Lughod, 'Introduction' (1993), and most of the essays in J. Clifford and G. E. Marcus, *Writing Culture* (1986). For a reassessment of the notion of the 'other,' not too different from mine, see M. Augé, *A Sense for the Other* (1998)

point of departure for the study has, in turn, made it possible to investigate the different ways of interacting with and understanding the world; to inquire into, as Malinowski stated in his first monograph on the Trobriands, 'the native's point of view, his relation to life, [...] *his* vision of *his* world.'[11]

Traditionally, the ethnographer has inquired into contemporary natives' point of view,[12] and at some levels there are differences between the way contemporary natives and historical ones can be approached. There is a difference in the way contemporary and historical natives are delimited by the ethnographer – the former in terms of differences in space, the latter primarily in terms of differences in time[13] – and in the methods used in studying the natives at an empirical level – in the first case through participant observation in the field, in the second case through reading of primary sources in libraries and archives. However, there is no principle difference between the way a contemporary 'other' and a historical 'other' can be analytically approached. We might as well inquire into the eighteenth-century zoologists' point of view as into that of the Trobiands or of the Azandes.[14]

Turning the British zoological endeavour into an ethnographic object, enables us to view the zoologists of the long eighteenth century, not as 'savages' who did not comprehend what they saw in nature, but as 'natives' who understood the world in such a different way that it might seem at first, almost incomprehensible to us, but which, nevertheless, made sense to them. And making sense, and even good sense, it seems fair from the outset to assume that the zoological endeavour did, not only from the point of view of the zoologists themselves, but also from that of those other gentlefolk who somehow were engaged in the zoological endeavour, either as collectors, spectators, or as readers: Why else would zoology have become

11 B. Malinowski, *Argonauts* (1964, org. 1922), p. 25; emph. in org.

12 By now, however, also historical ethnography or anthropology has become well-established as a tradition in its own right, though it seems to have become a little out of fashion in the present day. With his initial thoughts on the relationship between historiography and anthropology, E. E. Evans-Pritchard (see, for example, his 'Social Anthropology' (1962), pp. 20ff.) placed history on the anthropological agenda in the middle of the twentieth century. During the 1970s and 1980s, historical ethnography gained force with studies such as Clifford Geertz' on the Balinese theatre state in *Negara* (1980); James Boon's on Jacobean ethnology, among other things in *Other Tribes, Other Scribes* (1982); Marshall Sahlins' analyses of late eighteenth-century Hawaiian culture and society in *Historical Metaphors and Mythical Realities* (1981); idem., *Island of History* (1985); idem., *How "Natives" Think* (1995); Kirsten Hastrup's study of Medieval and early modern Icelandic society, in *Culture and History* (1985); idem., *Nature and Policy* (1990); Anne Knudsen's on Corsica, in *En Ø i Historien* (1989); and Michael Harbsmeier's study on early modern German travel literature in *Wilde Völkerkunde* (1994); just to mention some of the major works which have been decisive in shaping my historical ethnography here.

13 Cf. K. Hastrup, 'Sandheden' (1990), esp. pp. 82ff. For further discussions of the relationship between anthropology and history, see also M. Sahlins, *Island of History* (1985), pp. viiff.; G. Denning, *History's Anthropology* (1988), pp. 4-9, 23-4.

14 Though there, of course, is a difference in the European ethnographer's relation to, say, the Trobiands and the eighteenth-century zoologists, respectively, since the latter are our intellectual 'ancestors,' and the former are not. We might, consequently, find bits and pieces in the eighteenth-century zoological endeavour that have been brought on to us in different ways and along different trajectories. But, as I shall attempt to show, in the eighteenth-century context, these made sense from another perspective than ours.

so popular? Taking my point of departure in the sense of the exotic, the purpose of the present thesis will then be to inquire into how it became meaningful from the natives' point of view to approach and conceptualise nature in the specific ways it was done during the long eighteenth century, ca. 1660-1800.

In this introductory chapter, the scene for my study will be set. Although the overall analytical frame is drawn from ethnography (my 'native' field), the present study of British eighteenth-century zoology and zoologists is also closely related to science studies, and in the following section, a review of literature within this field relevant for my analysis will be given. I shall here, moreover, discuss some of the main theoretical assumptions and thematic areas, which have generally characterised studies in the history of science. This discussion will firstly pave the way for a specification of the thesis' problematique, and, secondly, for the establishment of my theoretical perspective. In the theoretical section, by way of a cultural-structuralist theory drawn from anthropology, an attempt is made both to substantiate the claims made above regarding the existence of different 'points of view,' with all that it implies, and, at the same time, to develop an analytical framework for the present analysis. I then turn to the empirical field presenting an outline of my empirical corpus, and giving a preliminary introduction to the endeavour of zoology by discussing its relation to society at large. Finally, an outline of the structure of the thesis will be given.

## History of Science in Review

The literature on eighteenth-century British zoology and zoologists is very sparse. Some of the leading British zoologists from the period have been portrayed and their works have been analysed in biographies;[15] reference has been made of a few British zoologists in more general studies of the 'history of biology' or 'history of natural history';[16] the disciplinary history of some branches of zoology has been traced;[17] and more limited aspects of British zoological

15 Such as C. E. Raven, *John Ray* (1986); E. A. Martin, *A Bibliography of Gilbert White* (1897/1970); and C. E. Raven, *English Naturalists* (1947), on the zoologists, and naturalists in general, prior to John Ray.

16 Such as David E. Allen's work on naturalists in Britain in *Naturalist in Britain* (1994); Ernst Mayr's study of biological thought from Aristotle to the twentieth century in *The Growth of Biological Thought* (1982), esp. Part I; Émile Guyénot's work on the life sciences in European thought in the early modern period in *Les Sciences de la Vie* (1941); Scott Atran's study of the cognitive foundations of natural history from Aristotle to the eighteenth century in *Cognitive Foundations of Natural History* (1990), esp. Part III and IV. Paul Lawrence Farber's outline of the study of nature from Linné to the twentieth century in *Finding Order in Nature* (2000).

17 Most notably, in Paul Lawrence Farber's study of ornithology in *The Emergence of Ornitology* (1982); in studies of the emergence of primatology, for instance, G. Barsanti, 'Storia naturale della scimmie' (1990), and R. Yerkes and A. Yerkes, *The Great Apes* (1929); and in studies of the research into polyps, in B. M. Stafford, 'Images of Ambiguity' (1996).

research have been illuminated in articles.[18] Almost exclusively, the focus of this literature has been on the few British zoologists who in the period, and in hindsight, have been considered to be 'great,' such as John Ray, George Edwards, Thomas Pennant, Gilbert White, and John Ellis.

If we turn to studies of eighteenth-century zoology in a European context, this pattern is replicated. In this case also, the studies are few, and even those of a more comprehensive nature, virtually always focus on the 'great' zoologists and natural historians, and most notably on the two giants of eighteenth-century natural history – the Swedish natural historian Carl von Linné and the French director of *Jardin Du Roi*, George-Louis Leclerc de Buffon.[19]

Although the review of literature given here is far from complete, nevertheless it clearly indicates that, in stark contrast to botany and botanists,[20] eighteenth-century British zoology and zoologists have only been accorded sporadic attention in history of science studies. Even when they have been made an object of study, a small handful of 'great' zoologists and their works have commonly come to represent the tradition as such. Most, if not all, of the zoologists discussed in these studies *were* also considered 'great' by their contemporaries, and the historical studies of these individuals are very interesting. In many cases, their work has been an important source of inspiration for my reading of the zoological corpus in the present thesis. However, from an ethnographical point of view, where the zoological endeavour is mainly considered as a socio-cultural phenomenon, this empirical perspective is too limited. In order to explain the reason for this, and in order to place my approach to the zoological endeavour within the more general field of science studies, I shall in the following go beyond the field of zoology and review studies of science more generally, with the emphasis on studies in the

18 Phillip Sloan has thus analysed the emergence of a new species concept towards the end of the seventeenth century in the writings of John Ray, in particular, in 'John Locke, John Ray' (1972), also cf. P. R. Sloan, 'Natural History' (1990); Daniel Carey has touched upon zoology in his analysis of the interrelations between natural history, travelling and the history of collection in 'Compiling Nature's History' (1997); Gillespie has done the same in his investigation of the relationship between natural history, natural philosophy, theology and the social order in 'Natural History, Natural Theology' (1987). A number of authors have dealt with zoology in relation to collections, P. L. Farber, 'The Development of Ornithological Collections' (1980); P. J. P. Whitehead, 'Museums in the History of Zoology' (1970); P. J. P. Whitehead, 'Museums in the History of Zoology' (1970); P. C. Ritterbush, 'Art and science' (1969); W. George, 'Alive or Dead' (1985); and the relation between zoology and voyages is touched upon in P. J. P. Whitehead, 'Zoological Specimens' (1969), and some of the essays in T. Rice, *Voyages* (2000), esp. chs. 4, 5, 6, 7.

19 Among works of a more general nature, also touching upon zoology, besides those already mentioned, are J. Roger, *The Life Sciences* (1997); G. Petit and J. Théodoridès, *Histoire de la zoologie* (1962); and Michel Foucault in his chapter on classical natural history in *The Order of Things* (1970), ch. 5. The literature on Linné and Buffon is immense. On Buffon, see esp. Jacque Roger's biographical study, J. Roger, *Buffon* (1997). On Linné some of the more important works include, F. A. Stafleu, *Linneaus and the Linnaeans* (1971); W. Blunt, *The Compleat Naturalist* (1971); S. Fries, *Linnés* (1971); L. Koerner, *Linnaeus* (1999), on both of the naturalists, see also D. Stemerding, *Plants, Animals, and Formulae* (1991); P. R. Sloan, 'The Buffon-Linnæus Controversy' (1976); W. Lepenies, *Das Ende der Naturgeschichte* (1976). See, in addition, also B. Dal, *Sveriges zoologiska litteratur* (1996), for an exquisite review of Swedish zoological literature from the Middle Ages to the twentieth century.

20 A clear indication of the strangely asymmetrical relationship between studies of botany and studies on zoology can be seen in bibliographies on the two domains, such as, D. E. Allen, 'Life Sciences' (1983), and S. A. Jayawardene, *The Scientific Revolution* (1996), pp. 264ff.

history of science, which have been important in shaping my conception of knowledge. Doing so, two main traditions within science studies will be distinguished and their main tenets briefly reviewed. This will be followed by a discussion of how these traditions have shaped the conception of knowledge and the analytical approach in the empirical field.

From one theoretical perspective, what we might term an evolutionary approach to science, the sparse attention accorded to the field of eighteenth-century zoology is not surprising. In broad outline, evolutionary historians have approached science as a continuous process of progress in which facts were accumulated, and theories, offering more accurate representations of nature, successively developed. This idea of the history of science has been fuelled by particular conceptions of science and nature. Firstly, it has been presupposed that nature was constituted in such a way that, as Karl Mannheim stated it is 'essentially accessible to all'.[21] Secondly, it has been presupposed that both man and his language were made in such a way that it was possible to represent nature accurately. On one hand, this implied that, in principle, human nature allowed nature to pass through the sensory organs in the same way in all researchers, and that it, furthermore, allowed the facts of nature to be processed in all researchers' minds in similar ways. It has, in other words, been presupposed that nature was fundamentally uniform and uniformly accessible. On the other hand, it has been implied that language could be made to represent nature transparently. As Émile Durkheim underscored in his classic comparison of science and religion, far from every human representation could be accepted as an accurate representation of nature, however. Like many of his contemporaries, Durkheim regarded primitive classification as a prime example of a representation, which did not primarily reflect on nature, but rather upon the people carrying it out. What differentiated scientific representations from primitive classification was argued to be the scientist's use of critical methods in his studies. According to Durkheim, employing such critical methods meant that the scientist in his classification of nature tended to overcome 'the social moulds according to which they were primitively classified'. As a result of the critical methods natural facts could in the scientist's representation 'be organized according to principles of their own, so logical organization differentiates itself from social organization and becomes autonomous.'[22]

For the history of science, this idea of science and the scientist has implied that science, firstly, could be studied relatively autonomously because it by definition was detached from

21 K. Mannheim, *Ideology and Utopia* (1966, org. 1929), p. 150.

22 É. Durkheim, *The Elementary Forms* (1976, org. 1912), p. 445. For a critical reassessment of 'critical rationalism' as the defining feature of science, see K. Popper, *Kritisk rationalisme* (1973), esp. chs. 1, 2 and 6; for a contemporary philosophical defence of this position, see W. Newton-Smith, 'Relativism and the Posibility of Interpretation' (1982); idem., 'Realism' (1990).

any social context, thanks to critical method.[23] Secondly, since accurate representations had not always existed it became possible to view the history of science as a development of increasingly improved critical methods and modes of explanation that facilitated increasingly more accurate representations of the fundamentally uniform nature. It is in this sense, that this approach to the history of science becomes evolutionary, and in a sense also teleological. Understanding the history of science as an evolution towards some ultimate representation of nature, towards the Truth, what becomes of significance in science's history, and hence noteworthy in the history of science, is those moments in history which has brought us closer to that Truth. Seen from this perspective, the history of natural history becomes interesting only as a prehistory to biology, and it was hence only logical that eighteenth-century zoology, and especially the British branch of it, should lead a life at the margins of the history of science, because it, on this account, did not contribute to the progress of science. As Ernst Mayr, for instance, stated after having reviewed the zoological classifications of Linné and Buffon in his history of 'biological thought': 'Little progress was made in animal classification during the seventeenth and eighteenth centuries.'[24]

From another theoretical perspective, that of the sociological (and sociological-historical) study of knowledge (SSK),[25] an inquiry into eighteenth-century zoologists and zoology, in principle, appears more sensible (although in practice, such inquiries have only been sporadically made). In explicit opposition to the evolutionary approach to science, from the beginning the SSK challenged many of the basic assumptions of this tradition: The idea of a uniformity of nature, a uniformity of man, and a uniformity of method. Ludwik Fleck could be

23 In general, social factors have only been brought into the historical focus within this approach in analyses of how specific historical contexts, on one hand, contributed to forwarding the course of science, such as in Robert K. Merton's analysis of the Puritan impetus to the 'scientific revolution' in the seventeenth century in 'Science, Technology and Society' (1938), and idem., 'Puritan Spur' (1973). For a critical reading and reassessment of Merton's thesis and the ideas about science which it is based on, see T. Gieryn, 'Distancing Science from Religion' (1988); R. Hall, 'Merton Revisited' (1963). On the other hand, from the evolutionary perspective what emerge as social and epistemological hindrances to the progress of science have, inversely, also been made an object of study. It is, for instance, a recurrent theme in É. Guyénot, *Les Sciences de la Vie* (1941); in A. T. Hopwood, 'The Development of Pre-Linnaean Taxonomy' (1958-9); and in A. Cain, 'Logic and Memory ' (1958); and it is the focal point in Hull's analysis of taxonomy and essentialism, in, 'The Effect of Essentialism on Taxonomy ' (1965). See also, C. E. B. Bremekamp, 'A re-examination of Cesalpino' (1953); idem., 'Linné's Views on the Hierarchy' (1953).

24 E. Mayr, *The Growth of Biological Thought* (1982), p. 182.

25 The labelling of the field, or, maybe more accurately, the conglomerate of fields all united by a relatively relativistic approach to science, is a bit perplexing. In different contexts, and at times with slightly different meaning or emphasis, such studies have been termed Science, Technology, Society (STS), Science and Technology Studies (STS), Sociology of Scientific Knowledge (SSK), Social Science Studies, Science Studies, History of Science. Not wanting to add to the confusion, in the following I shall use Sociology of Scientific Knowledge (SSK) as the most inclusive term, using it to refer to all of the studies within this approach (also such made before the term was invented in the 1970s), and hence, also subsuming under this category the History of Science Studies with which I will be mainly concerned. M. Hallberg discusses in *Symmetri och reflexivitet* (1997), pp. 2ff, the desiginatory heterogeneity.

seen as an important founder of the SSK-studies. Analysing the changing ideas and explanations of syphilis in early modern and modern Europe, Fleck elucidated that scientific theories and facts are always contingent upon a specific 'thought style' entertained within a historically situated 'thought collective.'[26] Developing and radicalising Fleck's point, Thomas S. Kuhn, in his analysis of scientific revolutions, argued that changes in the history of science are equivalent to paradigmatic alterations of the rules guiding the formation of scientific theories, the conception of facts, and scientific practices.[27] Although within an entirely different theoretical framework, the very idea of such radical changes were also developed by Michel Foucault and described as 'epistemic transformations' in his archaeologies of knowledge.[28] Regardless whether scientific changes are conceptualised in terms of alteration of 'thought styles,' 'revolutions in paradigms,' or 'epistemic transformations,' in all three accounts science is historiced in the sense that scientific authority is no longer seen as dependent on a universally valid method, but primarily upon the prevailing 'thought style,' 'paradigm,' or 'episteme.' Although in particular, Foucault's idea of 'epistemes' and Kuhn's notion of 'paradigms' have been criticised on many accounts, the very idea of fundamental shifts in the history of science still, as George Levine has observed, 'opened up to the study of the history of science the extraordinary possibilities of non-internalistic explanation.'[29] By historicising science, science was also contextualised. Its autonomous existence, preconditioned in the evolutionary approach, could no longer be sustained.

During the last three decades SSK-studies seeking 'non-internalistic explanations' to science have significantly increased, and their mode of explanation has taken many different forms. However, there seems to be three features uniting them. Firstly, it is generally presumed that scientific theory is always underdetermined by, what we pragmatically can call, 'data.' That the natural (and, for that matter, social) world in other words is constituted in such a way that it is always possible to give innumerable and, in principle, equally valid accounts of it.[30] Secondly, this means – as highlighted in particular in the doctrine of symmetry of the Edinburgh School[31] – no stance exists from which we as historians can judge the irrational from

26 L. Fleck, *Uppkomsten* (1997, org. 1935) esp. pp. 22ff and 48ff. Where nothing else is indicated in the notes the translations from Danish, as here, and later Swedish, Norwegian, and Latin are my own.

27 T. S. Kuhn, *Structure of Scientific Revolutions* (1996, org. 1962).

28 M. Foucault, *The Birth of the Clinic* (1973, org. 1963), idem., *The Order of Things* (1970, org. 1966), idem., *Archaeology of Knowledge* (1972, org. 1969).

29 G. Levine, 'Why Science Isn't Literature' (1994), p. 67.

30 As, for instance, argued by T. S. Kuhn, *Structure of Scientific Revolutions* (1996), pp. 4f.; K. Knorr-Cetina, 'Strong Constructivism' (1993), pp. 557ff; M. Mulkay, *Science and the Sociology of Knowledge* (1979), pp. 60ff; D. Bloor, *Knowledge and Social Imagery* (1991), ch. 2.

31 The doctrine of symmetry was first introduced by David Bloor in *Knowledge and Social Imagery* (1991), esp. pp. 8-13. It has later been developed, sometimes in more critical reassessments, by M. Hallberg, *Symmetri och reflexivitet* (1997), esp. Ch. 2, M. Ashmore, 'The Life and Opinions' (1988); H. M. Collins, 'What Is TRASP?' (1981) , among many others.

been shown to be a construction with a history of its own, dating from the seventeenth- and eighteenth-centuries.[36] The methods of science, including those of seeing and observing, as well as those of explaining and validating claims to truth have been made objects of the historian's analysis.[37] The object of knowledge itself, nature, as well as the basic building block which scholars in different ways have treated as 'facts' and 'evidence,' have been shown to be bound up in some measure within the specific historical context in which nature was (and is) investigated, facts evinced and classified.[38] The interrelations between knowledge and the sites of production have recently begun receiving attention.[39] Hence, the spatial context and its implications for the knowledge produced has been analysed in studies of the museum, which in the Renaissance served as one of the most important sites of studying,[40] the laboratory which became an important site for the production especially of experimental facts from the seventeenth-century onwards,[41] and, the clinic later in the nineteenth-century.[42] Finally, in recent years, some studies have been made of scholars' appropriation of space in the field.[43]

36 C. Taylor, *Sources of the Self* (1989), and R. Rorty, *Philosophy and the Mirror of Nature* (1980), esp. Part I and II.

37 Michel Foucault was, of course, among the very first to point to the historicity of observing and gazing in his study of penalogy, in *Overvågning og straf* (1977, org. 1976), and in his analysis of the modes of visibility in eighteenth-century natural history, idem., *The Order of Things* (1970, org. 1966). In *Techniques of the Observer* (1990) J. Crary followed this lead in an analysis of the historical construction of vision and the position of the observer in the eighteenth and nineteenth centuries. From a somewhat different perspective, S. Shapin and S. Schaffer in *Leviathan and the Air-Pump* (1985), ch. 2, esp. pp. 55ff., have studied the act of seeing as witnessing in seventeenth-century experimental philosophy, and Peter Dear has discussed norms and forms of experience in an early modern context, in *Discipline and Experience* (1995). On the history and changing modes of 'objectivity' in history, see especially the essays in A. Megill, *Rethinking Objectivity* (1994); L. Daston and P. Gallison, 'The Image of Objectivity' (1992); on truth and 'thought styles' in a historical context, see, besides L. Fleck, *Uppkomsten* (1997), I. Hacking, 'Language, Truth and Reason' (1982); idem., 'Style' (1992); and on the emergence of quantitative modes of studying as a privileged method during the eighteenth century, see the essays in T. Frängsmyr, J. L. Heilbron, and R. E. Rider, *The Quantifying Spirit* (1990). In studies of contemporary science, the idea of perception itself being culturally mediated, often advanced with reference to experimental psychology, has come to play an important role in explaining why science does not, and cannot, represent nature transparently. See, for example, D. Bloor, *Knowledge and Social Imagery* (1991), pp. 25ff; H. M. Collins, *Changing Order* (1992), ch. 1; M. Mulkay, *Science and the Sociology of Knowledge* (1979), pp. 43ff.; K. Knorr-Cetina, 'Strong Constructivism' (1993), p. 558.

38 The most comprehensive book on eighteenth-century British conceptions of nature is K. Thomas, *Man and the Natural World* (1983), though Thomas far from exclusively deals with learned conceptions of nature here. The first, to my knowledge, to suggest that facts were something made as much as found was, as I hinted at above, Ludwik Fleck, L. Fleck, *Uppkomsten* (1997, org. 1935), pp. 55ff. and *passim*. This idea was later taken up by T. S. Kuhn, *Structure of Scientific Revolutions* (1996, org. 1962), p. 7, and have been further developed in a series of recent studies on the conceptual context and modes of practices shaping the notion and handling of facts in the early modern period, see, especially, S. Shapin and S. Schaffer, *Leviathan and the Air-Pump* (1985), esp. pp. 25ff, and pp. 226ff.; and L. Daston, 'Marvelous Facts' (1994); idem., 'Baconian Facts' (1994); idem., 'The Cold Light of Facts' (1997); L. Daston and P. Gallison, 'The Image of Objectivity' (1992). For a more general discussion, also cf. R. C. Lewontin, 'Facts and the Factitious' (1994). In the same vein, also the notion of 'evidence' has been contextualised, see the essays in J. Chandler, A. Davidson, and H. Harootunian, *Questions of Evidence* (1994).

39 For a more general discussion of the importance of situating the production of knowledge, see A. Ophir and S. Shapin, 'The Place of Knowledge' (1991).

40 Esp. P. Findlen, *Possessing Nature* (1994).

41 See S. Shapin's study of the 'physical and symbolic siting' of Robert Boyle's and Robert Hooke's experimental works in his 'The House of Experiment' (1988), and, especially on Boyle, see also S. Shapin and S. Schaffer,

In a broader perspective, the relationship between the field of knowledge and other, often intermingled fields, of religion, philosophy, literature, and law have been made a subject of analysis, as have the particular ways of making distinctions between such fields.[44] The interchanges between natural, political and social order have been analysed in detail, especially as regards seventeenth-century experimental philosophy.[45] In part, in the context of the eighteenth century, the analysis of the relationship between science and society at large has been focused on the relationship between knowledge and the emerging national states,[46] and, in close connection with this, the building of empires from the end of this century onwards.[47] At a more local level, the production and use of knowledge in provincial contexts have been investigated.[48] Furthermore, at an institutional level, inquiries have been made into the role

---

*Leviathan and the Air-Pump* (1985), *passim*. See also O. Hannaway, 'Laboratory Design' (1986). Studies of laboratory life in contemporary science have multiplied during the last twenty years, .some of the most influential including B. Latour, 'Give Me a Laboratory' (1983); B. Latour, *Science in Action* (1987), esp. ch. 2; K. Knorr-Cetina, *The Manufacture of Knowledge* (1981), and M. Lynch, E. Livingston, and H. Garfinkel, 'Temporal Order' (1983).

42 M. Foucault, *The Birth of the Clinic* (1973).

43 Esp., A. t. Heesen, 'Boxes in Nature' (2000), see also P. Carter, *The Road to Botany Bay* (1989), esp. Ch. 1.

44 Such as Barbara Shapiro's study of the interrelations between natural science, religion, history, law, and literature, in *Probability and Certainty* (1983); or the tracing of relations by L. Daston and K. Park between the medieval and early modem concept of wonder and changing intellectual, philosophical, symbolic, artistic, social, religious, and epistemological contexts, in their *Wonders and the Order of Nature* (1998). From another perspective, see Foucault's analysis of the formation of disciplinary fields in the early modern and modern period in *The Order of Things* (1970).

45 See S. Shapin and S. Schaffer, *Leviathan and the Air-Pump* (1985), on seventeenth-century experimental philosophy and contemporary conceptions of political and social order; Shapin's analysis of the political context of the Leibniz-Clarke controversy around 1700, in his 'Of Gods and Kings' (1981); Mario Biagioli's analysis of the merging of 'self-fashioning' and 'world-fashioning' in early modem scholarship, in his 'Scientific Revolutions, Social Bricolage' (1992); A. J. Grieco's study of social and botanical classification in Renaissance philosophy, in his 'The Social Politics' (1992); F. Rigotti, 'Biology and Society' (1986), on the association between the notion of the Great Chain of Being in eighteenth-century continental natural history and social order in the wake of the French revolution; and A. Bewell, '"Jacobin Plants"' (1989), on botany and social theory in late eighteenth-century Britain. Studies on the relationship between early modern knowledge and religion, include M. C. Jacob, *The Newtonians* (1976); J. R. Jacob and M. C. Jacob, 'The Anglican Origins' (1980), on the Anglican spur to science; M. Hunter, *Science and the Shape of Orthodoxy* (1995), esp. chs. 12-15, on both the close connection between knowledge and theology and on the secularising potential of the 'new philosophy,' nevertheless.

46 Especially, L. Koerner, 'Purposes of Linnaean Travel' (1996), idem., *Linnaeus* (1999), on the relationship between Linnean natural history and the nation; and, within a British context, J. Gascoigne, *Science in the Service of Empire* (1998), on the uses of and demands on 'science' by government, and 'scientists' contributions to the development of bureaucratic institutions of the modem state. Another group of studies have focused on national differences in the 'scientific revolution'; see the essays in R. Porter and M. Teich, *The Scientific Revolution* (1992).

47 On the relationship between botany, in particular, and the emergence of the British empire, see the essays in D. P. Miller and P. H. Reill, *Visions of Empire* (1996), and J. Gascoigne, *Science in the Service of Empire* (1998); on the politico-strategic dimension of the scientific exploration of the Pacific Ocean, see A. Frost, 'Science for Political Purposes' (1988), idem., 'The Antipodean Exchange' (1996), and D. A. Baugh, 'Seapower and Science' (1990). On British scholars' perusal of linguistics, history, natural history and other field in late eighteenth-century India, see D. Kopf, *British Orientalism* (1969).

48 On the 'scientific revolution' in Scotland, see P. Wood, 'The Scientific Revolution in Scotland' (1992), and N. T. Phillipson, 'Culture and Society' (1975); and on the teaching of and the selective interest in certain aspects of

played by universities,[49] the learned societies,[50] the international and amorphous institution of the Republic of Letters,[51] and cabinets of curiosity and museums.[52]

Making conceptions of both method and nature relative to context means, finally, that it has become possible to approach scientific texts as literary texts. If science cannot be read as a more or less accurate representation of a uniform nature, the manner of presentation itself becomes epistemologically significant. The structure of scientific arguments, the style and rhetoric of presentations, the expository practices, and the iconography of illustrations have thereby been brought into the historian's analysis.[53]

By showing how science and the scientist are related to, conditioned by, and contribute to conditioning the social, the SSK-studies have, in conclusion, brought science and scientists out of their almost sacred, autonomous sphere beyond the social and into the centre of the 'mundane affairs' of social life.[54] By giving up the idea of scientific history as a history of progress of still more accurate explanations of a uniform nature, science – contextualised and historicised – has been transformed into a subject which, in principle, can be treated like any other subject in social or cultural history, or ethnography for that matter.

---

knowledge in provincial England during the eighteenth century, see J. Money, 'Teaching in the Market-Place' (1993).

49 J. Gascoigne, 'Politics, Patronage and Newtonianism' (1984); idem., 'The Universities and the Scientific Revolution' (1985).

50 On the history of learned societies in general, see J. E. McClellan III, *Science Reorganized* (1985), and the critique of McClellan's thesis by D. S. Lux, 'The Reorganization of Science' (1991); on the Royal Society, see M. Hunter, 'The Social Basis' (1976), where its sociological composition is discussed, and idem., *Science and the Shape of Orthodoxy* (1995), Part II. See P. Dear, *'Totius in verba'* (1985), and S. Shapin, *A Social History of Truth* (1994), esp. chs. 6-8, for discussions of the role of the Royal Society in introducing and authorising the 'new philosophy' in the final decades of the seventeenth century.

51 Especially, Goldgar's detailed study of the practices and norms of the Republic of Letters, in *Impolite Learning* (1995).

52 Such as Paula Findlen's study of Renaissance museums and knowledge production, in her *Possessing Nature* (1994), and Krzysztof Pomian's analysis of the place and role of the museum in early modern Europe, in his *Collectors and Curiosities* (1990), idem., 'Museet' (1993).

53 For more general discussions of the relations between representation and knowledge, see H. White, *Tropics of Discourse* (1985), M. A. K. Halliday, 'Language and the Order of Nature' (1987), D. LaCapra, 'Rhetoric and History' (1985/1998). On representation, rhetoric, and literary structure in an early modern context, see especially P. Dear, *'Totius in verba'* (1985); idem., *The Literary Structure* (1991); R. Rappaport, 'Borrowed Words' (1982); on the history of the footnote, see A. Grafton, 'The Footnote' (1994). Expository practices have been further explored in studies of present day science. See, for instance, S. Yearley, 'Textual Persuasion' (1981), G. Myers, *Writing Biology* (1990), B. Latour, *Science in Action* (1987), esp. Ch. 1, K. Knorr-Cetina, *The Manufacture of Knowledge* (1981), pp. 94ff. Especially during the last decade illustrations in science books have received increasing attention, for instance, with Martin Kemp's analyses of the history of naturalistic representation in science in his 'Taking It on Trust' (1990)), and his analysis of anatomical representations in the early modern period in idem. 'The Mark of Truth' (1993); Martin Rudwick's analysis of the development of a visual language in geology at the turn of the nineteenth century, in his 'The Emergence' (1976), Daston and Gallison's analysis of the production of objectivity through specific modes of illustrations, in their 'The Image of Objectivity' (1992), and the essays in W. R. Shea, *Science and the Visual* (2000), on visual representation in natural history and philosophy during the eighteenth century.

54 With a phrase borrowed from S. Shapin, 'Here and Everywhere' (1995), p. 304.

On this background, let us return to the present study. Although conceptualised in ethnographic terms, my approach to the British zoological endeavour of the eighteenth century owes a great deal to these SKK-studies in the history of science, as will appear throughout the thesis. Indeed, it is their contextualisation and historisation of science, which have made the present study possible. There is, however, one tendency in the SSK-studies, which I, for purposes of this study, would like to draw attention to here.

Despite the differences between SSK-studies, one common trend in their analytical focus might be noted. Although there certainly are exceptions, in analysing the social conditioning of science the emphasis tends to be placed on the modes of producing knowledge rather than on the content of the knowledge produced. In many cases, and certainly more so in some than in other, it is as if the question 'what did they know' – so meticulously and, indeed, almost exclusively, studied within the evolutionary tradition of the history of science – has come to play a mainly ancillary part in answering the question 'how did they know it?' This is certainly very useful if we want to know how knowledge was produced. However, it could be argued that there is more to science than the act of producing it, and that it might be interesting again to bring the question of content into fuller view. Although we cannot, of course, understand the product without understanding its mode of production, if we accept the basic assumptions of SSK, which I shall do, we cannot understand its content solely in terms of its production either. Ontologically, at least, they are two different things.

## The Problematique

In this study, by a slight turn of perspective, I propose to bring the question of 'how' and the question of 'what' equally into focus. I shall attempt to do so by heuristically distinguishing between the history of zoology and the history of zoologists. The first history will be concerned with the observations, the descriptions and depictions, and the classifications of animals, in brief, with the subject matter of zoology, and with the socio-cultural context, which conditioned the specific formulation of the subject. The second history will be concerned with the zoologists and their socio-cultural positioning as scholars, their modes of researching in the field, exchanging information, writing letters and books, describing, depicting, and classifying animals. Although these two histories are inevitably intermingled and hence must be studied in tandem, I will argue that it is not possible to reduce the history of zoology to that of the zoologists, or vice versa. Zoology is to the zoologist as the text is to the author, as the product is to the act of production, as, one might say, knowledge is to epistemology. Although they in a very basic sense are each other's condition of possibility, they are also irreducible histories in their own right.

Insisting on the dual nature of knowledge and its production, of course, does not in any way occasion a revolution in the history of science, since the content of science only in few cases has been entirely omitted, or has been presented as completely subsumed into the modes of production.[55] However, by highlighting and bringing the distinction between content and production into focus, it is possible to study the distinct specificity of each history, and to investigate the nature of the interrelations between them. That is what I propose to do in the present study. The guiding problematique may, thus, be formulated as a quest for that 'point of view' from where the zoological knowledge produced in eighteenth-century Britain became meaningful, and from where it became meaningful to produce it in the specific ways it was done. In order to give a more detailed explanation of how this study will be carried out the theoretical perspective must be introduced.

## THEORETICAL PERSPECTIVE

As indicated above my theoretical perspective shares many of the basic assumptions of the SSK-studies. However, my emphasis is placed somewhat differently. Rather than taking the starting point from questions relating to *knowledge* and its production – although such questions certainly also will form a substantial part of this inquiry – the primarily focus will be on *meaning*, and the modes through which meaning is produced. That, in turn, brings us back to ethnography. In the following I shall present a cultural-structuralist approach to the production of meaning. Categorisation is here identified as the locus of the production of meaning, and cultural assumptions about the working of the universe are identified as the domain, which from the natives' point of view makes it meaningful to categorise that world's phenomena in particular ways. As an implication of this approach, the distinction between the histories of zoology and of zoologists collapses from a *theoretical* perspective. In principle, there is no theoretical difference between social and natural categorisation, and I shall, hence, argue that both histories can be studied through the same analytical means. However, in conclusion to this section, I return to the question of the two histories and discuss how it is possible and even fruitful, at another level, to distinguish between zoologists and zoology, men and their work.

55 However, there are examples of this. Hence, Knorr-Cetina, for instance, identifies an 'opportunistic logic' in present day laboratory scientists as the modus operandi of science, or Michael Mulkay who defines knowledge as a resource which the scientist can use to obtain other resources, such a funds and students. In both cases, content becomes insignificant for understanding science, since science here, to put it bluntly, is made a function of a social game. K. Knorr-Cetina, *The Manufacture of Knowledge* (1981), p. 4 and *passim*; M. Mulkay, *Science and the Sociology of Knowledge* (1979).

If we, following Ferdinand de Saussure, accept the assumption that the world does not determine its representation, nor the meaning of signs, the question becomes how, then, do words acquire meaning? As is well known, Saussure's answer was that they do so by being structurally related to each other in systems of differences.[56] Transferring this theory of the sign to a sociological level, Claude Lévi-Strauss has argued that categories also at higher levels – like 'mythemes' in myths, groups in social systems, and, formulated more generally, any category in a classificatory system[57] – only gain meaning in relation to similar categories in a structural order:

> Les termes n'ont jamais de signification intrinsèque; leur significtion est "de position", en fonction de l'histoire et du contexte culturel d'une part, et d'autre part, de la structure du système où ils sont appelés à figurer[58]

It is through categorisation, therefore, that meaning arises. Lévi-Strauss never fully develops the role of culture and history in the formation of structural systems, because the working of a binary principle in his theory always supersedes the working of culture and history in organising the categories in human conceptual and social systems:

> [...] tout ce que nous prétendons avoir démontré jusqu'à présent est que la dialectique des superstructures consiste, comme celle du langage, à poser des *unités constitutives*, qui ne peuvent jouer ce rôle qu'à la condition d'être définies de façon non équivoque, c'est-à-dire en les contrastant par paires, pour ensuite, au moyen de ces unités constitutives, élaborer un *système*, lequel jouera enfin le rôle d'opérateur synthétique entre l'idée et le fait, transformant ce dernier en *signe*. L'esprit va ainsi de la diversité empirique à la simplicité conceptuelle, puis de la simplicité conceptuelle à la synthèse signifiante.[59]

Structuration always precedes culture and history because the binary principle, as Lévi-Strauss suggests elsewhere, is universally present.[60] In Lévi-Straussian structuralism meaning, ultimately, is made a function of a binarily defined categorisation. Although I shall follow Lévi-Strauss in assuming that meaning is a result of categorisation, I find it necessary – as many others have done before me – to modify his theory on two points.

Firstly, although signs may be theoretically determined to be arbitrary in relation to the world, within a particular context, signs mainly work as if they were also indexical. As Marshall Sahlins observes, in communication 'people bring signs into indexical relationships with the objects of their projects, as these objects form the perceived context for speech as a social activity.' Signs are used everywhere 'as the names of things.'[61] The world does not determine signs and their meaning, but people bring the world into the universe of signs by systematically using them in reference to the world.

We might even go one step further than Sahlins, and bring the world itself into the definition of the sign, as Charles S. Peirce did when he defined *semiosis*, the sign function, as a

56 F. de Saussure, *Course in General Linguistics* (1995, org. 1916).
57 C. Lévi-Strauss, *The Elementary Structures* (1969); idem., 'The Deduction of the Crane' (1971).
58 Idem., *La pensée sauvage* (1962), p. 74.
59 Ibid., p. 174; emph. in org.
60 See K. Hastrup, 'Fransk strukturalisme' (1975), pp. 50ff., for a discussion of this point in Lévi-Strauss' theory.
61 M. Sahlins, *Historical Metaphors and Mythical Realities* (1981), pp. 5-6.

relationship between sign-object-interpretant.[62] To begin with, this step raises the difficult question, which has preoccupied philosophers at least since the time of Descartes and which has also played a significant role in science studies, of whether any Real World outside our conceptualisation of it, exists or not. Are human categories somehow motivated, or are they, as Edward Sapir and Benjamin L. Whorf argued,[63] entirely determined by our culture?[64] Umberto Eco has argued that even though the Real World, or 'being,' as he calls it, cannot be understood nor conceived *an sich,* and only becomes comprehensible in language, our conception of being is, nevertheless, not entirely constructed 'from scratch'.[65] Language 'questions' being, 'and finds always and in some way or another something *given in advance.*'[66] This 'something' was what Peirce called 'object' or 'Firsts,'[67] and what Eco chooses to call 'lines of resistance':

> When we say that there exists lines of resistance, it only means that even though being appears to be a consequence of language, it is not so in the sense that it constructs it altogether freely.[68]

Eco exemplifies this by putting a twist on one of the full-blown constructivists' favourite examples: the differences in cuttings of meat and their denomination within different societies have caused problems in translating recipes. Different cultures, different cuttings, different names, therefore different categories. However, as Eco notes, 'it would be very difficult to imagine a cutting which at one and the same time offered both muzzle and tail.'[69] The moral of Eco's example is that although the Real World does not determine our conceptualisation of it, neither is our conceptualisation of 'being' entirely independent. The two cannot be categorically separated,[70] but neither can our categories be explained with reference to the World.

If the World somehow offers some lines of resistance to our formation of categories it means, on one hand, that not all descriptions are equally likely to be made (though they are, of course, imaginable in principle, like cuttings of muzzle and tail, or seven-legged pink cats with antennas and airscrews, and the like). But if the World does not determine our definition of categories that means that it is possible for different, also almost incomprehensibly different,

62 C. S. Peirce, *Semiotik* (1994), p. 116.

63 E. Sapir, 'The Status of Linguistics' (1968); B. L. Whorf, 'Language, Mind, and Reality' (1952), cf. F. Fearing, 'An Examination' (1954).

64 This question is immensely complex, and philosophers are much better equipped to discuss it than I am. In the following, I shall only give a very, very brief outline, the purpose here not so much being to solve the question – something which I think Umberto Eco, any way, has gone a long way towards doing in his recent book on language and understanding (U. Eco, *Kant og næbdyret* (2000)) – but merely to suggest how, within the framework of my theoretical perspective, we might afford the Real a place.

65 U. Eco, *Kant og næbdyret* (2000), p. 61.

66 Ibid., p. 61; emph. in org.

67 C. S. Peirce, *Semiotik* (1994), p. 94. For a discussion of this point in Peirce's semiotic, see U. Eco, *Kant og næbdyret* (2000), esp. pp. 104ff/Sec. 2.8, and F. Stjernfelt, *Rationalitens himmel* (1997), pp. 272ff.

68 U. Eco, *Kant og næbdyret* (2000), p. 61.

69 Ibid., p. 60.

70 Cf. E. Ardener, *The Voice of Prophecy* (1989), esp. p. 168.

conceptions of being to exist. In order to understand how these different conceptions, or points of views, come into being we must return to the question of categorisation and ask how the meaning of categories is fixed.

As we saw above, in the final analysis, classic structuralism identified a binary structure as the universally present, ultimate locus of the production of meaning. Now, and this is the second objection which has been raised against classic structuralism, there is nothing evident about the existence of such an underlying, meaning producing structure. It is true that structural patternings within a given community can be observed at an empirical level, and I shall, as argued above, with Saussure and Lévi-Strauss assume that it is through categorisation that meaning arises. However, the existence of a determining structure in the depth, some 'great hidden forces,' in the words of Michel Foucault,[71] which in 'inscrutable ways'[72] organise the human categorical system, does not appear obvious at all.[73] One problem with such a theory is that it does not leave any place for ambiguities in categories.[74] Another serious, and related problem is, as Mary Douglas has argued, that classic structuralism tends to accentuate the most systematic parts of behaviour, which easily can be binarily-structurally analysed, and leave the rest unanalysed.[75]

In order to maintain the important insight of classical structuralism, that meaning is relationally established, and to overcome these problems, I shall, along with Anne Knudsen, assume that the meaning-producing structuralisation takes place at the surface in actual life, in the concrete 'social practising,' rather than in the depth.[76] It is in both lingual and non-lingual practice that specific categories are related to other specific categories, whereby their meaning is fixed. From this perspective, practice becomes like a 'choreographing' of categories, in which meaning is produced as relations between category and category (and category...) are drawn.[77] As a category in practice, moreover, may be differently related to other categories at different times, its meaning may vary from context to context. Practice here becomes the locus of meaning production, because practice is identified as the locus of categorisation.

So far I have talked about 'categories' as if they existed in and of themselves. That is not the case, however. As David Schneider has argued, the delimitation of categories, or 'cultural

71 M. Foucault, *The Order of Things* (1970), p. 251.

72 A. Knudsen, *En Ø i Historien* (1989), p. 42.

73 The idea of a deep determining structure has not only been developed within structuralism, but in other forms also, for instance, within psychoanalysis (as the id), and Marxist historiography (as the economic basis). This idea of a deep structure might in itself, as Foucault has argued, be seen as a historical construction which arose as a privileged form of explanation during the late nineteenth and first half of the twentieth century. M. Foucault, *The Order of Things* (1970), pp. 243-53; also cf. E. Laclau, 'Politics' (1988).

74 Cf. E. V. Daniel and J. M. Peck, 'Culture/Contexture' (1996), p. 9; and M. Douglas, *Implicit Meanings* (1975), ch. 10. For a philosophic critique, see also E. Laclau, 'New Reflections' (1990).

75 M. Douglas, *Implicit Meanings* (1975), p. 170. For a similar critique, see also E. Leach, *Lévi-Strauss* (1970).

76 A. Knudsen, *En Ø i Historien* (1989), p. 41, cf. pp. 41ff.

77 Ibid., p. 42.

units' as he calls them, is in itself a part of the categorising endeavour. As 'things' are related to each other they are not only defined but thereby are also distinguished in particular ways as entities.[78] In some eighteenth-century contexts, the category 'man,' for instance, referred to every man and woman and gained its meaning by being either contrasted to the 'beasts' or to the 'angels.' In other contexts 'man' could be used as a synonym for 'civilised man' in contrast the 'Hottentots' and other savage people, etc. In each case both the extension and meaning of the category differed. The extension and referent of categories are not anterior to categorisation, then, but are in themselves subject to definition through the act of categorisation.

Now, although categories within the same community may be defined differently and thus gain different meanings in different contexts, the definition of categories are still far from fortuitous within a given community. On one hand, it is possible to observe patterns in the way people of the same community categorise; on the other hand, we have to assume that their modes of categorisation are meaningful at least to those members of the community who undertake them. In other words, they are collectively meaningful. Within a given community, something appears to mediate the acts of categorisation in such a way that it becomes more meaningful to draw certain relations between categories rather than others. Inspired by Bryan Cleal, I suggest that we call this 'something' for 'censuring contexts',[79] of which we may here distinguish between two principally different kinds – an institutionalisation of practices and a cultural space of implication.[80]

Firstly, the institutionalisation of practices. My notion of institutions is inspired by Mario Biagioli's definition of patronage as 'an institution without walls, its reality made of etiquette-bound rituals rather than of "things" such as buildings and statutes'.[81] An institution is here, in other words, defined as an institutionalisation of practices. In some cases buildings and statutes may constitute a by-product of a specific process of institutionalisation, but they do not define the institution. The solidification of practices does. Within the context of the history of science, we may define not only the learned societies, which have, of course, often been seen as institutions, and patronage, as Biagioli suggests, but also the Republic of Letters, and expository practices as institutions, in the sense that also these define conventionalised ways of acting. Institutions such as these become censoring, in the sense that they help to

78 D. Schneider, *American Kinship* (1968), pp. 2ff.

79 B. Cleal, 'Censurerende kontekster' (2001).

80 A third censoring context might be added, if my arguments for the World's lines of resistance are borne in mind, namely the World itself. However, since the lines of resistance, firstly, work on a vaguer level in relation to categorisation than the institutionalisation of practices and the cultural space of implications, and, secondly, since they do not play a very important role in my analysis of the zoologists and zoology (as Ardener has argued, what is universal and what is not is best determined in cross-cultural analyses, not in the analysis of a single community; E. Ardener, *The Voice of Prophecy* (1989), pp. 9ff.), they shall be omitted here.

81 M. Biagioli, 'Galileo's System of Patronage' (1990), p. 2.

consolidate and make some types of actions, and thereby some kinds of categorisations, more likely to be performed within their context than others.

Not all practices, however, are institutionalised, and even those that are, do not become meaningful with reference to an institution alone. To explain both the meaningfulness of structuralisation from the natives' point of view, and its relative systematicity within a given context, we have to assume that there is something which gives meaning to the specific ways relations are drawn; which makes it more sensible to draw relations between some categories, rather than others. We might call this meaning-giving context for 'culture.' Culture becomes, on this account, not a substance, which people possess, nor an essence, which defines their being. Instead, culture becomes that universe of shared assumptions and notions which are taken for granted about the world, which we have to assume exists in order to explain why categorisation is both executed relatively systematically, and becomes meaningful from the natives' point of view. Such a culture cannot be seen. It is a 'virtual order', as Sahlins calls it,[82] or 'an analytical implication', as Knudsen puts it,[83] which only becomes visible, or rather is only *made* visible through the ethnographer's analysis.

Within ethnography, culture has often been conceptualised as a 'whole,' as an entirely consistent world view. On one hand, we have to assume the existence of a certain degree of coherence in the cultural universe. There has to be some agreement in the assumptions about the organisation of the universe that people collectively entertain in order for meaningful communication to take place. However, on the other hand, there seems no reason to assume that this cultural order is entirely consistent. 'Everything is connected to something else,' as Søren Christensen observes, 'but everything is not connected with everything'.[84] The cultural order is not 'a synthesis', in which every taken-for-granted-notion is subsumed under and thereby adjusted to a whole.[85] Indeed, culture does not possess a cogito ensuring that the shared assumptions are logically attuned to each other. Culture is always in motion. Old assumptions die, new ones are born – culture is an ever evolving and hence, a not entirely consistent order, which 'nonetheless', as Clifford Geertz says with an apt metaphor, is ordered but in an 'octopoid' way.[86] Rather than viewing culture as a consistent whole, we might, consequently, see it as constellations of assumptions, which give meaning to people's practises, but which do not necessarily do so in any logically consistent way, or in entirely the same way in different contexts.[87] This also means that we must be prepared to find different assumptions

82 M. Sahlins, *Island of History* (1985), p. 153.
83 A. Knudsen, *En Ø i Historien* (1989), pp. 47-8.
84 S. Christensen, *Fakticitetens ironi* (1994), p. 68.
85 Ibid., p. 90.
86 C. Geertz, *The Interpretation of Cultures* (1973), p. 408.
87 Also cf. S. Christensen, *Fakticitetens ironi* (1994), pp. 90ff., and U. Hannerz, 'The World in Creolisation' (1987), pp. 550ff.

preconditioned in different contexts, which, if compared, may be found at odds with each other.[88]

In his or her quest for the natives' point of view, the constellations of cultural assumptions become a primarily concern for the ethnographer. Indeed, it could even be said that the natives' point of view equals these constellations of assumptions. The ethnographer is not, however, the only one who contemplates such assumptions. The natives also do so, though their reflections unfold within an entirely different context from the ethnographic one outlined here. Along with Victor Turner, I shall call 'the level of indigenous interpretation' for 'exegesis'.[89] Exegetical contemplation is valuable for the ethnographer in two respects. Firstly, it often gives guidelines for how something ought to be done – how, for instance, a taxonomic system ought to be formed, or how one should behave in order to be considered a polite gentleman. Thereby, exegesis helps to frame practising. Secondly, exegetical statements often give clues to relevant constellations of assumptions, which might help the ethnographer to identify why and how something becomes meaningful. But there is also a significant difference between saying and doing. The exegetical comment cannot be read as a neutral representation of the natives' practising, nor of their culture.[90] Indeed, the exegetical comment is often an idealised representation, and therefore must be read as an extension of practice.[91]

In sum, from this cultural-structuralist perspective, meaning is viewed as a function of a structuring practising through which categories are both delimited and their meaning fixed, as relations are drawn between categories through concrete choreographing practices. Hence, the structuring practising can be observed at an empirical level. The modes of categorisation within a given community is never entirely contingent, as might be seen in the existence of a certain systematicity in categorisation within a given community. This systematicity arises, I have argued, as a result of censuring contexts. The conventionalisation of practices within institutions, on one hand, makes it more appropriate to draw some kinds of relations rather than others within their context. On the other hand, and more fundamentally, we have to assume that both institutionalised and non-institutionalised practices are framed by shared constellations of cultural assumptions which make it more meaningful to draw some kinds of relations, rather than others in the actual acts of categorisation. This cultural order is not visible, but is only made explicit in the ethnographer's analysis.[92]

88 Cf. J. Boon, 'Symbols, Sylphs, and Siwa' (1986), p. 242; M. Douglas, *Implicit Meanings* (1975), pp. 3-4.

89 V. Turner, *The Forest of Symbols* (1967), p. 50. For a discussion of Turner's exegesis concept, see also D. Sperber, 'Pourqois les animaux parfaits' (1975), pp. 23ff.

90 As Turner himself also points out in *The Forest of Symbols* (1967), p. 25. Cf., in addition, also Pierre Bourdieu's analogous discussion of the differences between 'law' and 'rule,' in his P. Bourdieu, *Outline* (1977), pp. 17ff.; and Michael Hertzfeld's concept of 'disemia,' in his *Anthropology through the Looking Glass* (1987), p. 133 and *passim*.

91 I am grateful to Hans Ravn Larsen for making this point clear to me.

92 In my distinction between the empirical level of structuring practices and the cultural space of implications I closely follow A. Knudsen, *En Ø i Historien* (1989), p. 48.

As I indicated in introduction to this section, through this cultural-structuralist optic, both zoology and zoologists can be seen as created through the same kind of structuring practices. To put it very simply, as a category the 'zoologist' becomes meaningful, on one hand, as he is related to other kinds of categories, to other kinds of persons (the 'vulgar,' the 'polite gentleman,' 'women,' etc.), and as he in this capacity becomes a man who does certain kinds of things in certain kinds of ways, which again implies certain assumptions about who can and cannot act in this way, given, more fundamentally, certain presuppositions of what a man is, etc. etc. On the other hand, zoology can also be seen as the result of structuring practises in which animals, facts, species, genera etc. etc. are delimited and defined as they are related to each other in specific ways. This categorisation becomes meaningful on the background of constellations of shared assumptions about nature, animals, God, etc. From a cultural-structuralistic point of view, there is no theoretical difference between making sense of man and making sense of the world. Social and natural categorisation works through the same means. However, *empirically* these structuring practices are directed towards different ends – towards the self and towards an other (nature and the animals), respectively. Empirically, self-fashioning and world-fashioning, although, as Biagioli stresses, taking place simultaneously,[93] establish themselves as two different processes with different objectives and results. The two histories may, then, be distinguished at an empirical level with reference to the objective of their categorisations.

Translating my theoretical perspective into a methodology for the study of the two histories my method may be best described as a variant of Clifford Geertz's 'thick description.'[94] In dealing with both histories, I shall take my point of departure in a detailed analysis of practices, attempting to elucidate the common categories and structural patterns established through them. In order to illuminate exactly why certain kinds of structural patterns were established, and how from the natives' point of view they became meaningful an investigation into both the institutional settings, the exegetical framing, and the space of cultural assumptions mediating the concrete acts of categorisation will be carried out. Throughout I distinguish between acts of categorisation directed towards self-fashioning, and acts directed towards world-fashioning, in order to illuminate how these two histories differed and at the same time also conditioned each other.[95]

93 M. Biagioli, 'Scientific Revolutions, Social Bricolage' (1992), pp. 32ff.

94 C. Geertz, *The Interpretation of Cultures* (1973), ch. 1.

95 When moving outside the field of zoological studies, and, for instance, comparing them to other kinds of studies or activities in contemporary society, where the distinction between the two histories is of less importance, for the sake of brevity I shall refer to both histories at once as the 'zoological endeavour.'

## THE EMPIRICAL CORPUS

This formulation of my theoretical understanding of the field has had a direct influence on the choice of empirical material that will be used in the analysis. First of all, an attempt to analyse the common structuring practices and the collectively shared cultural assumptions censoring the zoological endeavour ethnographically, means, on one hand, that the contributions of all eighteenth-century zoologists, either 'great' or 'insignificant,' in principle become equally important since such common practices and cultural assumptions are displayed in the works of the 'great' as well as in those of the 'insignificant.'[96] On the other hand, this quest for the common and collectively shared also necessitates a rather comprehensive reading of zoological literature. Ignoring the distinction between 'great' and 'insignificant' zoologists, I have consequently searched bibliographies[97] and library catalogues, most notably at the British Library, and rather indiscriminately read what came my way. Although the weight in this corpus lies in what may be called monographs – books which in some way deal with the whole or part of the animal kingdom, in either a specialised or a more popular presentation (an elaboration on that distinction follows below) – I have also consulted contemporary catalogues from museums and cabinets, books on taxidermy, guidebooks on collection, and the like. Zoologists' manuscript remains, mainly letters and notebooks, have also been used.

Since I assume that the zoological endeavour cannot be understood in itself, but only in relation to a broader socio-cultural context it has, secondly, been found necessary to transgress the boundaries of zoological works in my reading of primary literature in a quest for censoring and meaning-giving contexts of the zoological endeavour. Therefore, although much less extensively, I have read a range of contemporary philosophical literature, books of manners, periodicals, moral tracts, political and auto-sociological works, travel accounts, theological literature, novels, and poems. It should be noted that in the selection of this literature I have been rather biased towards 'great' authors, in order to limit the extent of reading. To remedy this bias in some measure, an attempt has been made to supplement the primary literature with secondary literature, which is based on a more comprehensive research of the fields in question.

Expect for a handful of writers, all of the authors of my source material are British. Although the European context was certainly important for the British zoological endeavour, and although I touch upon it every now and then throughout the thesis, this context tends to be put into the background in my analysis in order to explore more local contexts of the

96 Though it, of course, also from this perspective may be interesting to investigate how certain authors in a given period establish themselves and are established as 'great,' and to examine the implications of such positioning for the knowledge produced. This will, however, not form a main theme in the present thesis.

97 Especially, V. J. Carus and W. Engelmann, *Bibliotheca Zoologica* (1861), and G. H. Bell and D. B. Rhodes, *A Guide to the Zoological Literature* (1994), have been useful.

zoological endeavour. As I shall attempt to show later (especially in Part II) this delimitation of a 'British zoology' is not entirely arbitrary. Though pursued in an international context, a more specifically British tradition of studying zoology established itself in this period, which may in some way legitimate this delimitation of source material.

With the problematique, the theoretical framework, and the empirical corpus presented, it is time to introduce the zoological endeavour itself.

## The Zoological Endeavour and Society: A Prelude

On my theoretical account – and, of course, in accordance with the basic tenets of SSK-studies – science and scientists are always and everywhere constituted within a socio-cultural universe which is bigger than the scientific endeavour itself. However, it is theoretically impossible to say anything about the specific nature of the interrelations between science and, to put it briefly, 'society.' The origin of specific patterns of practices or the precise constellations of cultural assumptions implicated in specific actions can only be determined through a concrete investigation. In a sense, to speak about 'science,' 'scientists,' and 'society' before the empirical analysis has even begun is already to have said too much: 'Science' and 'scientists' do not simply exist as unproblematic categories that the ethnographer can take her point of departure from. On the contrary, part of the constitution of any 'science' and 'scientist' is an indigenous demarcation of the categories of 'science' and 'scientist,' or, in this present case, of 'zoology' and 'zoologist,' in relation to a particular 'society.' The way that these boundaries are drawn and the point where they are drawn differ across time and space, and in themselves become constitutive for the scientific endeavour.[98]

During the eighteenth century, the endeavour of zoology, like other branches of learning, was not formally differentiated from society, as science would later be with its institutionalisation in universities. The men of learning were always also something more than men of learning, and their zoological books were not exclusively addressed to a professional audience, rather their readers were found in a more or less restricted part of, mainly, Polite Society. There were no definitive institutional divisions between 'science' and 'society,' but that does not mean that the endeavour of zoology coincided with 'society' either.

As a first introduction to the empirical field, I shall in broad lines attempt to encircle where and in what terms the boundaries between the zoological endeavour and 'society' were drawn. I shall do so by discussing, firstly, how the zoological book and, next, the zoologist

98 Also cf. E. C. Spary, 'The 'Nature' of Enlightenment' (1999), and S. Shapin, 'Science and the Public' (1990). Both authors make an analogous argument, though the first does so in a eighteenth-century French context, and the second, in somewhat different analytical terms.

were situated in relation to broader social contexts, and I shall argue that it was primarily 'Polite Society' which constituted the point of reference for these demarcations of the zoological endeavour. As I shall attempt to show the demarcations were never final, nor definite, and the zoological endeavour, though in some ways clearly distinguished from, were in other ways intimately related to Polite Society. With regard to the zoological books, the focal point here will not be on their contents – a few more opening remarks are necessary, I am afraid, before we get to the animals – but on their generic features. These not only helped to frame the presentation of the content, but also, on one hand, worked to distinguish the zoological book from other categories of books in an intertextual universe, and, on the other hand, worked to position the books 'intersocially' in relation to an audience. In the second part of this section the focus will be on the zoologists. I shall here sketch out the zoologists' relation to especially the Polite Society of the emerging middle echelons to which the majority of zoologists belonged in socio-occupational terms. In the course of the analysis below, in order to elucidate purely sociological features of the naturalists' social positioning I shall at times take recourse to a survey carried out of 104 natural historians, who published during the period 1660-1800 (Tab. 1.1-1.4).[99]

In brief, the following section will be concerned with how the zoological endeavour was constituted and how it constituted itself in relation to contemporary 'society.' This is no more than a prelude, however – detailing the nature of the relations between the zoological endeavour and contemporary society, and showing their epistemological implications for the zoological endeavour will be a recurrent theme throughout the thesis. Here I only attempt to sketch the contours of that space which framed the conceptualisation of such relations.

99 The figures are based on a survey carried out by searching the British Library external online catalogue for authors who published on natural history subjects in the period 1660-1800. The search gave 126 hits, out of which I could find no further information on 22 of them. These authors have, consequently, been excluded from the sample so that the 104 authors on whom information could be gathered equal 100%. The sources consulted include: L. Stephen and others, *Dictionary of National Biography* (1885-1901); C. C. Gillispie, *Dictionary of Scientific Biography* (1981); L. Baillie and P. Sieveking, *British Biographical Archive* (n.d.).

## Biographical Survey: Natural Historians' Social Positioning, 1660-1800

Sample: 104 natural historians

### Table 1.1: Father's Occupation

| | | |
|---|---|---|
| Aristocracy | 10 | 11.5% |
| Professions | 23 | 22.1% |
| Merchants | 7 | 6.7% |
| Office holders | 4 | 3.8% |
| Lowest echelons | 5 | 4.8% |
| no information | 55 | 52.8% |

### Table 1.2: Natural Historian's Education

| | | |
|---|---|---|
| University | 57 | 54.8% |
| Apprenticeship | 7 | 6,7% |
| Apprenticeship + University | 3 | 2,9% |
| Law | 1 | 0,9% |
| No formal education | 3 | 2,9% |
| no information | 33 | 31,7% |

### Table 1.3: Natural Historian's Occupation

| | | |
|---|---|---|
| Landed property | 5 | 4.8% |
| Professions | | |
| - physician | 29 | 27.8% |
| - clergyman | 19 | 18.2% |
| - draughtsman/illustrator | 6 | 5.8% |
| - professor/lecturer | 10 | 10.4% |
| - apothecary | 3 | 2.8% |
| - other | 14 | 13.5% |
| total, professions | 79 | 75.8% |
| Merchants | 4 | 3.8% |
| Office holders | 4 | 3.8% |
| no information | 8 | 7.7% |

### Table 1.4: Membership of Learned Societies
(the same person may be a member of more than one societies)

| | | |
|---|---|---|
| Total number of naturalists with min. one membership | 52 | 50% |
| - FRS | 36 | 34.6% |
| - College of Physicians | 11 | 10.6% |
| - Society of Antiquarians | 4 | |
| - Linnean Society | 4 | |
| - Royal Med. Soc. of Edinburgh | 3 | |
| - Royal Society of Edinburgh | 3 | |
| - Foreign Societies | 2 | |
| - other | 17 | |

## Books in between

We should be wary, as Michel Foucault has reminded us, of approaching a book as an independent object. 'The frontiers of a book are never clear-cut', Foucault observes,

> beyond the title, the first lines, and the last full stop, beyond its internal configuration and its autonomous form, it is caught up in a system of references to other books, other texts, other sentences: it is a node within a network.[100]

Furthermore, beyond the intertextual relations, the book can also be seen as a 'node' in an 'intersocial' universe. The author always comes from somewhere and always positions himself in a specific relation to an audience, which is delimited, if never determined, by the generic conventions of the book. In this way, a book is also always 'caught up' in a social 'network.' In the following, I shall start with briefly indicating the contours of the intertextual universe which the zoological books were related to, and then discuss by which generic means the zoological books were also distinguished in this universe, and how the author positioned himself and his book intersocially.

Intertextually, books are always related to other books by way of implicit or explicit reference, by shared features, and, to quote William Hanks, by 'common membership in a style genre within a given literary tradition,' 'by amplification (where one book elaborates on the other), by contradiction or by reinforcement'.[101] Such intertextual features tend, as Hanks concludes, 'to break down the boundary between what is inside and what is outside, giving it the appearance of a mosaic of parts derived from elsewhere.'[102]

The zoological books were intertextually linked to a large variety of other kinds of books and texts, with ramifications in many different directions. They implicitly evoked or explicitly named letters and manuscript-notes, theological and moral tracts, natural history poems, classical literature and Renaissance philosophies, contemporary natural philosophical tracts, articles in periodicals, the Bible, auto-anthropological and auto-sociological literature, travel accounts, philosophical books, as well as, of course and most extensively, other natural history and, especially, zoological books. Throughout the course of this study we shall have occasion to pursue some of the more important of these intertextual links. For the present, it is important to stress that the zoological books were inscribed in and incorporated elements from a much larger textual universe.

However, there were also areas of condensation in this intertextual universe. Even as the zoologists referred to Aristotle or Aldrovandi, cited a letter or a natural history poem, they also distinguished their own type of work from the rest, and thereby helped to demarcate a zoological corpus, a genre.

100 M. Foucault, *Archaeology of Knowledge* (1972), p. 23.
101 W. F. Hanks, 'Authenticity and Ambivalence in the Text' (1986), p. 727.
102 Ibid., p. 740.

We may take a 'genre' to mean an institutionalised set of practices which, in the words of Hanks, specify 'a set of focal or prototypical elements',[103] which by different agents may be used differently, but which overall define what kind of book one is dealing with. The prototypical elements include, for instance, a specification of the different stages in the text – headlines, dedications, introductions, main sections, conclusions, bibliographies; the rhetorical mode; the positioning and role of the author; the subject matter; the manner of citation; the addressee, etc.[104] At a more basic level, a genre helps to define how a text should be read. Although, in principle, a text, of course, may be interpreted in every way imaginable, 'the range of possibilities is never open-ended in the real social world', as Hanks argues.[105] The reason for this is both that the context of reading plays a constitutive role for the interpretation of the text,[106] and that by virtue of the generic conventions, the text itself provides some guidelines on how it should be read – in its most general function: as fiction, philosophy, zoology, theology, or poetry, for instance.

By the late seventeenth-century zoological books had become clearly distinguishable from literature, philosophy, and theological literature.[107] Emerging as a sub-field of natural history, the zoological books shared many generic features with books on minerals and plants. However, although there were some few works, which dealt with all three natural kingdoms, the zoological books were in general distinguished from these by subject matter. Among the zoological books we might, depending on how one draws the lines – and the drawing of lines will be my doing since no explicit definitions of genres were given by the zoologists themselves[108] – distinguish between two major sub-genres. Firstly, the General Introduction, which was usually presented as an 'abridgement' or a 'Collection' of typically the most

103 W. F. Hanks, 'Discourse Genres' (1987), p. 681.

104 Cf. Ibid.; N. Fairclough, 'Discourse and Text' (1992), idem., *Discourse and Social Change* (1992), pp. 124ff.

105 W. F. Hanks, 'Text and Textuality' (1989), p. 107.

106 Cf. ibid., pp. 106-7. This idea of reading as constitutive for the meaning of a text has not only been advanced within literary studies (e.g. D. LaCapra, 'Rhetoric and History' (1985/1998)), and history of reading studies (e.g. I. Rivers, *Books and Their Readers* (1982); J. Raven, H. Small, and N. Tadmor, *The Practice and Representation of Reading* (1996); R. Chartier, 'Texts, Printing, Readings' (1985); R. C. Darnton, 'Readers Respond' (1984)), but it has also received attention during the last twenty years or so within history of science studies. See, for instance, J. V. Price, 'The Reading of Philosophical Literature' (1982), and A. Johns, 'The Physiology of Reading' (1996), on the reading of philosophical literature, and L. Jardine and A. Grafton, '"Studies for action"' (1990), for a specific case study of William Harvey's reading of Livy.

107 On the emergence of the distinction between 'science' and 'literature' during the seventeenth century, see G. Beer, 'Science and Literature' (1990); on the generic conventions of philosophical writing in general, see R. Ginsberg, 'Introduction' (1987), and on Shaftesbury's writings in particular, see R. Markley, 'Style as Philosophical Structure' (1987); L. Klein, 'Shaftesbury, politeness' (1993); on 'scientific' poetry, see W. P. Jones, *The Rhetoric of Science* (1966); on the special genre of learned journals, see A. Johns, 'Miscellaneous methods' (2000), S. Yearley, 'Textual Persuasion' (1981); and on differences in style and class, see C. McIntosh, *Common and Courtly Language* (1986).

108 This, indeed, is often the case, cf. J. M. Swales, *Genre Analysis* (1990), ch. 1.

'curious' and 'interesting' things which were already known about the animal kingdom;[109] and secondly, the Specialised Account, which usually aimed not only to give a more comprehensive account of whole or part of the animal kingdom, but which often purported to present new discoveries as well.[110]

The General Introduction and the Specialised Account shared many generic features. Essentially, to a very large extent, they make use of the same kind of stages in the structuring of the book. Hence, after a title page, and possibly a dedication, we find in both sub-genres, a preface or an introduction which usually served metalinguistic purposes, in the sense that the author here positioned himself vis-à-vis the public, vis-à-vis nature, and vis-à-vis the natural history tradition. After the introduction or preface, a table of contents followed in some books, and, next, in all book the main body of the text – the substantial part of the book in which the description and classification of animals were presented, almost always accompanied by some engravings of animals, at times lavishly coloured. It is in the positioning of the author vis-à-vis the audience and in the delimitation of that audience in the presentation of knowledge in the main body of the books that we find the most significant generic differences between the General Introduction and the Specialised Account.

Let me start with the author. We might use the presentation of the author on the very title page as a prism for examining the positioning of the author vis-à-vis the audience in the two sub-genres. Already here crucial information was provided about who the author was (or was not), where he came from and how he gained authority to write about the things he did.

While the name of the author, and sometimes also his university degree, fellowships of learned societies, and less frequently his occupation, would appear on the title page of the Specialised Accounts, the General Introductions would often be published anonymously.[111] Already this signified a difference of intent between the two sub-genres. As I shall return to

109 Quotes drawn from Anonymous, *Beauties of Natural History* (1777), p. xxiv, Anonymous, *The Beauties of the Creation* (1790), p. v; F. Watson, *The Animal World Display'd* (1754), p. ix. Similar terms reappear in General Introduction after General Introduction.

110 The Specialised Account may be further subdivided with reference to subject matter into 'global accounts,' dealing with a subject in all of its alleged ramifications; 'national accounts,' focusing on the fauna of a specific country; accounts on one specific class of animals (quadrupeds, snakes, birds, etc.); and, lastly and partly cutting across these other sub-genres, accounts which only purported to describe specimens or species, and 'taxonomic accounts' in which the animals were also classified. As these sub-genres of the Specialised Account differed principally with regard to subject matter, but were framed by the same generic conventions, they will here be treated together.

111 There is one exception to this pattern, and that is the, in other regards, decisively Specialised Accounts of Thomas Pennant. In his *Synopsis of Quadrupeds* (1771), his name appears, but only at the end of the Preface; in his *British Zoology* (1768-1777), his name does not appear until the end of the dedication of the third volume, and again after another dedication in the fourth (there is no dedication in the first two volumes). Pennant, however, had such an enormous network of correspondence who were kept up to date with the latest developments in his writings, as it clearly appears from his letters, that it seems fair to assume that virtually everybody with an interest in zoology, or natural history, would know who the author was well before the publication of one of his works – a specification at the title page was not needed here.

later (Chapter 3), the credibility of claims to truth was to a large extent, but not exclusively, evaluated by assessed the veracity of an author,[112] and especially when it came to 'discoveries' of extraordinary animals, it would usually be important to know who the author was in order to decide whether his propositions could be trusted. This relationship between name and authority is exposed in the introduction to Edward Bancroft's natural history of Guiana. At first, Bancroft had planned to publish the book anonymously, however, his friends had

> represented the impropriety of publishing an Account of the unknown Productions of an almost unknown Country, on the slender support of anonymous Authority; and the justice of their remonstrance overcoming his juvenile timidity, had encouraged him to subscribe his Name to the Dedication; not with a presumptuous expectation of acquiring Honour for the Work, but solely to add to its Credibility.[113]

Whereas the General Introductions did not need the name of an author because they, as noted above, merely aimed to represent and give an abridgement of what was already known, the Specialised Accounts, inversely, needed the name of an author in order to gain authority because such Accounts purported also to present 'new' knowledge.

In order to understand what role the listing of university degrees and fellowships of learned societies in the Specialised Accounts played in defining the authors' position, we must look briefly at these institutions' relation to learning more generally. The universities have, on one hand, often been ruled out in histories of science as inconsequential in this period because they were decreed by statutes to provide an education based on scholastic learning, fundamentally at odds with the basic assumptions of the 'new philosophy,' and hence also with the zoological endeavour. And a glance at my survey also shows that it was not all natural historians who had a university degree (see Tab. 1.2). However, as recent studies of students' notebooks and professors' lecture notes have shown, the new philosophy in some measure found its way to the teaching halls during the eighteenth-century,[114] and, furthermore, the universities also provided their students with such a general education – especially in theology – which would be crucial for a man of learning.[115] In this way, the universities were not entirely inconsequential. On the other hand, the learned societies have often been portrayed as though they had a monopolising position in the production of knowledge during the eighteenth-century, equivalent to that which the universities would get towards the end of

112 On evaluating an author's veracity, see also S. Shapin, *A Social History of Truth* (1994), ch. 6.

113 E. Bancroft, *An Essay on the Natural History of Guiana* (1769), p. i. Expressing an unwillingness to become an author as in this case, was a recurrent theme in seventeenth and eighteenth-century natural history and in natural philosophical literature. As Shapin has argued, with reference to an seventeenth-century context, the denouncement of a quest for honour by being author was also linked to the building of authority, in as much as such a denouncement signified that one did not publish a book in order to fulfil sordid private ambitions, but solely in order to represent nature, and, hence, to add to the stock of genuine knowledge. S. Shapin, *A Social History of Truth* (1994), pp. 177ff.; on the humbling positioning of the man of learning also in the eighteenth century, see S. Schaffer, 'Self Evidence' (1994), p. 68.

114 J. Gascoigne, 'The Universities and the Scientific Revolution' (1985).

115 Cf. H. Kearney, *Scholars and Gentlemen* (1970), see also L. Stone, 'The Size and Composition' (1975).

the nineteenth-century.[116] In particular, the Royal Society, founded in London in 1662, provided an important forum for the 'new philosophy,' as it, especially in the following decades, become central both in promoting and consolidating new methods of study, and, as Steven Shapin has shown, in validating claims to truth.[117] Still, however, it was possible to be a natural historian without being a fellow of the Royal Society, or any of the other learned societies, which mushroomed around the country during the eighteenth-century (see Tab. 1.4),[118] and the authority of the Royal Society was, moreover, seriously challenged during the eighteenth-century.[119] Though the societies provided important forums, they did, in fine, not monopolise the pursuit of knowledge.

Although neither the universities nor the learned societies, then, possessed the 'right to control of the exercise,'[120] even on the background of this very brief sketch, it might be suggested that they could still, for each their different reasons, confer authority upon an author's endeavour. It was not necessary to list a university degree or fellowships at the title page of a Specialised Account together with a name, but it might still lend authority to the name of the author and his claims.

On the very title page the author, then, positioned himself and his work in relation to the readers. In both the introductory section and in the main body of the text, inversely, he addressed the question of who these readers would ideally be.

'Viewed as a kind of practices,' Hanks says, 'genres are characterised by what Bakhtin called their "addressivity"': 'Different genres correspond to different conceptions of the addressee'.[121] In the zoological books, in some cases, the addressee was designated explicitly in introductory statements, but the audience was also, and just as importantly, demarcated through the mode of representation and usage in the main body of the text. In both cases, the audience addressed differed to some extent between the two sub-genres.

As the name should suggest, the General Introductions were addressed to a 'general public.' As was often made explicit in the introductory statements, the public included women, young people, as well as the 'learned and curious.' 'In this small volume, alone,' the author of

116 As esp. argued by J. E. McClellan III, *Science Reorganized* (1985), p. xix, and *passim*; and, more briefly by L. T. Sarasohn, 'Thomas Hobbes and the Duke of Newcastle' (1999), p. 717. For a somewhat different view, see M. Hunter, 'The Social Basis' (1976), and for a critique of McClellan's study, see D. S. Lux, 'The Reorganization of Science' (1991).

117 S. Shapin, *A Social History of Truth* (1994), see esp. pp. 266-87.

118 For a review of the most important of these provincial societies, see J. E. McClellan III, *Science Reorganized* (1985), chs. III and IV.

119 See for instance *Monthly Review*, vol. 4 (Feb., 1751), p. 282. Even from the beginning, as Hunter has argued, the Royal Society was notoriously London biased, and 'it is clear that it was never central to the scientific activities of those based in Oxford, Cambridge, or the provinces rather than London.' M. Hunter, 'The Social Basis' (1976), p. 13, cf. pp. 13ff.

120 As Ben-David has argued that the universities were later to do, idem., 'The Profession of Science' (1972), p. 363.

121 W. F. Hanks, 'Discourse Genres' (1987), p. 682.

the *Naturalist's Pocket Magazine*, for instance, stated, 'we may venture to assert, the most intelligent naturalist will discover somewhat that is new, and not altogether unworthy of his attention; while, to readers in general, it cannot fail to afford a very considerable fund of information and entertainment.'[122]

To 'readers in general': If we take into account the number of people who could not read such books – possibly as many as three quarters of the population, namely the generally uneducated people of the lower echelons[123] – sociologically, the targeted audience here became the members of Polite Society and above. Among these it might be noted that women, who as we later will see for the most of the eighteenth-century were generally denied the opportunity to write zoological books, were by no means unimportant as readers. Hence, from the early eighteenth century onwards, women of the middle and higher echelons became increasingly important as readers of especially General Introductions to natural history and philosophy.[124] It might appear somewhat surprising to find that the learned also were included in the targeted audience for the General Introductions together with the young and females. It could be argued that there is two reasons for this. Firstly, the differences between the General Introductions and the Specialised Accounts were not any bigger than it was actually possible to present knowledge in the General Introductions which could be of interest to specialised authors, as is evident from their citation of such works. Secondly, the fact of addressing also the learned may be interpreted as a warrant for the credibility of the General Introduction. The General Introductions might 'avoid[...] that technicality of science which is so apt to discourage those who read chiefly for amusement,' as one author stated, 'without, in the mean time, neglecting to introduce whatever may be essential, in this respect, to readers of every description.'[125] Being amusing did not necessarily mean that it was untrustworthy.

It is characteristic that the authors of the Specialised Accounts virtually never gave the subject of the audience any explicit consideration in the introductory section. It seems as if it went without saying who the targeted addressee was. And in a way it did, at least as soon as the reader got to the main body of the books, where the sheep were separated from the goats. In the Specialised Accounts, the animals, and especially the well-known animals, would here often be described in a stenographic style, where sentences would be cut off, verbs would be

122 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. I, Preface (unpaged).

123 Leaving the difficulties of defining rates of literacy aside here (but, see R. A. Houston, 'British Society in the Eighteenth Century' (1986); R. S. Schofield, 'The Measurement of Literacy' (1968)), from the late seventeenth century to the 1750s, the rate of literacy – here defined as possessing sufficient literate abilities to write one's own name – raised from 50% for males and 25% for females to 62% for males and 42% for females. Although one can only guess about the exact size of the group of people who could actually also read scholarly literature, it seems certain that, though it was much smaller than these figures indicate, it also increased during the period. D. Cressy, 'Levels of Illiteracy' (1981); idem., 'Literacy in Context' (1993).

124 G. S. Rousseau, 'Science Books and Their Readers' (1982), p. 213.

125 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. I, Preface (unpaged).

left out, abbreviations would be employed, and signs would mainly only be used denotatively. Even when animals, and usually more uncommon animals, were described more circumstantially, the mode of representation would still be specialised. Through the employment of such rhetorical modes in the main body of the text, the potential audience of the book was delimited. The specialised descriptions of animals required a reader who was familiar with the codes so to say, who possessed a certain amount of knowledge about the natural world, and about the tradition of writing about it: the learned and in natural history already well-versed.

In the Specialised Accounts, moreover, we find an extended use of citations in the main body of the book, most often given in an abbreviated form, like 'Br. Zool.,' or 'Lin. SN.' In using such 'coded' citations the author, once again, took for granted that his reader was versed in the zoological tradition (as well as literature more generally, since the cited works were by no means restricted to natural history), and that the reader thus possessed enough knowledge about zoological works to deduce that 'Br. Zool.' stood for Thomas Pennant's *British Zoology*, or 'Lin. SN.' for Carl von Linné's *Systema Naturæ*. The extended use of citations also served another function, as through the citations the individual book was explicitly woven into an intertextual universe. We might note in passing that although authors also frequently cited continental authors – and especially such 'great' naturalists as Linné and Buffon – the majority of the cited works were by compatriots. In this way the intertextual universe, explicitly demarcated by citations, tended to be nationally biased.

In the main body of the General Introductions, in contrast, we find a more narrative style employed in the descriptions of the animals. The tone and objective is set in some introductory remarks to *The Beauties of Creation* in which the author noted that, 'It has been our endeavour to trace more those grand outlines of sublime wonders that elevate the heart to the Creator, than to descend to the minute investigation of the mere specularist', that is to say, of the specialised author.[126] Here, the reader would encounter the animal kingdom in general outline, presented in an often entertaining style, and, on any account, always in a narrative and hence, an easily decodable mode of language. In the General Introductions, moreover, we hardly find any citations in the main body of the text. In the introduction, the author would usually stress that, indeed, he had such an acquaintance with natural history books as was required to write a proper introduction to zoology. Usually, these books were not specified, and hence, the General Introductions were only very vaguely inscribed in an intertextual universe in explicit terms. They were presented as if they could stand alone, as if each was the only book that a curious reader needed to read in order to obtain all of the useful knowledge about the animal kingdom.

126 Anonymous, *The Beauties of the Creation* (1790), p. vi.

In sum, the Specialised Accounts, with their often stenographic style and coded representations, with their masses of citations, and specialised descriptions, addressed a learned audience. Inversely, the General Introductions, with their more narrative style, lack of citations, and more general outline of the animal kingdom, addressed both the learned and the polite. We should, however, be wary with distinguishing too sharply between these two sub-genres. In practice, the writers of the General Introductions not only attempted to bridge the gap between the two genres by also targeting the learned as part of their envisioned audience, but both 'learned' and 'popular' writers might also employ generic practices from both sub-genres. Furthermore, even some of the most learned of the Specialised Accounts were read far beyond the bounds of a more narrow field of specialised zoologists. Although the addressee would in some measure be pre-conditioned in the texts, the behaviour of the actual readers could not be controlled.

Rather than radically differentiated, the zoological books might best be seen as placed along a continuum bound by the extremes of the thoroughly Specialised and the thoroughly Generalised, respectively.[127] Although this conception of the relationship between the Specialised and the Generalised, or popularised as it has often been called, might hold good more generally as well,[128] the utter lack of any finite distinction in our period is still significant, since it reflects a rather blurred line of distinction between zoologists and non-zoologists. Placed between a thoroughly specialised audience and a general public, constituted by the middle and upper echelons, the position of the zoological books can, in fact, be seen as mirroring the position of the zoologists and the entire zoological endeavour in relation to contemporary society. As it shall be argued in the next section, the zoologists themselves were closely related to that part of society which constituted the 'general public' for at least part of their books, while the zoologists were also distinguished from it in crucial ways, and, in effect, partially establishing themselves as a community apart.

## Scholars at the Margins of Polite Society

To start the discussion of the relationship between eighteenth-century society and the zoologists, I shall at first take one step back in time. In a series of well-known studies, Peter Dear and Steven Shapin have shown how the experimental philosopher and his endeavour in the seventeenth century was almost completely encapsulated by gentle society.[129] Focusing on

127 This is also the reason why in the following in most cases, I shall treat the two sub-genres together.
128 Cf. M. Cloître and T. Shinn, 'Expository Practice' (1985), esp. p. 58, who make an analogous argument in relation to contemporary scientific and popularised texts in physics.
129 P. Dear, *'Totius in verba'* (1985); S. Shapin, *A Social History of Truth* (1994).

trust – on how claims to truth became acceptable as statements about nature – both authors have argued that the scholar merged to a large extent with the gentleman, because the gentleman was the only person in this period who with credibility could position himself as a 'spokesman for reality.'[130] Hence, he was also the only one whose statements about nature could be accepted as knowledge. Taking my cue from Dear and, especially, from Shapin's more comprehensive study of the positioning of the experimental philosopher in the seventeenth century, in the following section I shall examine what happened to the relationship between learning and society, the scholar and the gentleman, in the face of the thorough social changes which occurred in Britain from the late seventeenth century onwards. I shall spend some time discussing both transformations in the conceptualisation of the gentleman, and some of the core ideas of the emerging Polite Society, which from the turn of the century came to provide the primary social context for defining and distinguishing the zoological endeavour.

Let me begin by briefly reviewing Dear's and Shapin's thesis. Before the Restoration it had, basically, been property that constituted the difference, which made the difference between the gentlemen and the rest. As the seventeenth-century political theorist, James Harrington, laconically stated: 'The man that cannot live upon his own must be a servant; but he that can live upon his own may be a freeman.'[131] Drawing on a civic humanistic tradition, property was, in the words of J. G. A. Pocock, conceptualised as 'both an extension and a prerequisite of personality.'[132] The 'servants' or, as they were also called, the 'vulgar' were because of their lack of possessions, and because of what was conceived of being an only very limited development of their experience and hence, of their ability to understand the world, from the outset excluded from the realm of knowledge.[133]

In contrast, for the aristocratic gentleman, property became crucial in two ways. Firstly, property, and usually landed property, would generate a surplus, which meant that the gentleman would not, like the vulgar, have to work to earn a livelihood. Neither would he, as the vulgar, be dependent on other people in order to survive. The possessions, thereby, guaranteed autonomy. This autonomy became the basis of a gentleman's moral integrity, which vouched for his credibility. Secondly, it was argued that at a cognitive level, the surplus generated by landed possessions gave the gentleman the time and resources needed to develop his understanding, both by studying and by expanding his experience of the world, usually

130 S. Shapin, *A Social History of Truth* (1994), p. 192.
131 J. Harrington, 'A System of Politics' (1977), p. 834 (post-humorously published).
132 J. G. A. Pocock, *Virtue, Commerce, and History* (1985), p. 103; this relationship between property and personality is also discussed in idem., *Politics, Language and Time* (1973); J. Barrell, *The Political Theory of Painting* (1986), ch. 1; S. Copley, 'Introduction' (1984).
133 S. Shapin, *A Social History of Truth* (1994), pp. 86ff.

through travelling.[134] Thanks to his property, studies and travels, the aristocratic gentleman, then, would be enabled to develop such a generalised rationality which would allow him to understand the world, and position himself as a credible spokesman for that world.

It was the chain of associations linking the gentleman to integrity, credibility and rationality, which at a political level in the seventeenth century, provided the basis for the landowners' almost exclusive ownership of political rights.[135] Analogously, it was this chain of associations, which turned the aristocratic gentleman into a credible scholar. As Shapin concludes: 'Participants [in the field of learning ...] belonged to a culture that pointed to gentlemen as among their society's most reliable truth-tellers, a culture that associated gentility, integrity, and credibility.'[136] The experimental philosopher was first a gentleman and then a scholar. These roles had to merge in order for his words to be considered trustworthy as knowledge.

Now, from the Restoration to 1800, the social landscape changed quite dramatically with the emergence of the middle echelons. As society changed so too did the social composition of the learned community, the scholars' social positioning, and their relation to society at large.[137] Before the Restoration according to Nicholas Hans, more than half of the naturalists had been of aristocratic breed.[138] During the eighteenth century, this number for natural historians dropped to only 5 per cent according to my survey, whereas more than three quarters of the naturalists were engaged in one of the professions which came to be associated with the middle echelons (see Tab. 1.3).[139] To substantiate these figures, and thereby to

134 On education in general, see S. M. Brewer, 'The Design' (1963); J. Barrell, *The Political Theory of Painting* (1986), esp. ch. 1, and on the importance of the Grand Tour, see C. L. Batten, *Pleasurable Instructions* (1978); J. Black, *The British and the Grand Tour* (1985).

135 J. G. A. Pocock, *Politics, Language and Time* (1973), esp. ch. 3.

136 S. Shapin, *A Social History of Truth* (1994), p. 241.

137 As also Shapin hints at, ibid., pp. 410-1.

138 N. Hans, *New Trends in Education* (1951), pp. 33, 34-5.

139 These figures should be compared with the findings of Nicholas Hans in his survey of 680 'scientists' of all denominations who published in the seventeenth and eighteenth centuries, in N. Hans, *New Trends in Education* (1951), pp. 30ff. Hans, searching for social origin of the 'scientists' rather than occupational status, found that in the eighteenth century 25% of the 'scientists' belonged to the 'upper classes' (peers and gentry), 49% were of the 'middle class' (comprising the same vocational groups as in my survey), and 26% were of the 'lower class' (farmers, craftsmen, labourers). The difference between these findings and mine might be explained by two factors. Firstly, in the selection of scholars to use in the sample, Hans has selected 'scientists' by 'their original contributions to the advancement of science' (p. 31), whereas my criteria for incorporation has been merely the publication of a book on natural history. Now, the 'originality' of a naturalist might be a bit hard to define, but in Hans's case it appears to have entailed the incorporation of 'scientists' of relative high social standing, as might be indicated by the fact that as many as 79.3% of the total number of 'scientists' in Hans's survey, 1662-1800, were fellows of the prestigious Royal Society, whereas only 34.6% of the naturalists in mine were F.R.S. As is well-known, the Royal Society was somewhat biased in their selection of members towards the highest echelons of society, cf. M. Hunter, 'The Social Basis' (1976), pp. 32ff.

Secondly, Hans searched for information on the 'social origin' of the 'scientists,' that is for the *father's* occupation, whereas my figures for the *naturalist's own* occupation (the figures for the father's occupation in my survey are more in tone with Hans', see Tab. 1.1). This has influenced our findings in two ways: On one hand, due to the rights of primogeniture, the younger sons of peers and the gentry generally had elucidate the socio-cultural positioning of the natural historians, we have to look more closely at the social changes which took place after the Restoration, and, at first, at the changed definition and conception of the gentleman.

During the long eighteenth century, the notion of the gentleman was to be fundamentally altered. In the decades following the Restoration, an additional category of gentlemen was added to that of the 'born,' aristocratic gentleman within the emerging bourgeois society: The 'breed gentleman,' here described by Daniel Defoe after he had taken note of the 'born':

> On the other hand, the son of a mean person furnish'd from Heaven with an originall fund of wealth, wit, sense, courage, virtue, and good humour, and set apart by a liberall education for the service of his country; that distinguishes himself by the greatest and best actions; is made acceptable and agreeable to all men by a life of glory and true fame; that hath the naturall beauties of his mind embellish'd and set off with a vast fund of learning and acquir'd knowledg [sic]; that has a clear head, a generous heart, a polite behaviour and, in a word, shews himself to be an accomlish'd gentleman in every requisite article, that of birth and blood excepted; I must be allowed to admit such a person into the rank of a gentleman[.][140]

At first advanced by merchant apologists, especially in the periodical press of Addison, Steele and Defoe,[141] the notion of 'the breed Gentleman' was soon to be appropriated by those 'middling sort of people' who came into being as a recognisable echelon in this period. This echelon, emerging as an intermediate 'class' between the gentry and aristocracy, on one hand, and the labouring poor, and on the other, included people who, as Peter Earle aptly put it, 'worked but ideally did not get their hands dirty.'[142] The vocations where it was possible to do that included, in urban areas, commerce and manufacturing of all kinds, independent artisans, civil servants, and, as the intellectual fringe of the middle echelon, the learned professions (law, clergy, medicine, and teaching), and, in the country side, small farmers and joined freeholders. In the eighteenth century, this rather heterogeneous group of people included somewhere between twenty and twenty-five per cent of the population.[143]

---

to sustain themselves to some extent when they came of age. Many went into one of the learned professions or civil offices (see J. Thirsk, 'Younger Sons' (1969); L. Stone and J. C. F. Stone, *An Open Elite?* (1984), pp. 407ff.). This downward movement on the social scale accounts for some of the discrepancies between our figures. On the other hand, those naturalists who were of a lower class origin, conversely, moved upwards on the social scale, as also Hans notes, as they generally got an education and became employed in one of the middle vocations. N. Hans, *New Trends in Education* (1951), pp. 35-6.

140 D. Defoe, *The Complete English Gentleman* (1726), letter XXII, reprinted in S. Copley, *Literature* (1984), p. 41.

141 On the polite gentleman in the periodical press, see P. Carter, *Men and the Emergence of Polite Society* (2001), pp. 60ff, and *passim*.

142 P. Earle, *The Making of the English Middle Class* (1989), p. 3.

143 As Paul Langford points out, the figures are notoriously difficult to calculate, not least because the exact limit of income at the lower extreme is hard to define, and, moreover, because a large group of families were concentrated at the lower margin of the spectra of income; P. Langford, *A Polite and Commercial People* (1989), pp. 61ff. In terms of income, the middling sort of people ranged from people with a personal fortune of a few hundred pounds and an annual income of £50, to a very few with fortunes of more than £10.000. The majority of the middling sort had an annual income between £50 and £2.000, with the bulk earning from £80 to £150. Within the learned professions, from where the majority of naturalists were drawn, in the 1750s the average income was between £50 for inferior clergy, £60 for persons professing liberal arts, also £60 for civil officers, and £100 for superior clergymen. These figures have to been seen on the background of a female servant earning around £2 a year in addition to receiving a room and board, and a day labourer or a journeyman earning

As Lawrence & Jeanne C. F. Stone have argued, by the emergence of this 'middle class' in the post-Restoration period, the previous status hierarchy of, in brief, the (aristocratic) gentlemen versus the rest gradually collapsed.[144] At the same time, the concept of the gentleman was transformed. Imitating their genteel superiors, both in denomination[145] and in their manners and style of consumption, the people of the middle echelons initiated a process of redefinition of the social landscape – a 'debasement of gentility' as Langford has called it[146] – by which the close association between property, gentility, understanding, and credibility was, in the end, broken.

The bourgeois, or polite, gentleman came to be known rather by his manners than by his property or descent: 'The appellation of a gentleman is never to be affixed to a man's circumstances, but to his behaviour in them', Richard Steele stressed.[147] As it was often explicitly underscored in eighteenth-century conduct literature, in contrast to the aristocratic gentleman, the polite gentleman was first and foremost a man of the world. True, like the aristocratic gentleman of the previous century, he had to assume a humble and modest attitude, but also, and just as importantly, he had to be pleasing, witty, and to exert an easiness in intercourse and variation in conversation:[148] The polite gentleman was essentially a sociable creature. Although it was advised that a would-be gentleman should acquaint himself with a variety of philosophical, historical, theological, and poetic works,[149] a thoroughly literary education was not part of his curriculum. On the contrary, the 'gentleman-to-be' was, in fact, routinely advised in conduct literature to hide his learning in Polite Society, if he possessed any:

between £8 and £30 a year. Even the income of people of the lower middle echelon would be enough to sustain a more fashionable lifestyle, with a furnished house or apartment, one or more servants, a coach, a respectable wardrobe, books and periodicals etc. The figures are derived from P. H. Lindert and J. G. Williamson, 'Revising England's Social Tables' (1982). For an evaluation of the figures in relation to the middling sort of people specifically, see P. Earle, *The Making of the English Middle Class* (1989); M. Hunt, *The Middling Sort* (1996). On the learned professions in early modern Britain, see R. O'Day, *The Professions* (2000); G. Holmes, 'The Professions' (1979).

144 L. Stone and J. C. F. Stone, *An Open Elite?* (1984), pp. 408ff.

145 On changes in denominations during the eighteenth-century, see P. J. Corfield, 'Class by Name and Number' (1987).

146 P. Langford, *A Polite and Commercial People* (1989), p. 66.

147 R. Steele quoted in L. Stone and J. C. F. Stone, *An Open Elite?* (1984), p. 23.

148 E.g. Anonymous, *The Polite Philosopher* (1760); J. Trusler, *Principles of Politeness* (1784); cf. P. Carter, *Men and the Emergence of Polite Society* (2001), ch. 1 and 2.

149 The advice of curriculum given by Edward Thompson to his younger cousin appears to be rather typical in this respect. He was recommended to read Erasmus, Cicero, Justin, Terence, Virgil, Ovid and Horace, some French historians like Pere D'Orleans, Cyrus and Telemachque; Don Quixote; 'the History of your own Country', the Spectator and the Tatler, as well as 'the Lives of the most eminent men'; of poetry: Dryden, Spencer, Gay, Swift, Pope, Milton; the Bible, as well as sermons of the greatest theologians should be studied, and, finally, natural philosophy: 'I would likewise have you apply yourself to the pleasing study of *Natural Philosophy*, proceeding leisurely from the history of meteors, minerals, plants and living creatures, as far as Anatomy'. E. Thompson, *Sailor's Letters* (1766), pp. 160-3; emph. in org.

> The last thing I shall mention, is that of concealing your learning, except upon particular occasions. [...] Pedantry proceeds from much reading and little understanding [...]. If a man can talk but on one subject, he is also a pedant upon that subject, let it be what it will, whether on law, arms, books, or any other; bar him his favourite topic, and he had not a word to say; in short, a mere courtier, a mere soldier, a mere scholar, a mere any thing, is an insipid pedantic character, equally ridiculous amongst men of sound learning and good breeding, and consequently ought, in our behaviour, to be carefully avoided.[150]

The polite gentleman was a man of the world.

Although in some respects, the gentleman of the eighteenth-century showed a continuity with the aristocratic gentleman, the polite gentleman was a different creature altogether as his very foundation had been redefined. No longer directly defined in terms of property, (though certainly also in terms of what money could buy: fashionable clothes, carriages and horses, a respectable home etc. did not come cheap[151]), but primarily in terms of manners, the close connection between property, independence and gentility had been broken. 'To be respectable,' as John Trusler concluded in his *Principles of Politeness*, 'it is not necessary to live in a certain line of life':

> A man should give dignity to his situation, and not his situation, to him. Every man may be considered as the centre of a circle; some of a larger, some of a smaller; and in this light, he is of greater or of less importance, according to the character he bears. He who has fewest wants, and is most able to live within himself, is not only the happiest, but the richest man; and if he does not abound in what the world calls wealth, he does in independency; and it being independency only that can make us great, by all means confine your expenses to your fortune, and determine to live free from debt.[152]

Not being in debt could now be seen as the mark of a gentleman's independence: The 'debasement' of the gentleman was complete.

With the new emphasis on manners, polite sociability – easy, varied, witty, pleasing – came to define the core elements of the polite gentleman of the eighteenth-century. With this new definition of the gentleman, the relationship between the gentleman and the scholar had also been fundamentally altered. We might get a first indication of this by looking into how the scholars' learned pursuits were received within Polite Society.

Although the majority of natural historians occupationally and socially belonged to the middle echelons, as we saw above, their relation to Polite Society was, at best, precarious. Scholars were exposed as narrow-minded pedants in satires such as Jonathan Swift's of the ridiculously unpractical and excessively boring learned Laputians in *Gulliver's Travels*, or in Henry Fielding's portray of the equally ridiculous and even harmful Mr. Square and Mr. Thwackum in *Tom Jones*;[153] they were ridiculed in pamphlets, plays and poems;[154] and made

150 J. Trusler, *Principles of Politeness* (1784), pp. 114-5, cf. Anonymous, *The Polite Philosopher* (1760), p. 24.

151 And besides, as Jonathan Swift *alias* Simon Wagstaff noted in his satirical exposé of conduct literature, refining ones manners in itself took distinguishing financial means. The Reader, Swift hence stated in introduction, did not need to worry that 'the Publication of my Book may, in a long Course of time, prostitute this noble Art to mean and vulgar People', as the Art of being Gentle 'requires so much Time, Study, Practice, and Genius' that the vulgar never would be able to acquire it. Learning how to be a gentleman or -woman was simply beyond their time; S. J. S. Wagstaff, *Polite Conversation* (1738/1892), pp. 28, 30.

152 J. Trusler, *Principles of Politeness* (1784), p. 122.

153 J. Swift, *Gulliver's Travels* (1735/1998); H. Fielding, *Tom Jones* (1749/1994).

prime examples of how *not* to behave in Polite Society in conduct literature, as we saw above.[155] The naturalists *qua* naturalists were not exactly embraced within Polite Society – with the redefinition of the gentleman as a sociable creature, the men of learning became partially disassociated from Polite Society.

It was not the scholars' interest in nature in itself that was considered ridiculous or impolite. On the contrary. Natural history of a more relaxed variety, and especially botany and the more picturesque branches of entomology, became fashionable within Polite Society during the eighteenth-century, and especially during its second half, as I mentioned earlier.[156] It was the *way* that learned men approached the subject, which was deemed at odds with Polite Society, as indicated here by a satirical poet:

> [...] turn thee, to admire
> Where Dullness sits in Harlequin's attire:
> Mark from her chair Topedo's wonders teem,
> And mumbing yawns exemplify the theme.
> Here Virtuosi dwell, who strangely wise,
> Are learn'd in maggots, and can nick-name flies;
> Whose skill defects a mite from mouldy cheese,
> Traces his nerves, and even counts is fleas. [...]
> All things they prove, and calculations bring,
> How many geese are bred in Saturn's ring;
> How soon a snipe in Mercury would roast,
> And how the sun-beams should prepare the toast.
> They'd set the *Thames* on fire, to clear a doubt,
> How many days 'twould take in burning out[.][157]

As hinted at here, what did not square well with the maxims of Polite Society was the way naturalists nit-pickingly focused on one obscure topic alone. Doing so, on one hand, the naturalists violated the crucial demand of variety in Polite Society – 'redundancy' was, as one author of a book of manners pointed out, always a 'fault' in a polite gentleman.[158] On the other hand, the extensive reading of books, closely associated with the learned man, was identified as a source of the scholar's bad manners. The scholar might learn a lot about the natural world from such books, however he would remain absolutely ignorant with regard to the social:

> Again, there is another sort of knowledge beyond the power of learning to bestow, and this is to be had by conversation. So necessary is this to understanding the characters of men that none are more ignorant of them than those learned pedants whose lives have been entirely consumed in colleges and among books; for however exquisitely human nature may have been described by writers, the true practical system can only be learnt in the World.[159]

154 See for instance Anonymous, *An Essay on the Rationality of Brutes* (1752); Anonymous, *An Introduction to the Art of Lying* (1754); cf. W. P. Jones, *The Rhetoric of Science* (1966); J. M. Levine, *Dr.Woodward's Shield* (1977).

155 Also cf. P. Carter, *Men and the Emergence of Polite Society* (2001), p. 71.

156 See also K. Thomas, *Man and the Natural World* (1983), pp. 280ff.; J. Browne, 'Botany in the Boudoir' (1996); D. E. Allen, *Naturalist in Britain* (1994); J. L. Heilbron, 'Domesticating Science' (2000), pp. 1-5.

157 Anonymous, *An Historic Epistle* (1775), pp. 14-5; notes excluded, emph. in org.

158 Anonymous, *The Polite Philosopher* (1760), p. 18; cf. pp. 21-4.

159 H. Fielding, *Tom Jones* (1749/1994), p. 412.

It was the monotonous pedantry, then, of men who preferred books to the (social) world, obscure subjects to pleasing and witty ones, one topic to a variety, which was conceived as essentially unbecoming, and if not downright impolite.

It is evident from the recurrent apologetic passages in the zoological literature from this period that the zoologists were well aware of how their pursuits were received within Polite Society. In their writings, however, quite a different picture emerged both of their own endeavours and of Polite Society. Said, for instance, William Brownrigg in a letter to John Ellis:

> The Study of Insects, and various other Branches of Natural History have indeed been placed in a very unjust light by Steel [sic], Swift, & other late Writs, who took the Liberty to ridicule what they did not understand. But these Sciences have withstood all the force of their Baillery, and daily grow into greater repute[.][160]

Likewise Benjamin Stillingfleet, in a longer apologetic passage, praised by other natural historians for raising natural history to honour,[161] attempted to counter the critique:

> I can scarcely condemn mankind for treating with contempt a virtuoso whom they see employed in poring over a moss of an insect day after day, and spending his life in such seemingly unimportant and barren speculations. The first and most natural reflections that will arise on this occasion must be to the disadvantage of such pursuits. Yet were the whole science of nature laid open to our views, were we admitted to behold the connections and dependencies of every thing on every other, and to trace the œconomy of nature thro' the smaller as well as greater parts of this globe, we might perhaps be obliged to own we were mistaken; that the Supreme Architect had contrived his works in such a manner, that we cannot properly be said to be unconcerned in any one of them; and therefore that studies which seem upon a slight view to be quite useless, may in the end appear to be of no small importance to mankind. Nay, were we only to look back into the history of arts and sciences, we must be convinced, that we are apt to judge over hastily of things of this nature.[162]

Some authors, like Thomas Pennant, attempted in some measure to make a place for their work within Polite Society, by pleading for the necessity of knowing nature in order to appreciate the arts: 'an acquaintance with the works of nature is equally necessary to form a genuine and correct taste for any of the above mentioned arts' – painting, sculpture and poetry.[163]

However, most authors, along with Pennant in other places, pointed to broader contexts of the utility of their works in order to justify their endeavours. Hence, Pennant underscored that 'To exalt our veneration towards the Almighty, is the principal end of this sublime science [zoology]; and the next to that, the various benefits resulting from it to human society deserve our serious consideration.'[164] From the perspective of Polite Society what seemed to be looked pedantry were by the naturalists turned into services for God and mankind.

We may understand these differing conceptualisations of the men of learning and their pursuits as an indication of a partial disassociation of the learned from Polite Society. By the

160 W. Brownrigg to J. Ellis, 15 June 1753, Linnean Society, London, Ellis Corr., vol. I. 46.
161 See, for instance, T. Pennant, *British Zoology* (1768-77), vol. IV, pp. iv-vi.
162 B. Stillingfleet, *Miscellaneous Tracts* (1762), pp. vii-viii.
163 T. Pennant, *British Zoology* (1768-77), vol. I, p. ix; note excluded, cf. pp. vii-ix.
164 Ibid., vol. I, p. vi.

eighteenth century, the naturalist was no longer self-evidently encapsulated by the gentleman, and I shall later in this study suggest that we might, in fact, see in this period the emergence of an 'intelligentsia,' who vis-à-vis Polite Society, explicitly defined their ability to position themselves as spokesmen for reality just as much in terms of an exclusive and excluding learning, as in terms of gentlemanly qualities.[165]

But the disassociation was only partial. On one hand, norms and forms of Polite Society did, as I shall later attempt to show, decisively helped to frame zoology. On the other hand, at a basic sociological level, the category of zoologists would also be circumscribed by Polite Society. We might get an indication of this if we take a look at the categories of people who were denied access to act as zoologists, and at the reasons for their exclusion.

As appears from my survey no one from the lower echelons published books on natural history subjects (see Tab. 1.3), and, furthermore, all of the naturalists in the survey were males.[166] On one hand (as I shall return to in much more detail in Chapter 6), women were unqualified to act as natural historians because they would always be dependent on at least a father or a husband and, hence, would be potentially untrustworthy since they were thus not free to tell the truth. Moreover, their nature would also in general impede them from becoming natural historians because their naturally weak and soft constitution, to put it bluntly here, made them more fit for child rearing and the pursuits of the private sphere than for learned endeavours.[167] On the other hand, the 'vulgar' were excluded from the field of learning in the eighteenth-century for same reasons that they had been so excluded in the seventeenth-century. In part this was because, like the women, they were deemed potentially untrustworthy because also the vulgar would always be dependent on someone else, usually their superiors, in order to survive. In part, because their mechanical work would leave them neither time, nor any opportunity to develop their rational faculties and understanding of the world, as John Locke explained:

165 This argument closely parallels Norbert Elias' analysis of the emergence of a German intelligentsia in the same period. N. Elias, *The Civilising Process* (2000), esp. p. 24. For a congenial argument within a British context, although the focus is somewhat different, see also P. Harrison, 'Curiosity, Forbidden Knowledge' (2001), esp. pp. 288-9.

166 There were some very few women who made it into the field of zoology. The only female writer, who was regularly referred to, was the Dutch Maria Sibylla Merian, who published a book after a tour to Surinam which mainly became known for its description of a certain metamorphosing frog to which I shall later return. M. S. Merian, *Metamorphosis Insectorum* (1705). Within a British context, Sarah Stone was without doubt the most prominent, and virtually the only woman in zoology for most of the eighteenth century, though she was not known as a writer, but as an illustrator. She made illustrations for such books as J. White, *Journal of a Voyage to New South Wales* (1790); G. Shaw, *Museum Leveriani explicatio* (1792); T. Pennant, *The View of Hindoostan* (1798-1800). For an introduction to Merian, see T. Rice, *Voyages* (2000), ch. 3; and for a study of Stone and her contributions to natural history, see C. E. Jackson, *Sarah Stone* (1998). Towards the very end of the eighteenth century, women also began to write on natural history subjects, mainly in more popular accounts addressed to young readers. On this, see B. T. Gates and A. B. Shteir, 'Introduction' (1997), pp. 6ff.

167 Cf. L. Jordanova, 'Natural Facts' (1980); R. Porter, *Enlightenment* (2000), pp. 334ff.

'Tis not to be expected, that a man, who drudges on, all his life, in a laborious trade, should be more knowing in the variety of things done in the world, than a pack-horse, who is driven constantly forwards and backwards, in a narrow lane, and dirty road, only to market, should be skilled in the geography of the country.[168]

As indicated here, the ability to understand and one's social position were conceived to be closely related. Adam Smith elucidated the relation in detail:

[T]he understanding of the greater part of men are necessarily formed by their ordinary employments. The man whose whole life is spent in performing a few simple operations, of which the effects are perhaps always the same, or very nearly the same, has no occasion to exert his understanding or to exercise his invention in finding out expedients for removing difficulties which never occur. He naturally loses, therefore, the habit of such exertion, and generally becomes as stupid and ignorant as it is possible for a human creature to become. The torpor of his mind renders him not only incapable of relishing or bearing a part in any rational conversation, but of conceiving any generous, noble, or tender sentiment, and consequently of forming any just judgement concerning many even of the ordinary duties of private life.[169]

As here becomes evident, epistemological abilities hinged on sociological position, because it was one's place in society which in the first place made it possible to either develop or impeded a development of the ability to understand the world.[170]

It is within this context of a sociologically motivated epistemology – which will be explored further throughout this thesis – that we have to understand Polite Society's circumscription of the category of zoologists. Although the polite gentleman did not define the naturalist, it was still in practice only the gentleman who, together with his aristocratic superiors, possessed the socio-epistemological potential of becoming a naturalist. Although it also took 'learning' to be accepted and trusted as a naturalist, as a credible spokesman for nature, being a polite gentlemen was a necessary socio-epistemological point of departure.

In sum, the distinction between learning and 'society' was blurred. The zoological books were inscribed in intertextual relations which ramified in many different directions; the distinction between a specialised and a popular audience was only vaguely defined; the zoological endeavour was fashionable, yet, particularly in its more specialised form, it did not form an easy part of Polite Society; and the zoologist himself was, on one hand, establishing himself as a man of exclusive learning and thereby becoming visible as a figure in his own right, yet he was, on the other hand, socio-epistemologically also closely related to the polite gentleman of Polite Society.

This blurred relationship between the zoological endeavour and 'society', as we will see in the following chapters, decisively marked the concrete practices and cultural constellations of assumptions implicated in the zoological endeavour. On one hand, what might be seen as more exclusive learned modes of approaching animals were developed, whereby the differences between learning and Polite Society were substantiated. On the other hand, the zoologists also drew on institutionalised practices and cultural assumptions

168 J. Locke, *Essay* (1706/1997), pp. 623-4/IV,xx,2.
169 A. Smith, *The Wealth of Nations* (1776/1999), vol. II, pp. 368-9.
170 Cf. J. Barrell, *The Political Theory of Painting* (1986), ch. 1.

entertained within Polite Society more generally. Unfolding at the margins of Polite Society, the zoological endeavour of the eighteenth century was neither entirely distinguished from, nor wholly encapsulated by Polite Society; it remained as much defined from within, as from without.

## THESIS IN OUTLINE

I shall return to the question of the relationship between the zoological endeavour and society at large in explicit terms in the final chapter. Until then, however, my point of departure will be taken in the zoological endeavour itself, although the positioning of the endeavour at the margins of Polite Society means that throughout the thesis we will have to take frequent detours into that intertextual and 'intersocial' universe which the zoological endeavour, both at the level of practices and the level of cultural assumptions, was intimately related to.

As the objective of this thesis is not only to elucidate the twin histories of zoology and zoologists respectively, but also to examine how these two histories conditioned each other, in each of the remaining chapters I shall oscillate between the two histories, sometimes paying more attention to one, sometimes to the other in my analyses. Throughout I attempt to show how and in what way epistemology and the positioning of the zoologists had implications for the zoological knowledge produced, and vice versa.

The overall framework for my analysis of the two histories will, in general outline, be structured by the movement of animals from the field to their incorporation into zoological classificatory schemes. In Part I, I enquire into the transformation of animals into objects of knowledge. I analyse how the zoologists created and approached a world of matter, and how that matter was turned into zoologically valid facts – how, in short, an empirical base for the study of zoology was established. In Chapter 2, I start with a more general analysis of the nature of eighteenth-century natural history, its demarcation from Renaissance studies, and with a discussion of some of its core elements – the notion of 'history,' 'nature,' 'matter,' and 'facts,' the relation between nature and man, and the ideas about man, and learned men in particular, which were preconditioned in the contemporary idea of studying natural history. In the following two chapters, I turn to an analysis of the practical modes of introducing animals into discourse as learned facts. In Chapter 3, the focus will be on modes of collecting, on the social division of labour in this process, in which not only zoologists, but also men and women of all echelons of society were engaged, and on the zoologists' distinguished techniques of observing and describing animals. In Chapter 4, the attention will be directed towards the socio-spatial siting of observing and describing animals – although at times, animals would be observed in the bosom of nature, the zoologist could just as well encounter them in letters, private cabinets, public museums, coffee-houses, or at market places. The 'field' was multi-sited, and the meanings inscribed on the animals in these fields differed. In these two chapters, by examining how the zoologists both in social space and through observational and textual means appropriated the animals, I do, on one hand, discuss how animals were turned into zoological objects. Moreover, focusing in this analysis on how the zoologists distinguished their approach to animals from that taken by other people, whom they encountered in their endeavour, I attempt, on the other hand, also to encircle the zoologists' special epistemological space of manoeuvring in this process.

In Part II, I turn to the zoologists' quest for transcendental order in their construction of taxonomic systems. In Chapter 5, the history of taxonomy – from Plato and Aristotle through Renaissance practices and to Carl von Linné's all-embracing *Systema Naturæ* – is sketched out as a background to an understanding of the British eighteenth-century endeavour. In contrast to earlier naturalists, who eruditely had used logic as a handmaid for classification, the eighteenth-century British zoologists insisted on an empiricistic method in constructing taxonomic systems, and I discuss their exegetical theories of natural systems, as well as its epistemological implications. In Chapters 6 and 7, I move on to the construction of taxonomies in practice. In Chapter 6, the focus will be on species – the most important category in the British zoologists' taxonomic systems. I trace the steps the zoologists took, not always in perfect agreement with their exegetical theories, in creating such immutable, essentially defined species, which Darwin found so savage, and I explore the ideas regarding a perfectly harmonious and unchanging universe, which informed this formation of species. In Chapter 7, I turn to the creation of the entire taxonomic system. In exegetical principle that system – its categories, the taxa, and the relation between them – should, like God's nature, be simple, and unambiguously defined. In practice, however, the British zoologists found it humanly impossible to reconstruct God's sublime system, and instead praised 'vagueness' and even 'inaccuracy' in man-made taxonomic systems. Inquiring into both the structure of the systems actually made, and the zoologists' discussions of the differences between their systems and Nature's, allow me both to analyse the product of the zoological endeavour, and to consider the zoologists', professedly, all too 'human' epistemological space of manoeuvring in creating these systems.

Throughout these six chapters, then, I oscillate between analysing the form and the content of zoology, and analysing the positioning of the zoologists; I oscillate, in other words, between analysing world-fashioning and self-fashioning, and, in both cases, I attempt to encircle the point of view from where it became meaningful to fashion self and world in the ways in which it was done. In the final chapter, I consider the relationship between zoologists and zoology, man and nature, itself. I begin with a discussion of man's place in zoology, and turn to zoology's place in contemporary auto-sociology, so to say, in an analysis of the interchanges between natural historical and social classification. This, in turn, brings me to a more elaborate discussion of the zoologists' place in contemporary society, and, more generally, to the ideas of the zoologists' place in the universe, and its implications for the production of zoological knowledge, from the natives' as well as from the ethnographer's point of view. In the final section an attempt is made to close this ethnographic history of the twin histories, by discussing how natural history became transformed into biology in the first half of the nineteenth-century, in the process of which the eighteenth-century zoologists' conceptions of nature, of animals and species, became almost incomprehensibly strange.

# Part I

# THE MATTER OF FACTS

Chapter 2

# Natural History beneath the Angels

By the eighteenth century, the concept of 'Natural History' had come to figure prominently in books dealing with zoological topics: The vast majority of zoological books included 'natural history' in their title as they presented their studies as a natural history '... of Quadrupeds, '... of Birds', '... of English Insects,' or of the natural world of geographical locations like Carolina, Guiana or Selborne. In the books, the description of animals would be called natural histories as well: a natural history '... of the common cow,' '... of the pig-tailed monkey,' '... of the crested black vulture.' Natural history at once defined the entire field of study as well as the specific accounts of animals. In the sense of a universally employed and virtually uncontested concept, natural history provided an overall framework for the study of animals during the long eighteenth century. To understand the implications of this framing for the zoological endeavour, we must examine the foundations of natural history itself.

The concept of natural history, and more commonly 'history' – or its equivalent in Greek or Latin – were actually not new to eighteenth-century studies of the natural world, although by the end of the seventeenth-century they reached an unprecedented paramountcy. These terms had been in use since ancient times – part of Aristotle's famous work on zoology, for instance, was called *History of Animals*; Pliny the elder's encyclopaedic work on astronomy, geography, minerals, flora and fauna was titled *Naturalis Historia*; in the Renaissance, Ulysses Aldrovandi commenced a *Historia naturalis* in 1599, and Ferrante Imperato wrote a book entitled *Dell'historia naturale* (1599). The first reported use of 'natural history' in English dates from 1567 in J. Maplet's *A Greene Forest, or a natural Historie, wherein may bee seene the most ufferaigne [sic] Vertues in all the whole kinde of Stones and Mettals; of Brute Beastes, Fowles, Fishes.*[1]

1 Cf. *Oxford Dictionary* (1989).

Although the term itself had been in use in Europe some thousands years, its meaning had radically changed as had the kind of study which it designated. To focus only on the last of these changes, which is of more immediate importance to us here,[2] during the seventeenth century, the Renaissance modes of studying nature were fundamentally transformed, paving the way for the zoological studies of the eighteenth century (during the first half of the nineteenth century, the concept of natural history would become obsolete as the study of nature was reconstructed as biology, as we will see in the last chapter). It is difficult, if not to say impossible, to determine a specific date for the last reconstruction of natural history. Francis Bacon, lawyer and Lord Chancellor to Charles I, has often received the credit for almost single-handily reforming natural history in the beginning of the seventeenth-century with his collection of works in *The Great Restauration* (1620). The Lord Chancellor himself was, at any rate, in no doubt as to the groundbreaking novelty of his endeavour. Positioning himself as a modern Aristotle by naming his central work on natural history the *New Organum*, in imitation of the ancient sage's work, and, indeed, by choosing *The Great Instauration*, as the collective title for his reforming works, Bacon signalled with the very choice of titles his books what he made explicit within them: that, in his humble opinion, his approach constituted 'a new birth of science'.[3] Quite a few of Bacon's British descendants of the seventeenth and eighteenth centuries tended to agree with him, though they did not necessarily agree with every one of his creeds.[4] However, even Bacon had kindred spirits preceding him;[5] and, for their part, quite a number of his contemporaries and descendants in the seventeenth century tended to continue the Renaissance tradition of investigation. For the better part of the seventeenth century, the debate between what has come to be known as the 'ancients' and the 'moderns' raged in Britain, and it was not until after the Restoration that something resembling a general settlement of approach had been reached within natural historian circles.[6]

---

2 On ancient and especially Aristotelian natural history, see D. Hull, 'The Effect of Essentialism on Taxonomy ' (1965); G. E. R. Lloyd, 'The Development of Aristotle's theory' (1961); D. M. Balme, 'Aristotle and the Beginnings of Zoology' (1970); and for a very detailed account which, in addition, directly addresses the question of the difference between ancient and eighteenth-century natural history, see P. Pellegrin, *Aristotle's Classification* (1986). I shall return to Aristotle's zoological corpus in Ch. 5. For other general introductions to the emergence and consolidation of natural history during the seventeenth and eighteenth century, see J. Roger, 'The Living World' (1980); P. R. Sloan, 'Natural History' (1990).

3 F. Bacon, *New Organon* (1620/1962), p. 94/I.xcvii.

4 See for instance J. Glanvill, *Essays* (1676), III, p. 23; A. Cowley, 'To the Royal Society' (1722), (unpaged); T. Sprat, *The History of the Royal Society* (1667/1722), p. 36.

5 In *The Death of Nature* (1980), pp. 164ff., C. Merchant points to some of the predecessors to Bacon's theories, and indicates that his merits lie more in his formulation of a 'total program' for natural history, than in him singled-handily inventing all of the ideas of this program.

6 See H. Baron, 'The *Querelle*' (1959), for an outline of the debate between the ancients and the moderns principally in the seventeenth century; J. M. Levine, 'Ancients and Moderns' (1981-82), for a discussion of its ramifications in the eighteenth century, mainly within the fields of literature and civil history; and S. Shapin and S. Schaffer, *Leviathan and the Air-Pump* (1985), for a discussion of some of the rival conceptions to this of the 'new philosophy' during the seventeenth century.

During the seventeenth century, in the often vigorous debates over what natural history was and how it ought to be pursued, the foundations of natural history were oftentimes made unusually explicit. In often outspoken opposition to Renaissance philosophy, the scholars discussed the limits of natural history, the correct definition of a fact, the notion of nature, the proper procedures of study, and the appropriate positioning of the scholar. Through these exegetical discussions and a simultaneous emergence of a new practical approach to nature, the foundations of a new kind of natural history was laid, which made the zoological studies of the eighteenth century possible, as I shall argue. Although on a minor scale, significant changes were, however, also to take place around the turn of the century, not least, as Lorraine Daston has highlighted,[7] with regard to the conception of facts and the proper means of studying them. A long period of transition preceded the virtually uncontested acceptance of natural history in the long eighteenth century as the framework for the study of animals.[8]

While the seventeenth-century scholars would often be outspoken in their discussions of what natural history was and how it ought to be pursued, the eighteenth-century zoologists mostly remained silent on the point: They just carried it out. In contemporary dictionaries as well as in philosophical works of a more general nature we find, however, the concept defined in broad terms, and here we might get a first indication of what natural history in the eighteenth century was all about. In broad terms, natural history was subsumed under the category of 'history,' and distinguished from both 'philosophy' and 'art.' Hence, mapping the fields of knowledge, Sir William Jones observed that

> Human knowledge has been elegantly analysed according to the three great faculties of the mind, *memory, reason,* and *imagination,* which we constantly find employed in arranging and retaining, comparing and distinguishing, combining and diversifying, the ideas, which we receive through our senses, or acquire by reflection; hence the three main branches of learning are *history, science,* and *art*: the first comprehends either an account of natural productions, or the genuine records of empires and states; the second embraces the whole circle of pure and mixed mathematics, together with ethicks and law, as far as they depend on the reasoning faculty; and the third includes all the beauties of imagery and the charms of invention, displayed in modulated language, or represented by colour, figure, or sound.[9]

So, as Jones explained elsewhere, 'science' or 'philosophy' dealt with 'abstract theorems,' whereas 'history,' including both civil and natural history, dealt with 'mere facts':[10] 'in all branches of knowledge, we are only historians, when we announce facts, and philosophers, only when we reason on them'.[11]

7 L. Daston, 'The Cold Light of Facts' (1997).

8 Although the designation 'natural history' had existed prior to the period under consideration here, I shall in the following, for the sake of clarity, employ it exclusively in reference to the seventeenth and eighteenth-century type of natural history.

9 S. W. Jones, 'A Discourse' (1784/1993), p. 6; emph. in org.

10 Idem., 'The Tenth Aniversary Discourse' (1793/1993), p. 207.

11 Ibid., p. 226.

Likewise Ephraim Chambers in his *Cyclopædia: or, an Universal Dictionary of Arts and Sciences* defined 'history' as 'a recital, or description of things as they are or have been; in a continued, orderly narration of the principal facts and circumstances there of.' By extension, 'Natural history' was 'a description of natural bodies; whether terrestrial, as animals, vegetables, fossils, fire, water, air, meteors, &c. or celestial, as the stars, planets, comets, &c.',[12] as these natural bodies either 'appear [...] spontaneously' to 'our senses,' or 'with the assistance of art, as in *anatomy, chymestry, medicine, agriculture* &c.'[13] While the 'natural' in 'natural history' defined the subject matter, then, 'history' defined the method of study and presentation.

These rather conventional definitions of natural history as, with Samuel Johnson's concise definition: 'The knowledge of facts and events',[14] of course, tell us something about this field of study: That it was concerned with occurrences in nature that either could be 'spontaneously' observed or brought about through experiments, as Chambers stated;[15] that it was delimited by what could be sensed, and distinguished from what could only be discovered through reasoning or invented through imagination; and that the perceptible occurrences could somehow be ordered within a literary presentation. However, in this definition of natural history just as much was left out, or taken for granted: What was a 'natural body,' for instance? or, a 'fact'? What defined the limits of what 'are or have been'? that is, what defined 'nature'? What defined sensation? What kind of man was it that was capable of sensing natural bodies in such a way that they became facts? and what kind of literary presentation did 'history' entail?

I shall return to the question of literary presentation and the methodology of history in later chapters. In the present chapter I mainly attempt to unravel the 'nature' of natural history. In so doing, I shall start with giving a very brief sketch of Renaissance studies of nature. While it will be difficult to do justice to Renaissance scholarship in such a short analysis, it is hoped that it here can serve as an outline of the historical background of natural history, and, hence, to highlight both points of continuity and change between the Renaissance and the seventeenth- and eighteenth-centuries studies of nature. Turning to the natural history of the long eighteenth century, I shall be concerned with what can be seen as its two main axes. Firstly, its ontology, which implied a new definition of nature as material and which in turn, as possibly its most important implication for natural history, made the emergence of 'facts' possible. Secondly, its epistemology, which outlined a new positioning of man vis-à-vis such a material nature, and which in turn, preconditioned a new anthropology. In both cases, I shall

12 E. Chambers, *Cyclopædia* (1741), vol. I, HISTORY (unpaged); note excluded, emph. in org.
13 Ibid., vol. I, p. iii.
14 S. Johnson, *Dictionary* (1755), HISTORY (unpaged).
15 E. Chambers, *Cyclopædia* (1741), vol. I, p. iii.

in this chapter only focus on how the natural world was approached and conceptualised at the empirical level within natural history – the taxonomic part of natural history, the transcending of matter and building of systems, will be dealt with in Part II.

Before I start, a brief theoretical note on the demarcation of natural history in time is necessary. As should be evident from the remarks above, I do not find it legitimate to distinguish natural history of the seventeenth and eighteenth centuries from Renaissance natural philosophy so sharply as to describe them as two discontinuous paradigms or epistemes (and neither, as I shall argue in Chapter 8, is it possible to view nineteenth-century biology as entirely disconnected from eighteenth-century natural history) as, for instance, Michel Foucault has done.[16] As I shall attempt to show in the following, despite all the transformations, the prolonged period of transition and the continuities on some levels were so significant that a theory of sudden disruptions cannot be sustained. On the other hand – and partly for reasons outlined in Chapter 1 – neither do I find it possible to explain the changes taking place within a historic-evolutionary framework. Despite continuities, the differences between Renaissance philosophy and eighteenth-century natural history were too extensive for the two traditions to be viewed simply as stages in a continuous development of the same kind of zoology. I would suggest that in order to account for the temporal demarcation of natural history we have, in a sense, to place ourselves in between these two positions, establishing a position from where it becomes possible both to accept that a statement, a practice, an event always follows and builds on previous statements, practices, and events, but that the patterns of practices and the cultural space of assumptions may also change and become fundamentally altered.

Returning to the cultural-structural perspective, we might see historical periods as closely connected to the cultural order. On one hand, the cultural order helps to integrate disparate events taking place during a period of time, by giving a relatively coherent kind of meaning to them. In this sense 'history is', as Sahlins says, 'culturally ordered'.[17] On the other hand, as Sahlins also stresses, the cultural order is also always put at risk in practice. Nature under no obligation to 'conform to the categories by which certain people perceive them',[18] and this may lead to redefinitions of some categories, and their mutual relationships. Moreover, despite the censoring contexts, categories *can* be related to each other in entirely new ways in practice, because culture is not a 'mental prison,' not a consistently structured whole determining practice, but an octopoid constellation of assumptions which gives meaning to practices and censures it, but which is much too complex to imprison it. Through new modes of categorisation, categories will gain new meaning, and this, in turn, ultimately, opens up the

16 M. Foucault, *The Order of Things* (1970).
17 M. Sahlins, *Island of History* (1985), p. vii; cf. K. Hastrup, *Nature and Policy* (1990), p. 5.
18 M. Sahlins, *Historical Metaphors and Mythical Realities* (1981), p. 67.

possibility of a fundamental transformation of the cultural order.[19] The succession of events, then, cannot be understood without reference to a cultural order; but neither can the cultural order and its possible transformation be understood without reference to the succession of events. 'History is culturally ordered,' but likewise, 'cultural schemes' are 'historically ordered'.[20] Disruptions are born of that, which both at an empirical and at a cultural level of implications went ahead of them, and in that sense, at least, they entail continuity.[21]

To the extent that the cultural order is not a consistently integrated whole, the transformation of a field in time cannot *a priori* be assumed to rearrange the entire repertoire of practices, institutions, concepts, theories, and structural relationships *in toto* and at the same time. Rather, different domains can change in different tempi, though the transformation of some domains will, obviously, imply transformations of others.[22]

From this perspective, the demarcation of a field in time can never be exact or definite, A 'period' (such as 'the Renaissance,' 'the eighteenth century,' 'the nineteenth century,' etc.) rather becomes a heuristic, a shorthand for such a dispersion of a cultural order over time, which gives relatively coherent meaning to practices and hence integrates these practices in a temporal space, but which at the same time is fundamentally blurred at its ends.

However, in demarcating a period in time the ethnographer is not left entirely on her own. The natives are also active in defining periods. When they contrast their way of doing things with what went before them they are engaged in demarcating periods, and thereby they become active in instituting breaks, and in making such breaks meaningful from their point of view.[23] It is with the seventeenth and eighteenth-centuries natural historians' characterisation of Renaissance philosophy I shall begin my inquiry into natural history and its prehistory – it is, after all, their point of view I am concerned with in this study.

---

19 More fundamentally, what causes such changes in the modes of categorisation – whether they are political, economic, social, or cultural factors, a production of inconsistencies within the categorial systems themselves or a confrontation with new phenomena in the natural world, or a combination of all – is a question I shall not attempt to solve here. For the inquiry into the foundations of eighteenth-century natural history, it suffices to trace the changes, which occurred solely at a conceptual level, and to investigate their impact for the study and understanding of natural history in the eighteenth century. For a discussion of how change may be approached and understood from an anthropological point of view, see K. Hastrup, *Nature and Policy* (1990).

20 M. Sahlins, *Island of History* (1985), p. vii.

21 This also implies that I, as others before me, do not find it convenient to talk about a 'scientific revolution' taking place in the seventeenth century. See, for instance, S. Shapin, *The Scientific Revolution* (1996), esp. ch. 1. For a discussion of the history of the concept of scientific revolutions, see B. I. Cohen, 'The Eighteenth-Century Origins' (1976).

22 K. Hastrup has made an analogous argument for general historical changes: 'The general point is that history contains several levels of dynamism, and that the relative speed by which history unfolds itself at these levels varies from one culture to another and from one period to the next.' K. Hastrup, *Nature and Policy* (1990), p. 16. Also M. Foucault, in fact, makes an analogous argument for the transformation of epistemic formations in his theoretical exposition of the archaeology of knowledge. However, in his empirical analysis, inversely, he tends to leave the question of transformations unanalysed. M. Foucault, *Archaeology of Knowledge* (1972), p. 175.

23 Cf. K. Hastrup, *Nature and Policy* (1990), p. 35.

## Renaissance Labyrinths

Repeatedly, the zoologists of the eighteenth century returned to the work of their Renaissance predecessors. In the descriptions of animals, the major zoologists of the Renaissance – such as Ulysses Aldrovandi, Conrad Gesner and Pierre Belon – often figured in the citations. In the introductions to the zoological works, however, the Renaissance scholars most often provided counter-images to the eighteenth-century zoologists' enterprise. On occasion, the critique could be merciless. For instance R. Brookes, in his *New and Accurate System of Natural History*, described the work of one of the most prominent Renaissance scholars, the Bolognese professor Aldrovandi, as 'insupportable tedious and disgusting, filled with unnecessary quotations and unimportant digressions'.[24] Above anything else, in their critical portrays of their predecessors' works, the seventeenth and eighteenth-century scholars delimited and outlined the virtues of *their* kind of natural history. Hence, contrasting contemporary scholars to those of the Renaissance, Thomas Sprat underscored how they in contrast to their forbearers had attempted to make 'faithful *Records* of all the Works of *Nature*, or *Art*,' by

> separat[ing] the Knowledge of *Nature*, from the Colours of *Rhetorick*, the Devices of *Fancy*, or the delightful Deceit of *Fables*. They have labour'd to inlarge [sic] it, from being confin'd to the Custody of a few, or from Servitude to private Interests. They have striven to preserve it from being over-press'd by a confus'd Hap of vain and useless Particulars; or from being straightened and bound too much up by general Doctrines. [...] They have attempted, to free it from the Artifice, and Humours, and Passions of Sects; to render it an Instrument, whereby Mankind may obtain a Dominion over *Things*, and not only over one another's *Judgments*: And lastly, they have begun to establish these Reformations in Philosophy, not so much, by any solemnity of Laws, or Ostentation of Ceremonies, as by solid Practice and Examples; not by a glorious Pomp of Words; but by the silent, effectual, and unanswerable Arguments of real Productions.[25]

In this sketch, Sprat highlights succinctly the three main points of disquiet generally voiced in the new philosophers' reviews of Renaissance scholarship. Firstly, the Renaissance manner of cloaking every fact in endless references to texts, and thereby, according to another author, leading the mind into 'the pleasant Labyrinths of ever-fresh Discourse', instead of restricting themselves to the 'natural and living Face' of nature herself.[26] Secondly, the Renaissance scholars' tendency to hide their knowledge from the public were targeted – their manner of closing their museums to everybody other than a distinguished few, publishing their findings in expensive books, and concealing them altogether from the majority by letting them only circulate in manuscripts. Finally, the inclination to tie the making of knowledge to the interests of 'sects' were criticised since this was conceived only to lead to a distortion of knowledge by private interests, and to endless disputes. These three points – putting texts before things, hiding knowledge from the public, and shadowing knowledge by private interests – became open to such criticism during the seventeenth-century reformation of the studies of nature,

---

24 R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. x.

25 T. Sprat, *The History of the Royal Society* (1667/1722), p. 62, emph. in org.

26 A. Cowley, 'To the Royal Society' (1722), unpaged.

because they in unison were perceived to corrupt the relationship between knowledge and its true and only concern, nature herself. Nature, it was argued, could not be understood through the study of books or through the help of private interests. She could only be comprehended through a careful study of her own productions:

> The Illustrious Lord *Bacon* hath noted this as the chief cause of the unprofitableness of the *former Methods* of *Knowledge, viz.* That *they* were but the *Exercises* of the *Mind,* making *Conclusions,* and spinning out Notions from its own *native Store;* from which way of proceeding noting but *Dispute* and Air could be expected. [...] Whereas the *Knowledge,* from which any thing is to be hoped, must be laid in *Sense,* and raised not only from some few of its *ordinary* Information; but *Instances* must be *aggregated, compared,* critically *inspected,* and *examined; singly,* and in *consort.*[27]

Although this picture of Renaissance scholarship does not say so much about the Renaissance study of nature, it does tell us quite a lot about the conception of knowledge in our period. The new idea of a knowledge 'from which any thing is to be hoped' as unconditionally based on the experience of nature, and completely separated from private interests or dubious theories, was founded on a new way of distinguishing between experience and theory, on, it could be said, a new distinction between epistemology and ontology. To be able to grasp the emergence of this distinction in the seventeenth-century better, I shall in the following take my cue from Sprat and his contemporaries' review of Renaissance scholarship, and, from the perspective of the historian, take a closer look at what can be said to have characterised Renaissance studies of nature.[28]

## Renaissance Simples

The idea that natural history should be based on a study of nature was not an invention of the seventeenth century. In the Renaissance, the scholastic slogan, *nihil in intellectu quod non prius in sensu,* 'nothing is in the mind which has not first been in the senses,' had been proclaimed, and, in practice, the Renaissance scholars had far from only been occupied with books, although they certainly also were preoccupied with them. Renaissance philosophers, such Aldrovandi and the Jesuit scholar Athanasius Kircher, accumulated enormous and highly praised collections of nature's 'simples,' as they were called – dried plants, stuffed or skinned

27 J. Glanvill, *Essays* (1676), III, p. 23, emph. in org.

28 Taking my cue from these authors, and, in addition, focusing only on those parts of Renaissance scholarship which had consequences – regardless of whether they are defined in terms of continuity, change or reconfiguration – for eighteenth-century natural history, and, furthermore, doing so in a highly summary fashion, also means that I shall leave out many trains of Renaissance thought. Some of these, such a 'nominalist' theories of the world as made up of nothing but individuals, were in stark contrast to those outlined in the following. For a fuller treatment of Renaissance philosophy, see, esp., L. Daston and K. Park, *Wonders and the Order of Nature* (1998); P. Findlen, *Possessing Nature* (1994); A. Haaning, *Naturens lys* (1998). I have drawn heavily on the work of these four authors in the following sketch of Renaissance philosophy.

animals, minerals etc. etc.[29] Some of the Renaissance naturalists went into the field themselves to *'fare esperienza,'* as it was called in Italy, in order to observe and collect, and, in the words of Erasmus, to hear nature 'speak[...] to us everywhere and teach[...] the observant man many things if she finds him attentive and receptive'.[30] At the same time, botanical gardens were established, first in Pisa in 1543, and quickly spreading out over most of Europe as a 'laboratory of nature'.[31] Experience, then, also had a central role to play in the Renaissance study of nature. But the conception of experience, of that nature which was the object of experience, and of the experiencing subject differed from the eighteenth-century conception.

In the Renaissance, those 'facts,' which were to form the fundamental building blocks of eighteenth-century natural history, did not exist. The word had not been introduced into common language,[32] and, more importantly, the definitive qualities, which were to characterise the 'facts' of natural history, had not yet been introduced into learned discourse. In the place of facts, the Renaissance scholars can be said to have had the 'simples.' But their attributes differed on fundamental points from those latter accorded facts.

In a basic sense, the simples were not simply simples. Different kinds of simples existed which could be used for different purposes in different explanatory contexts. Firstly, there were the extraordinary simples, such as a four-legged dragon found in the countryside near Bologna in 1572, or a locust with the words IRA DEI written upon its wings, which was discovered during the plague of 1542. On one hand, such extraordinary natural productions could be read as portents within a preternatural context. Hence, they could be read not only as signs of God's existence, but also of his mercy or, more usually, his anger in relation to specific groups of people. The locust, for instance, was taken as a certain sign of 'divine wrath'.[33] On the other hand, some extraordinary simples also possessed healing properties, and would, hence, be suitable for *materia medica,* such as the skin of a viper taken in April, or powdered gems.[34] The extraordinary simples, the wonders of creation, then, were mainly preternaturally and medically significant.

29 On Aldrovandi's and Kircher's collections, and Renaissance collections in general, see P. Findlen, *Possessing Nature* (1994), on the last subject, see also K. Pomian, *Collectors and Curiosities* (1990), esp. pp. 99ff.

30 Quoted in P. Findlen, *Possessing Nature* (1994), p. 155, who also in chs. 4 and 5 discusses the virtues of *fare esperienza.*

31 Ibid., p. 257, cf. pp. 256ff.

32 According to *Oxford English Dictionary,* 'fact' was introduced into common English during the sixteenth century, at first with the meaning of 'a feat.' From late sixteenth century – the first reported case is from 1581 – 'fact' was for the first time used in a recognisable early modern sense of 'what has actually happened or is the case; truth attested by direct observation or authentic testimony; reality.'

33 P. C. Ritterbush, 'Art and science' (1969), p. 564. The example of the four-legged dragon is taken from P. Findlen, *Possessing Nature* (1994), p. 17ff. In the event, the dragon was actually not read as a sign of divine anger, but determined to be merely an extraordinary creature. As Daston has stressed, prodigies would not always be read as signs, L. Daston, 'Marvelous Facts' (1994), p. 256. For a fuller treatment of Renaissance portents, see further J. Mouthan, *A Comparatiev Study* (n.d.).

34 Cf. P. Findlen, *Possessing Nature* (1994), ch. 6; see also A. Haaning, *Naturens lys* (1998).

They were, however, not of general use to Renaissance philosophy, since this philosophy was mainly concerned with the common and universal operations of the universe.[35] A second kind of simples became significant in this case. Within the context of philosophy, the emphasis was placed on ordinary simples, or 'commonplaces.' Such commonplaces referred not so much to a specific thing, but rather to the way things commonly behaved or appeared.[36] Thus, a commonplace designated how dogs, cats, or crocodiles were in general, and not how a specific dog, cat or crocodile had acted or appeared on a specific day. In their conception of ordinary simples, Renaissance philosophers were hence, with Lorraine Daston's words, 'empirical without being factual'.[37]

## The Primacy of Philosophy

This interest in simples as commonplaces reflects on the explanatory context of the simples within scholastic natural philosophy. The commonplaces were not so much of interest in themselves; rather, they were of interest as examples of philosophical theories of universal axioms, and as illustrations of philosophical, and especially, ancient texts. Philosophy always preceded experience, because philosophy aimed at disclosing universal axioms and Platonic ideas of the world. It was directed at revealing the world's 'ontic locus',[38] and that was not best done through an empirical investigation, but through philosophical inquiry.

This idea of philosophical inquiry hinges on a particular conception of nature and man and of the relationship between them. On one hand, the world and all its phenomena were taken to be defined by 'ideas' or 'essences' which had been inscribed by God and which determined the meaning of things. Such ideas or essences could not be observed, but they could be revealed through philosophical inquiry. When it was deemed possible to reveal the essential ideas by such means, it was because the ideas not only existed in nature, but also had their counterpart in man's mind, in the shape of innate ideas or principles. These innate principles made man attuned to truth, in the sense that they made him naturally capable of recognising truth when he came upon it through his philosophic investigations. With their double existence the ideas were thereby 'tying thought to reality and permitting direct knowledge of essences', as Phillip Sloan remarks.[39]

That the world's phenomena were defined by God-given ideas meant, furthermore, that they could never be fortuitous. The productions of nature, as, indeed, of culture, were

35 L. Daston, 'Baconian Facts' (1994), pp. 340-2.
36 Cf. P. Dear, *Discipline and Experience* (1995), p. 4; W. J. Ong, *Ramus* (1983), pp. 104ff.
37 L. Daston, 'Baconian Facts' (1994), p. 344.
38 Cf. C. Taylor, *Sources of the Self* (1989), pp. 160-1.
39 P. R. Sloan, 'John Locke, John Ray' (1972), p. 19.

rather conceived 'to take the form they d[id] in order to exemplify ideas or archetypes', as Charles Taylor has pointed out.[40] The simples, thus, could be read as 'Emblems' and 'Epigrams', which, as the Renaissance scholar Edward Topsell explained with special reference to animals,

> God hath used [...] as Sacraments or Mysteries to contain his will, (not only in the monstrous treble-headed, or seven-horned-shapes) but also in pure, ordinary, natural [illegible: limbs?]: how shall we be able to gesse [sic] at the meaning in the secret, that do not understand the revealed?[41]

In a world where visible form referred to invisible ideas, the ordinary simples, then, became like 'keys to making the invisible visible'.[42] On this account, natural productions, such as beasts, could, in the words of Topsell, be approached as 'a natural vision, which we ought to see and understand, for the more cleare [sic] apprehension of the invisible Majesty of God'.[43] Nature, here, was fundamentally conceived as a normative field, and its simple productions as signs of God's hidden paradigm.[44]

Now, the essential meaning of these observable forms remained secret in the sense that it could not be observed empirically. In revealing the hidden paradigm, the Renaissance philosopher could either use a method of logical division or (and possible in conjunction with this) a method of hermeneutic interpretation. In Chapter 5 I return to the method of logical division; here the focus will be on interpretation. The basic modus of interpretation was the comparison of simples with simples, signs with signs, forms with forms, and its basic objective was to reveal analogies and resemblances, homologies and correspondences between the simples.[45] Everything in the world formed part of a complex network of sympathies and anti-sympathies, and hence, everything, from the signs of nature to the signs of books, could, in principle, be related to everything else in order to extract the meaning of the signs.[46]

In writing histories of animals, this method of interpretation was articulated in comprehensive accounts of an animal's multiple relations with other things in the world. In describing an animal, not only its figure, colours and organs, and the possible resemblance of these to other things would be specified, but also the animal's various names and their philological meanings, the stories and fables in which it appeared, its treatment by ancient authors, its appearance in the Bible and on coats of arms, the usage made of it by man, and its medical properties, etc. would be detailed. Through such an interpretation, an animal would, in short, be inscribed in a multidimensional web of signification, whereby it's meaning would be revealed.

---

40 C. Taylor, *Sources of the Self* (1989), p. 160.
41 E. Topsell, *The Historie of the Foure-Footed Beastes* (1607/1973), The Epistle Dedicatory (unpaged).
42 P. Findlen, 'Empty Signs?' (1990), p. 513 and p. 515.
43 E. Topsell, *The Historie of the Foure-Footed Beastes* (1607/1973), The Epistle Dedicatory (unpaged).
44 Cf. C. Taylor, *Sources of the Self* (1989), p. 161; P. Findlen, *Possessing Nature* (1994), p. 84.
45 P. Findlen, 'Empty Signs?' (1990), pp. 512-3.
46 J. E. Kristensen, 'Det kuriøse og det klassificerende blik' (1993), p. 38.


Ill. 2.1 THE CAT (E. Topsell, *The Historie of the Foure-Footed Beastes,* 1607/ 1973).

To give just one example: About the common cat, Edward Topsell, in his translated version of Conrad Gesner's *Historia animalium liber 1: de quadrupedibus viviparis* (1551), started by listing all the known names of the cat in a variety of different languages, noting that it in Latin was called 'catus' because, according to Ovid, the sister of Apollo, Cautus, had laid 'for a spy in the likeness of a cat, for a cat is a watchfull and warye beast'.[47] Further, their reverence among the Egyptians was taken note of, before the price of Spanish cats in Germany was mentioned, whereupon the cat was compared to a 'Lyonesse' which again was compared to Venus who once transformed a cat into a beautiful women, however, she forgot her docile nature and turned into a lioness bereft of honour. The moral:

> men and beasts, hold nothing by their owne worth and benefit, but by the vertue of their creator: Wherefore if at any time they rise against their maker, let them looke to loose their honour and dignity in their best part, and to return to baseness and inglorious contempt, out of which they were first taken, and howsoever their outwarde shape and condition please them, yet at the best they are but beasts that perish, for the Lyons suffer hunger.[48]

Then, Topsell went on to describe the colours and extraordinary eye-sight of cats, their tongue and teeth, manner of hunting mice, birds and apes, and methods of preventing cats from hunting hens. Next, he described their general nature, and the means of keeping a cat at home, their way of copulation, their dangerous breath etc. etc. until, finally, he recounted their healing potential (the head of a black cat, burned to powder, should be thrown into an eye twice a day to cure it from blindness, for instance). All of this was interspersed with numerous references to the Bible and to ancient authors.[49]

It was through such multidimensional interpretations of animals that those accounts came into being, which from the perspective of the eighteenth-century zoologists appeared as 'tedious [...] unimportant digressions' and 'Labyrinths of ever-fresh discourse'. Within a Renaissance context, it was precisely such multidimensional readings which constituted knowledge, since it was by scrutinising simples for their theological, philological, mythical, utilitarian, medical etc. meaning, that the ontic locus behind could be revealed. It was through 'reading in the book of nature' and by comparing that reading with the books of ancient authors and with philosophical theories that the ideas inscribed by God on nature and imprinted on the mind of man could be made visible.

As Charles Taylor has highlighted, this conception of nature as a normative field and of man as possessing an innate faculty, which made him capable of disclosing the essence of nature positioned man in a particular way vis-à-vis nature.[50] The possession of innate ideas by every man, allowed the scholar to approach nature in 'first person,' so to say. Ontology and epistemology coalesced, or more accurately, had not yet been invented as two distinct

47 E. Topsell, *The Historie of the Foure-Footed Beastes* (1607/1973), p. 102.
48 Ibid., p. 103.
49 Ibid. pp. 102-7.
50 C. Taylor, *Sources of the Self* (1989), pp. 127ff. and 155ff.

domains,[51] because the things to be known – the ideas, which were embodied in the ontic locus – were made a part not only of the external world, but also of man himself in the shape of innate principles.[52] It was these conceptions of nature, knowledge and the knowing subject, and their interrelation, which would be thoroughly transformed during the seventeenth century. To begin with, the idea of innate ideas would be rejected, and the nature of man and his relation to nature would be redefined, as we now shall see.

## NATURES OF NATURAL HISTORY

### The empty mind

The very first book of John Locke's *Essay Concerning Human Understanding* was dedicated to a vigorous attack on the notion of innate ideas, or, as Locke commonly designated them, 'innate principles,' launched in line with previous seventeenth-century philosophers' denunciation of the doctrine.[53] 'It is an established opinion amongst some men,' Locke observed,

> That there are in the understanding certain *innate principles*; some primary notions, κοιαι εννοιαι, characters, as it were stamped upon the mind of man, which the soul receives in its very first being; and brings into the world with it.[54]

In the next three chapters, the idea of innate principles was demolished. At first, Locke pointed out that it was obvious that innate principles could not exist universally, and hence be a quality stamped on man's mind upon his creation as had been argued, since such innate principles did not exist in '*children* and *idiots*'.[55] To preserve the doctrine of innate principles, Locke then noted, that some of its adherents had argued against this by pointing out that the innate principles could only be discovered by the help of reason, and thus, could not be expected to be found in either children or idiots. But such an argument was not reasonable, Locke stated, for 'how can it with any tolerable sense be supposed, that what was imprinted by nature, as the foundation and guide of our reason, should need the use of reason to discover it?'[56] Finally, Locke pointed out that the ideas of exactly which principles were considered universal, differed between different societies because man's 'faculties' were 'bounded within the ways, modes, and notions of his own country, and never directed to any other, or further inquiries'.[57] If innate principles did not exist universally, and if they could not be discovered without the

51 Also cf. R. Rorty, *Philosophy and the Mirror of Nature* (1980), ch. 1.
52 Cf. C. Taylor, *Sources of the Self* (1989), pp. 159ff.
53 See, for instance, F. Bacon, 'Plan of the Work' (1620/1962), p. 27; J. Glanvill, *Essays* (1676), Essay I, pp. 15ff.; T. Sprat, *The History of the Royal Society* (1667/1722), pp. 16ff.
54 J. Locke, *Essay* (1706/1997), p. 59/I,ii,1; emph. in org., editor's notes excluded.
55 Ibid., pp. 60-1/I,ii,5; emph. in org.
56 Ibid., p. 63/I,ii,9.
57 Ibid., p. 97/I,iv,12.

help of reason they could not, Locke concluded, be innate at all. Rather than coming into the world with innate principles stamped upon the mind, man came into the world as a 'yet empty cabinet' or, as Locke said elsewhere, with a mind as a 'white paper, void of all characters, without any ideas'.[58] Man was born, as John Dunn sums up Locke's thesis, as a 'cognitively free' being.[59]

It was not thanks to any innate principles that ideas about the world were formed, then, and it was not due to any inward reflection on innate ideas that any true conceptions of the world could be formed, as also Isaac Barrow stressed:

The knowledge of such things are not innate, it doth not spring up in our minds, it doth not any-wise incident by chance, or infuse by grace (except rarely by miracle).[60]

Without any notion of innate ideas to substantiate the validity of philosophic contemplation on its own, philosophy lost its primacy in the study of nature, and was, in fact, to the extent that it did not take its point of departure from observation, relegated to the domain of mere private opinion within natural history. Joseph Glanvill explained:

*Our Demonstrations* are raised upon *Principles* of our *Own*, not of *Universal* Nature; And, as my Lord *Bacon* notes, we judg [sic] from the *analogy* of our *selves, not the Universe*: Now many things are *certain*, according to the *Principles* of one Man, that are *absurd* in the apprehensions of many others: and some appear *impossible* to the *vulgar*, that are *easie* to Men of more improved Understandings. This is extravagant in one Philosophy, which is a plain truth in another: and perhaps what is most impossible in the apprehensions of Men; may be otherwise in the *Metaphysicks*, and *Physiology* of Angles. The sum is, We conclude *this* to be *certain*, and *that* to be *impossible* from our own narrow Principles, and little Scheams [sic] of Opinion. [...] The *ways* of God in *Nature (as in Providence)* are not as *ours* are: Not the Models that we frame any way commensurate to the vastness and profundity of his Works; which have a *depth* in them greater than the *Well* of *Democritus*.[61]

Where should Man start then, if not within his own mind? Lord Monboddo posed the question rhetorically in his *Of the Origin and Progress of Language*, and answered it himself: 'I answer, from the source of all our knowledge in our present state of existence, I mean the senses.'[62] From the seventeenth-century onward the senses became, in a rather concrete sense and with great and repeated emphasis, the basis of any knowledge. 'The *Senses* are the *Fountain* of *natural Knowledge*', as Glanvill had observed a century earlier in the same vein,

and the *surest* and *best Philosophy* is to be raised from the *Phænomena*, as *they* present them to us: when we leave *these*, and retire to the *abstracted notions* of our minds, we build Castles in the Air, and form *Chymerical Worlds*, that have *nothing real* in them.[63]

It was through the senses alone that any knowledge about the natural world could hope to be gained.

How exactly the phenomena of the external world were transmitted to the mind – or, as Locke had it a bit more poetically, how the sensations were conveyed 'from without to their

58 Ibid., p. 65/I,ii,15; p. 109/II,i,2.
59 J. Dunn, 'From Applied Theology' (1983), p. 123.
60 I. Barrow, *Of Industry* (1693), pp. 157-8.
61 J. Glanvill, *Essays* (1676), Essay I, p. 15; emph. in org.
62 L. Monboddo, *Of the Origin* (1774), vol. I, p. 70, note*.
63 J. Glanvill, *Essays* (1676), Essay I, 17; emph. in org.

audience in the brain, the mind's presence-room'[64] – was by no means clear to the authors. As Glanvill emphasised in 1676: 'Our eyes that see other things, see not themselves; and the *Instruments* of *Knowledge* are unknown'.[65] More than a hundred years later, and after numerous dissections of the eye, ear, nose, tongue and skin had taken place, the issue seemed as unresolvable as ever:

From numberless experiments and observations, it is unquestionable, that the nerves are the instruments both of sensation and of animal motion. But, how these effects are produced by the nervous influence is a discovery still to be made. [...] But it is needless to dwell upon a subject covered with darkness, and which all the efforts of human powers will probably never bring to light.[66]

However, some authors, among them Glanvill himself, did go on to speculate on how the world was made present to the mind. Ideally, man's senses, and most importantly but not exclusively, the eyes would allow the material particulars of the external world to imprint themselves on the mind, as if they were reflected in a 'mirror' or a 'glass', or, with a more tactile metaphor, impressed on 'wax'.[67] Using the *camera obscura* – that light proof chamber in which the rays of light from the objects of the world through a small hole in one side of the room would be projected as a reduced and inverted picture on the opposite wall – as a model, Locke explained the operation:

For, methinks, the *understanding* is not much unlike a closet wholly shut from light, with only some little opening left, to let in external visible resemblances, or ideas of things without; would the pictures coming into such a dark room but stay there, and lie so orderly as to be found upon occasion, it would very much resemble the understanding of a man, in reference to all objects of sight, and the ideas of them.[68]

However, the metaphor of the camera obscura was not entirely accurate. In contrast to the entire picture of the world, which would be reflected in the camera obscura, man's mind would not reflect the world in its entirety; it would not even reflect everything, which the world had to offer. To understand more specifically what kind of world was implied in this conception of sensation and mind – what kind of world it was that could be made an object of such a reflection in the mind's mirror – it is necessary to take a look at the ideas of the external world existing in contemporary philosophy.

64 J. Locke, *Essay* (1706/1997), p. 123/II,iii,1.

65 J. Glanvill, *Essays* (1676), Essay I, p. 5, emph. in org.

66 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, pp. 80-1.

67 J. Locke, *Essay* (1706/1997), p. 121/II,i,25; T. Sprat, *The History of the Royal Society* (1667/1722), p. 97; L. Monboddo, *Of the Origin* (1774), vol. I, pp. 45-6; J. Harris, *Hermes* (1751), p. 356. Although the metaphors generally used in making sense of the sensory experience were mainly visual, and although the eyes certainly played a major role in the approach to the world during this period, it is important to bear in mind that the visual did not exclusively define the field of perception. 'Hearing, Seeing, Touching, and Smelling', as Beattie enumerated, all contributed to providing that 'evidence [on which] is founded all knowledge of external and material things'. J. Beattie, *Essays* (1776), vol. I, p. 56.

68 J. Locke, *Essay* (1706/1997), p. 158/II,xi,17; emph. in org. See J. Crary, *Techniques of the Observer* (1990), ch. 2, for a discussion of the frequent use of the camera obscura as a metaphor for the process of sensation in the eighteenth-century.

Everything which existed in the world from the smallest mineral, through plants, animals, to man and the angels above, were taken to be defined by an essence or, as it was sometimes called, 'primary causes'. As Locke explained, the 'real essence' equalled the 'being, of the thing itself, that foundation from which all its properties flow, and to which they are all inseparably annexed.'[69] The real essence was hence, in the words of another author, to be considered as '*models* or *archetypes* of all *material forms* [...]; of which *the material* is no more than a copy.'[70] It was the essence which determined the nature and the material outline of a thing, and it was the essence which determined the nature of species and, indeed, the very order of nature herself, as we later will see in more detail (Chapter 5).

This idea of 'real essences' in some measure resembles the Renaissance conception of 'ideas'/'essences.' However, at least in one crucial respect, the eighteenth-century idea of essence differs from the Renaissance one. As with the Renaissance scholar, the natural historian was not considered capable of perceiving essences. With the rejection of the Renaissance theory of innate ideas which made man attuned to the ideas of the world, however, eighteenth-century man became fundamentally severed from ever obtaining any certain knowledge about the essence. Locke highlighted this point when he noted that man cannot 'denominate' things '*by their real essences*, because we know them not':

> There is not so contemptible a plant or animal, that does not confound the most enlarged understanding. Though the familiar use of things about us, take off our wonder; yet it cures not our ignorance. When we come to examine the stones, we tread on, or the iron, we daily handle, we presently find, we know not their make; and can give no reason, of the different qualities we find in them. 'Tis evident the internal constitution, whereon their properties depend, is unknown to us. [...] The workmanship of the all-wise, and powerful God, in the great fabric of the universe, and every part thereof, further exceeds the capacity and comprehension of the most inquisitive and intelligent man, than the best contrivance of the most ingenious man, doth the conceptions of the most ignorant of rational creatures [*i e* the vulgar and savage].[71]

What made its way to the presence chamber of the mind through the senses was not the essences, but only an impression of the 'secondary qualities' of things. Qualities, which were generated by the essences and hence derived from these, but which, like the material copy of the archetypical idea, were of a fundamentally different nature. What made its way to man's empty mind, then, and what consequently defined the secondary qualities, was only that material part of nature which could be made available to the human sensorium, such as, with Locke's example of a snowball, it being '*white, cold,* and *round*.'[72] An ideational and, from the perspective of man, imperceptible world preceded and defined the perceptible world of matter, just like in the Renaissance, but the world's 'ontic locus' was now placed entirely

69 J. Locke, *Essay* (1706/1997), p. 375/III.iii.18. Cf. P. R. Sloan, 'John Locke, John Ray' (1972); M. J. Osler, 'John Locke' (1970), pp. 10ff.
70 L. Monboddo, *Of the Origin* (1774), vol. I, p. 88; emph. in org.
71 J. Locke, *Essay* (1706/1997), p. 397/III,vi,9; emph. in org.
72 Ibid., pp. 134f./II,viii,8; emph. in org.

beyond the reach of man: He was left with only the secondary qualities of things to work with in his quest for knowledge.

The secondary qualities presented themselves to the human sensorium as an assemblage of particulars: 'all things that exist in the world are only particulars', as Locke said.[73] Or, in the words of Harris: 'Life is merged in a multitude of *Particulars*'.[74] The external world was only accessible to man as a world of particular, sensible objects, and what was accepted as sensible – colour, figure, size, movement, etc. – was to a very large extent what could somehow be quantified. The realm of the external world was, as R. G. Collingwood has pointed out, restricted 'to a complex of quantities – quantities spatial or quantities temporal, but quantities and nothing more.'[75]

Within the mind, the impressions of the secondary qualities would be transformed into 'simple ideas,' as Locke called them,[76] and they would be stored in the faculty of memory from where they could be brought forward for later inspection. The simple ideas fundamentally circumscribed thinking, as they constituted the ultimate 'building blocks' of thought: 'perceptions are the only *materials* from which *ideas* are formed', as Lord Monboddo observed.[77] Man was not capable of forming this material for himself, as also Locke stressed:

> It is not in the power of the most exalted wit, or enlarged understanding, by any quickness or variety of thought, to *invent or frame one new simple idea* in the mind[.][78]

Thus, both in knowledge and art as, indeed, in fantasies, man was doomed to take his point of departure from the particular impressions, which had imprinted themselves on his mind. That in turn also meant that, in principle, every man and woman regardless of whether they were learned or vulgar, gentle or wild would have the same impressions imprinted upon their mind when confronted with the same objects.[79]

Vis-à-vis the world, man with his mind as blank as a piece of white paper, then, became a passive recipient – 'our minds are *Passive* to the impressions of Sense', as Glanvill emphasised[80] – and the world became the agent. In its most basic operation, the mind was reduced to a simple instrument of reflection, and the world a supplier of materials for thought.

73 Ibid., p. 368/II,iii,6.
74 J. Harris, *Hermes* (1751), p. 343; emph. in org.
75 R. G. Collingwood, *The Idea of Nature* (1945), p. 103. Also cf. T. Frängsmyr, J. L. Heilbron, and R. E. Rider, *The Quantifying Spirit* (1990).
76 J. Locke, *Essay* (1706/1997), p. 121/II,i,25. Other authors had other names for Locke's 'simple ideas,' Hume, for instance, called them 'simple impressions,' the meaning, however, being the same, and I shall below employ the terminology of Locke. D. Hume, *An Enquiry* (1748/1988), p. 21.
77 L. Monboddo, *Of the Origin* (1774), vol. I, p. 78; emph. in org.
78 J. Locke, *Essay* (1706/1997), p. 122/II,ii,2; emph. in org.
79 J. Harris, *Hermes* (1751), pp. 395-7, discusses this point at some lenght.
80 J. Glanvill, *Essays* (1676), Essay I, p. 21; emph. in org.

## The Light of Facts

With the rejection of the notion of innate ideas, any *a priori* philosophical principles were made relative, as we have seen, and as such unsustainable as a point of departure for studying nature. Instead of turning inward, the naturalist of our period would with his empty mind, have to start with the only thing which was given – the perceptible part of nature – and let her material particulars fill the cabinet of his mind. Nature had to take precedence over thought.

Already Francis Bacon had been emphatic on this point: 'the true method of experience', he stressed after having criticised the Renaissance scholars' preoccupation with universal theories and ancient texts as 'altogether erroneous and impassable', 'on the contrary first lights the candle, and then by means of the candle shows the way'.[81] If man wanted to know anything at all about nature, he had to start with his own experiences of nature, carefully distinguishing those experiences from his preconceived theories.

It is in this connection, as a natural historical (and philosophical) definition of what could be sensed, that the conception of 'facts' gained its significance during the seventeenth century. It was, however, not within a natural history context that the first definition of the salient features of facts would be defined. In *Elements of Common Law*, Bacon had defined 'matters of facts' in judicial terminology as that which could be experienced by man in relation to a crime, namely, all the circumstances concerning the crime itself. These Bacon sharply distinguished from 'matters of judgement': Those conjectures, which could be made on the basis of such facts but which under no circumstance formed a part of them.[82]

Within this juridical definition, facts were, in principle, divorced from any theoretical or philosophical framework, and this became one of their salient features within natural history. It was such facts that could be recounted in a history without the use of reason or imagination; and it was such facts that, indeed, alone ought to be recounted in a history. In contrasting this new category of facts to the Renaissance simples, which only became interesting as examples of ideas, Nehemiah Grew, thus, mockingly observed that when recounting facts, it was more 'proper' simply to 'remarque some of the Uses and Reasons of Things', 'instead of meddling with Mystick, Mythologick, or Hieroglyphic matters; or relating stories of Men who were great Riders, or Women that were bold and feared not Horses.'[83]

Sharply distinguished from philosophic contemplation, natural particulars were no longer conceived as signs to be interpreted. With the exegetical separation of facts from theory and with the rejection of the notion of innate ideas, nature's productions became facts which

81 F. Bacon, *New Organon* (1620/1962), p. 81/I.lxxxii; p. 80/I.lxxxii.

82 Francis Bacon, *The Elements of Common Law* (1630), quoted in L. Daston and K. Park, *Wonders and the Order of Nature* (1998), p. 230. For a discussion of the intimate relationship between Bacon's conception of law, statemanship and knowledge, see J. Martin, *Francis Bacon* (1992).

83 N. Grew, *Museum Regalis Societas* (1681), Preface (unpaged), emph. removed.

could, and by definition should, stand alone (quite literally as well: The long eighteenth-century witnessed an outpouring of books and journals, most importantly the *Philosophical Transactions* of the Royal Society, in which matters of facts, such as animal specimens, were simply described, but not in any way philosophically explained. Such publications appear to be one clear example of the new approach to nature – and quite at odds with Renaissance philosophy). Detached from a meaningful nature and a textual tradition, the facts came, as Daston so aptly has put it, to 'signif[y] nothing at all'.[84] The facts gained an epistemological autonomy and, at the same time, gained an epistemological primacy in the construction of knowledge. Due to the new conception of the mind and nature, facts became the only thing given, and consequently, the only thing solid to build any knowledge upon.

Tracing the (alleged) etymological meaning of the 'real' to the 'royal,' Bacon underscored this point by way of analogy, as he displaced the supreme autonomy of the King to the natural realm. Knowledge of facts, i.e. natural history, was not only, in principle, freed from theory, but also 'elevated within the hierarchy of knowledge', as Solomon points out.[85] No longer merely serving as examples of universal axioms, the matters of fact became the treasured basis for any knowledge of the perceptible world. '[W]ithout a natural and experimental history such as I am going to prescribe no progress of the human race could have been made or can be made in philosophy and the science', Bacon concluded.[86] Nature, like the King, came before anything else.

It was not only the relationship between nature and philosophy that had been redefined. The nature of experience itself or – to remain at a discursive level – at least the way in which it had to be represented in order to be considered an acceptable experience in natural history had been altered as well. As we saw above, a philosophically relevant simple in Renaissance scholarship had been a commonplace, and hence, as Dear put it, an experience amounted to 'a statement of *how things happen* in nature'.[87] During the seventeenth century, this conception changed, as experience was increasingly tied to the specific act of experiencing. In the following chapter I shall return to an analysis of this act; for now it suffices to note the implications of this conception of experiencing on the notion of facts. While the untying of nature's particulars from theory had made them epistemologically autonomous, the tying of them to a specific historical act of experiencing made them factual as well. Facts became thereby, as Daston says, 'small nuggets of experience.'[88]

---

84 L. Daston, 'Marvelous Facts' (1994), p. 250.
85 J. R. Solomon, 'Prologue' (1998), p. xviii.
86 F. Bacon, *Preparative* (1620/1962), p. 252.
87 P. Dear, *Discipline and Experience* (1995), p. 4; emph. in org.
88 L. Daston, 'Baconian Facts' (1994), p. 343.

There is one more feature of natural history's facts that we have to take into account. As we saw, during the Renaissance, a qualitative difference existed between different types of simples – between the extraordinary and wondrous simples which within a preternatural context could be read as portents, and the ordinary simples, which as commonplaces could be used in philosophy as examples of universal axioms, and read as signs of God's hidden paradigm. Within natural history, all facts became equal in principle; the wondrous and the extraordinary were here, in theory, to be treated on an equal footing with the ordinary and trivial. In the *New Organum*, Bacon stressed this as he made an eulogy for the 'trivial and commonly known' in natural history. Earlier on, Bacon noted, men 'had been accustomed' to focus on 'the causes of things which rarely happen [...]; while of those which happen frequently they never ask the cause but take them as they are for granted.' This thinking was flawed:

> But I, who am well aware that no judgment can be passed on uncommon or remarkable things, much less anything new brought to light, unless the causes of common things, and the causes of those causes, be first duly examined and found out, am of necessity compelled to admit the commonest things into my history. Nay, in my judgment philosophy has been hindered by nothing more than this, – that things of familiar and frequent occurrence do not arrest and detain the thoughts of men, but are received in passing without any inquiry into their causes; insomuch that information concerning things which are not known is oftener wanted than attention concerning things which are.[89]

This emphasis on the common did not mean that natural historians should no longer take note of what appeared extraordinary. Nor did it imply that genuinely extraordinary occurrences in the natural world were not thought to have occurred. A simple look at the Bible would affirm that genuinely extraordinary things in the shape of miracles indeed had taken place, and that it at times, indeed, had pleased God 'to overrule or control the established course of things in the world by his omnipotent hand'.[90] However, it was commonly agreed that God had chosen not to reveal himself in this way any more, as there was not longer any need for miracles:

> *God* never yet left himself without Witness in the *World*: And it is observable, that he had commonly chosen the dark and ignorant *Ages*, wherein to work Miracles; but seldom or never the Times when *Natural Knowledge* prevail'd: For he knew there was not so much need to make use of extraordinary Signs, when Men were diligent in the Works of his Hands, and attentive in the Impressions of his Foot-steps in his *Creatures*.[91]

Miracles – i.e. genuinely inexplicable natural occurrences – had their place in time, but in the present enlightened age what appeared to a researcher to be out of the ordinary course of nature was likely to appear extra-ordinary due to a lack of experience on man's part, rather than due to any intervention in the common course of nature by God. The extraordinary became in principle ordinary, as Bacon stressed:

> For we are not to give up the investigation, until the properties and qualities found in such things as may be taken for miracles of nature be reduced and comprehended under some Form or fixed Law; so that all the irregularity or singularity shall be found to depend on some common Form, and the miracle shall turn out to be only on the exact

89 F. Bacon, *New Organon* (1620/1962), p. 106/I.cxix.

90 R. Boyle, *A Free Enquiry* (1686/1996), p. 14.

91 T. Sprat, *The History of the Royal Society* (1667/1722), p. 350; emph. in org.

specific differences, and the degree, and the rare concurrence; not in the species itself; whereas now the thoughts of men go no further than to pronounce such things the secrets and mighty works of nature, things as it were causeless, and exceptions to general rules.[92]

Though, as Daston has highlighted,[93] extraordinary and ordinary phenomena would only gradually come to be treated as equally important facts during the seventeenth century, by the final decades of this century, extraordinary animals had within zoology either been excluded altogether from the field of study if they were interpreted as abnormal (such as a five-legged pig, or a three-tailed snake). Or, in cases where more than one animal shared the same extraordinary features, their extraordinarity would be considered as a function of man's ignorance, rather than be seen as a quality of the animal. '[W]onder is the child of rarity', as Bacon had observed,

and if a thing be rare, though in kind it be no way extraordinary, yet it is wondered at. While on the other hand things which really call for wonder on account of the difference in species which they exhibit as compared with other species, yet if we have them by us in common use, are but slightly noticed.[94]

The rare and extraordinary were now in principle placed on an equal footing with the common and normal as no more and no less than matters of facts.

The inclusion of all natural phenomenon – except for the anomalous individuals – into the category of facts hinged on a new conception of the explanatory context of facts. As Bacon had it, it was the 'common Form' or 'fixed Law' of nature, or in other words, the regular workings of nature, which came the principal object of natural studies, and which all facts equally well could illuminate.[95] The notion of 'laws of nature' was not new to the seventeenth century. It had also been in use in Medieval and Renaissance philosophy, here usually denominating nature's regular mode of working as opposed to her 'accidental' procedures. While the Renaissance conception certainly paved the way for the seventeenth and eighteenth-centuries usage, marked differences can also observed. What, in brief, separated the latter, and especially the eighteenth-century conception of 'law of nature,' from the former was, primarily, an idea of nature as 'governed by immutable laws' which ensured 'that natural phenomena were always regular and uniform': By the eighteenth century, nature had become entirely regimented by its laws.[96] In principle, vis-à-vis such a regular order of nature, all facts became equal, because they were all a product of, and hence all equally well pointed back to, this regular order.

92 F. Bacon, *New Organon* (1620/1962), p. 168/II.xxviii.
93 L. Daston, 'Baconian Facts' (1994); idem., 'The Cold Light of Facts' (1997).
94 F. Bacon, *New Organon* (1620/1962), pp. 171-2/II.xxxi.
95 Ibid., p. 168/II,xxviii.
96 L. Daston and K. Park, *Wonders and the Order of Nature* (1998), p. 351, cf. p. 120. See J. R. Milton, 'The Origin and Development' (1981), for a detailed discussion of the development of the notion of natural laws from Ancient to early modern times; and J. E. Ruby, 'The Origins of Scientific 'Laws'' (1986), for a partly different reading; see L. Cranberg, 'Law' (1968), for an impressionistic sketch of the relation between scientific and juridical laws.

In summing up the indigenous notion of facts, it could be said that what had taken place during the seventeenth century was a 'universalisation' of the category of the fact, entailing a trivialisation, a materialisation and a historisation. Each and every one of nature's phenomena could be identified as a fact, but this identification was, in turn, based upon certain preconceptions regarding the category of facts. First and foremost a fact was, as we have seen, defined as a perceptible entity, which came into being as a result of a historically situated experience. This meant, on one hand, that in contrast with the Renaissance concern with 'commonplaces' which, properly speaking, could not be observed, natural history was concerned only with 'individuals, which are circumscribed by time and place', in the words of Bacon.[97] On the other hand, it meant that only those qualities which could be sensed in such individuals – if necessary with the help of instruments such as the telescope, microscope, measure sticks, weights or the like – such as a specific body's colour, shape, movement, weight, measures, smell, taste, sound etc., that is, only the secondary qualities of things would form part of a fact. The limits of sensations, hence, came to define the limits of a fact.

Moreover, this definition of facts as perceptible entities determined how facts could be specifically distinguished from each other. The categorial definition of facts placed limits on the way specific facts could be differentiated, and thereby also classified, as it was only on the basis of the perceptible characters that it was possible to describe and hence distinguish facts from each other. As we will see in the following chapters, this definition of facts and the consequent framing of the axes of differentiation, had a direct influence on the eighteenth-century conceptualisation of animals.

Finally, with man equipped with a mind which, in principle, only reflected what was given, facts became, by definition, indisputable. As Dr. Johnson laconically stated in his definition of the category in the *Dictionary*, facts were: 'Reality; not supposition; not speculation'. With a quote from South's *Sermons* Johnson cemented this indisputable reality of the fact: 'Matters of *fact* breaks out and blazes with too great an evidence to be denied.'[98] As small nuggets of experience facts had become something over which 'no dispute could be possible', in the words of Simon Schaffer.[99]

Such a conception of facts implies a social exclusion, as Schaffer and Shapin have shown in an experimental context. Within zoology, not everybody agreed on what was a matter of fact. In eighteenth-century Britain there were, for example, people who believed in the existence of mermaids, dragons, and unicorns, in other words, in animals that most natural historians did not regard as matters of facts. However, rather than treating these people as natural historians, they would be treated as 'Vulgar' people who loved 'what is strange, rather

97 F. Bacon, *The Dignity* (1623/1962), p. 292.
98 S. Johnson, *Dictionary* (1755), FACT (unpaged).
99 S. Schaffer, 'Making Certain' (1984), p. 141.

than what is true', in the word of one author who was careful to position himself as a natural historian.[100] Those who did believe in the reality of such 'non-existing facts' were likely, as here, to be excluded from the ranks of natural historians. The construction of facts, then, implied a social dimension, as Schaffer and Shapin conclude. As facts defined the boundaries of assent, by extension, they also defined the terms of exclusion from the group of people who gave their assent. Matters of facts, hence, became, 'both an epistemological and a social category'.[101]

## The Nature of Nature

Although, as we have seen, a distinction analogous to Bacon's, between matters of facts and matters of judgement, can be discerned in the Renaissance distinction between simples and universal axioms, the 'Baconian distinction' between natural history and philosophy was new both in its very insistence on the epistemological autonomy and philosophical importance of the matters of fact,[102] and in its categorial definition of facts as trivial, historical and material. As alluded to above, in tandem with the emergence of the category of facts, the conception of nature herself was transformed. No longer inherently meaningful (or in any case, no longer in possession of a humanly conceivable meaning), to the eyes of the human observer, nature became a purely material thing (however, to the *understanding* of man she would still also be treated as in possession of an ideational order. An idea to be further discussed in Part II).

In existing analyses of seventeenth-century natural history and philosophy, a mechanisation of nature has commonly been identified as the most decisive feature of the new conception of nature.[103] And this is, of course, far from wrong. After all, the seventeenth century witnessed not only René Descartes' development of a mechanical framework for understanding nature, which was inspired not least by the descriptions of the universe by Galileo Galilei, but also Robert Boyle's physical experiments, and Newton's physico-mathematical research, which were both based on an explicitly formulated mechanical conception of the universe. As Boyle stated in *Free Enquiry into the Vulgarly Received Notions of Nature*, 'universal nature' ought to be conceived of as

> the aggregate of the bodies that make up the world, framed as it is, considered as a principle by virtue whereof they act and suffer according to the laws of motion prescribed by the author of things. Which description may be thus paraphrased: that nature, in general, is the result of the universal matter or corporeal substance of the universe,

100 F. Watson, *The Animal World Display'd* (1754), p. 300.

101 S. Shapin and S. Schaffer, *Leviathan and the Air-Pump* (1985), pp. 25, 69ff., cf. S. Schaffer, 'Making Certain' (1984), pp. 142-4.

102 Cf. L. Daston and K. Park, *Wonders and the Order of Nature* (1998), p. 237.

103 See, for instance, C. Taylor, *Sources of the Self* (1989), esp. pp. 159ff; R. Rorty, *Philosophy and the Mirror of Nature* (1980), ch. 1.

Ill. 2.2 MERMAID AND -MAN (U. Aldrovandi, *Monstrum Historia,* 1642). In the Renaissance scholar Ulysses Aldrovandi's *Monstrum historia* mermaids and mermen were depicted and described together with a range of other monsters. By the end of the seventeenth century, it was agreed among those who called themselves, and would be known as 'natural historians' that such monsters were nothing but 'creatures of imagination.' Consequently, they were excluded from the world of zoology.

considered as it is contrived into the present structure and constitution of the world, whereby all the bodies that compose it are enabled to act upon, and fitted to suffer from, one another, according to the settled laws of motion.[104]

Upon this view, nature – like 'a ship furnished with pumps, ordnance, etc. is an engine as comprises or consists of several lesser engines'[105] – became a machine upon which God had 'impressed' his general laws of motion.[106] Nature, then, was a combination of corporeal matter and divine, natural laws, where the principle of motion was inherent to matter itself.[107]

The mechanic conception of nature was, however, not the only conception of nature in currency in the period, even though it dominated physics and chemistry. In particular within the field of physiology during the second half of the eighteenth century a rival vitalist conception of nature – or at least of plants and animals – was advanced which challenged some of the assumptions of mechanism. 'The notion that animals are machines, is perhaps too absurd to merit refutation',[108] the zoologist William Smellie hence ventured:

The idea of a *machine* implies a select combination of the common properties of matter. The regularity of its movements is a proof that they are totally distinct from animal or spontaneous motion. A machine has nothing analogous to sensation, which is the lowest characteristic of an animal. An *animated machine*, therefore, is an absurd abuse of terms. It confounds what Nature has distinguished in the most unambiguous manner.[109]

Firstly, vitalism rested on a fundamental distinction between animate and inanimate matter. With regard to the former, the mechanical frame of explanation was generally accepted. As regards the latter, however, it was another matter: 'Animals and vegetable substances differ from common matter in having power superadded, totally different from any other known property of matter, out of which arises various new properties', as one of the most prominent spokesmen for vitalism in the second half of the eighteenth century, John Hunter, stressed.[110] Secondly, then, with regard to animate matter, it was argued that such matter had a 'vital principle' superadded to the living organism. This vital principle, which conferred a power of self-preservation and action, was absent in inanimate matter, and did consequently, account for the *life* of such organisms: 'Mere composition of matter does not give life; for the dead body has all the composition it ever had.'[111] In order to explain life, one had to reckon with 'the idea of spirit, viz. a species of intelligent quality that presides over and directs the actions of [animate] matter.'[112] The vitalist conception of (animate) nature was, then, based on a fundamental distinction between 'that which acts and that which is acted upon', as Hilde Hein says: 'That which receives action is itself inert and passive, lacking the spontaneity of self-movement. That which acts imposes form upon matter and is itself wholly external in nature to

104 R. Boyle, *A Free Enquiry* (1686/1996), p. 36.
105 Ibid., p. 40.
106 Ibid., p. 90.
107 Also cf. H. Hein, 'The Mechanism-Vitalism Controversy' (1972), pp. 174f.
108 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, p. 247.
109 Ibid., vol. I, p. 249; emph. in org.
110 J. Hunter, quoted in S. J. Cross, 'John Hunter' (1981), p. 37.
111 J. Hunter, quoted in ibid., p. 36.
112 J. Hunter, quoted in ibid.

the matter upon which it acts.' Hence, a basic dualism between life and matter, absent in the mechanic conception of nature, became central to the vitalist conception of nature.[113]

These two different conceptions of nature laid different frameworks for the legitimate natural philosophical explanations of matter, and in that sense they were meta-theoretical. This in turn meant, as Hein also points out, that they did not usually concern debates over 'matters of description' – in this basic approach to nature the adherents of the different philosophies usually agreed – but debates over 'matters of explanation', over how matters of facts should be understood.[114] What the two theories shared in their approach to, and, consequently, in their description of matters of fact, was a conception of *perceptible* nature as *material*, because the force of motion in mechanism, or the vital spirit of life in vitalism, alike were placed outside the reach of the human observer. Regardless of whether that motion or vital spirit was placed within nature, as in the case of the mechanical laws, or distinguished from nature, as in the vitalist approach, in both cases they were only accessible through contemplation on matters of fact. In addition, both approaches converged in treating matter as if it acted according to universally valid, regular laws, which at the same time made nature a uniform whole and also explained that uniformity, although the two approaches diverged in defining and locating these laws. Rather than a mechanisation of nature in itself, then, it was a 'materialisation' and 'regularisation' of nature, which was basic to both approaches, and which became foundational for natural history: It was the materialisation of nature, or 'empiricistic' understanding of nature as I shall call it, which allowed the observer to approach nature as a collection of perceptible facts which, devoid of any meaning in themselves, could only be registered on the mirror in the empty cabinet of the mind. As indicated earlier, it was, furthermore, the 'regularisation' of nature that allowed natural historians to treat each and every fact – common or extraordinary – as equal parts of the great natural order.

In brief, it was this triple redefinition of natures – of the mind's, which having been emptied of innate ideas became, at least in principle, like a mirror through which the particulars of nature could be reflected; of nature's, which drained of any perceptible meaning had become materialised and at the same time entirely regular; and of the facts', which had become universalised as trivial nuggets of indisputable experience – which, I will argue, became foundational for eighteenth-century natural history. It was this definition of the nature of the mind, of nature, and of the fact that made it possible to stage natural history as a purely empirical and factual recounting of nature's particulars, and which, in turn, made it meaningful to position this factual natural history as the only possible basis for any knowledge at all.

113 H. Hein, 'The Mechanism-Vitalism Controversy' (1972), pp. 163-4, notes excluded. For a further discussion, see also T. M. Brown, 'From Mechanism to Vitalism' (1974).

114 H. Hein, 'The Mechanism-Vitalism Controversy' (1972), pp. 160-1.

There was an *aberdabei*, however. Although man might be born cognitively free, not only was he born with passions and a faculty of imagination as well, he was also born with senses which did not always convey the particulars of the world to his mind's cabinet accurately and transparently. Furthermore, from the time of his birth to the time of adulthood when he might embark on studies of the natural world, he would have developed theories about the world which were not necessarily true, and he would have developed interests in the world as well. There were constitutive cracks in the mirror, then, as also Bacon pointed out in the preface to *The Great Instauration*. Due to the failure of the senses and the 'idols' of the mind – i.e. the various preconceptions that men would develop during their life – the mind would become

> as an uneven mirror [which] distorts the rays of objects according to its own figure and section, so the mind, when it receives impressions of objects through the sense, cannot be trusted to report them truly, but in forming its notions mixes up its own nature with the nature of things.[115]

'[W]e see but in part, and as in a glass darkly,' as Joseph Addison stressed, quoting the Bible to the same end.[116] Thus, man was never an empty cabinet or a perfect mirror when approaching nature in practice. He himself formed an impediment to knowledge, and it is to this impediment and the precautions taken against it that we must now turn in an attempt to more fully grasp the anthropology preconditioned in natural history.

## The Human Predicament of Knowledge

It was not only the Renaissance scholars who played the part of counter-image to seventeenth and eighteenth-century natural history and philosophy. So too did the angels. Only, they tended to place the learned endeavours in the negative: Where the discussion of Renaissance scholarship tended to highlight the, from the natives' point of view, accomplishments of natural history, the descriptions of the angels underscored its limitations. To appreciate this human predicament of knowledge, which also played a constitutive part in natural history, we must turn our gaze to the heavens.

### Homo Duplex

As we have seen, man was not considered capable of obtaining any knowledge about the real essences of things, because his senses only allowed him to receive knowledge about secondary

115 F. Bacon, 'Plan of the Work' (1620/1962), p. 27.
116 J. Addison, reprinted in G. A. Aitken, *The Spectator* (1898), vol. I, p. 331. The quotation from the Bible is from I Cor. xiii 12.

qualities. 'The *World* of *God*' was, as Glanvill concluded after having discussed the limited abilities of Man, 'no doubt [...] an other thing, than the *World* of *Sense* is; and we can judg but little of its *amplitude* and *glory* by the imperfect Idea we have of it'.[117] Indeed, vis-à-vis the world of God men appeared but as '*Atoms of Imperfection*', as another author stressed:

If we compare ourselves [...] with the Almighty powerful Being, it will be impossible but that our Actions, with respect to him must be full of inconsistent Absurdities[.][118]

Not all creatures were found as unfit to approach God's nature as man. As the encyclopaedist Ephraim Chambers pointed out, there were always the angels above: 'where we leave off, there possible some superior order of beings may take it up'.[119] By the nature of things, man could not actually *know* anything about these superior, invisible beings – 'Angles of all sorts are naturally beyond our discovery', as Locke observed.[120] However, by employing the cosmological notion of the Great Chain of Being, the existence of angels and their place in the universe could be inferred from the 'analogy of Nature,' as Joseph Addison here explains:

If the Scale of Being rises by such a regular Progress, so high as Man, we may by a Parity of Reason suppose that it still proceeds gradually through those beings which are of a Superior Nature to him, since there is an infinitely greater Space and Room for different Degrees of Perfection, between the Supream [sic] Being and Man, than between Man and the most despicable Insect.[121]

Man was linked, then, to the angels because by virtue of his mind and soul he was a spiritual being like them; what distinguished man from the angels and, inversely, linked him to the brutes was the fact that man was also a corporeal being. On this chain, man's basic nature becomes evident. As an intersection of spirit and matter, the eighteenth-century man was a 'Centaur', as Locke said,[122] or, with a concept borrowed from Count de Buffon, a '*homo duplex*'.[123]

In relation to knowledge, it was precisely the corporeal existence of man that accounted for the difference between his absurdities and the purer knowledge of the angels. In contrast to man, the real essences and hence the order of nature was not beyond the sensory capacity of the angels, and this constituted their first and fundamental advantage over man. We have already seen Glanvill taking note of this in passing as he, in his critique of the Renaissance scholars' reliance on philosophy, suggested that, 'perhaps what is most impossible in the apprehensions of Men', namely the comprehension of the essences, 'may be otherwise in the *Metaphysicks*, and *Physiology* of Angles.'[124] Locke gave an explanation for this difference

117 J. Glanvill, *Essays* (1676), Essay I, p.17; emph. in org.

118 G. Edwards, *A Natural History of Birds* (1743-51), vol. VI, Preface (unpaged); emph. in org.

119 E. Chambers, *Cyclopædia* (1741), vol. I, p. xxi.

120 J. Locke, *Essay* (1706/1997), p. 494/IV,iii,27.

121 Addison, *The Spectator*, no. 519, Oct. 25, 1712, reprinted in R. J. Allen, *Addison and Steele* (1970), p. 437. For a more elaborately developed conjecture on extra-terrestrial life, see also J. Wilkins, *The Discovery* (1638/1973); cf. A. O. Lovejoy, *The Great Chain of Being* (1948).

122 J. Locke, quoted in J. Dunn, 'From Applied Theology' (1983), p. 124.

123 G.-L. L. Buffon, *Histoire naturelle* (1777-89), vol. I, pp. 69ff.

124 J. Glanvill, *Essays* (1676), Essay I, p. 15, emph. in org.

between angels and man, as he pointed out that the angels, not being limited by corporeal sense organs, might be so created that they could 'frame, and shape to themselves organs of sensation or perception, as to suit them to their present design, and the circumstances of the object they would consider'.[125]

It was not only man's incapacity to perceive the real essences that made him absurd vis-à-vis the angels. Even with respect to the secondary qualities of things his sensorium might fail him as well. Due to fundamental limitations in the human sensory organs they might supply the mind with a distorted idea of the external world (as when a straight stick under water appeared gnarled to the eye; a church tower at a distance appeared to be at the size of a thump; or the earth, from the point of view of man, appeared to be flat[126]). Moreover, sensations could be corrupted by, in Harris' words, 'Inattention, Idleness, the turbulence of Passions; Education, local Sentiments, Opinions, and Beliefs'.[127] Man might have come into the world as a *tabula rasa*, but he certainly did not remain like that until the time he took up natural history studies. He would develop ideas of his own and interests in the world around him, and both of these tended to distort the pure perception of the senses (as when the sailor saw a mermaid in place of a sea-cow, or the hyena was perceived to be a 'terrible monster' with the face of a human being,[128] or when the philosopher vainly thought that every occurrence in nature agreed with his chimerical ideas[129]). Although the human sensorium would often work as smoothly as the camera obscura, the very possibility of a distorted representation of the external world in the mind instituted a fundamental uncertainty. Man's sensory organs were, as Glanvill concluded, 'too narrow for the *vastness* of things, and too *short* for *deep researches*: They make us very *defective* and *unaccurate Reporters*, and many times very *deceitful* and *fallacious ones*.'[130] In brief, the limitation of the senses and the existence of all kinds of private interests constituted a principle impediment to man's knowledge.

The angels, moreover, were considered to be in possession of extended faculties of memory and reason, and hence, when contemplating on past observations of primary and

125 J. Locke, *Essay* (1706/1997), p. 275/II,xxiii,13.

126 These examples are drawn from L. Monboddo, *Of the Origin* (1774), vol. I, pp. 25ff., and J. Glanvill, *Essays* (1676), Essay I, p. 18. Both authors discuss the problematique at length.

127 J. Harris, *Hermes* (1751), p. 406.

128 Examples drawn from F. Watson, *The Animal World Display'd* (1754), pp. 300ff., where a review of some of the most common 'creatures of imagination' is given.

129 T. Sprat, *The History of the Royal Society* (1667/1722), pp. 103ff. I shall return to this example below.

130 J. Glanvill, *Essays* (1676), Essay II, p. 23, emph. in org. It was this uncertainty as to the status of the sensations vis-à-vis the world, which the 'sceptics' were to draw to the extreme in their theories of understanding. See, for instance, D. Hume, *A Treatise of Human Nature* (1739-40/1978), esp. pp.66ff./I,ii,6, and pp. 180ff./I,iv,1-2; and idem., *An Enquiry* (1748/1988), pp. 135ff. I shall omit the intricacies posed by the Scottish enlightenment thinkers to the theory of understanding here, as the problem highlighted by them in the relation between sensations and the world never became acute within natural history during the eighteenth century. In general, as I shall return to later, it was generally accepted here that what was sensed, referred to an object in the world. See J. Richetti, *Philosophical Writing* (1983), for a more general discussion.

secondary qualities, they would probably be enabled to, in the words of Locke, 'retain together, and constantly set before them, as in one picture, all their past knowledge at once'.[131] As if responding to Locke's characterisation of the angels' capacities, Thomas Sprat (although some years prior to Locke's statement) lamented the limitations to man's ditto:

> How can it be imagined, that any single Mind can comprehend and sustain long enough the Weight of so many different *Opinions*, and infinite *Observations*; when even the best *Mathematicians* are soon tir'd with a long Train of the most delightful *Propositions*, which were before made to their Hands? Or, if there could be a Man of that vastness of *Soul*; yet how can we be assur'd, that he should hold the *Seale* even?[132]

Although the portraits of angels usually remained rather airy, their recurrent appearances in learned literature from the period points to two important co-ordinates for man's relationship with knowledge in our period.[133] Firstly, at a conceptual level, a particular definition of knowledge was implied. Knowledge was not, as it later would be, restricted to being a human accomplishment. Rather than being a product of human enterprise, knowledge was conceptualised as a thing existing in itself, as something to be discovered, more or less perfectly, according to the abilities and constitution of those who sought to discover it. Truth, the ultimate perfection of knowledge, was a given in God's world, as the professor of moral philosophy and logic, James Beattie, underscored after having drawn the reader's attention to the distinction between truth and falsehood:

> Whosoever is sensible of that distinction, and is willing to acknowledge it, must confess, that truth is something fixed and determinate, depending not upon man, but upon the Author of nature.[134]

Knowledge constituted an ontological, rather than an epistemological category.

Secondly, at an epistemological level, in the learned literature the angels became icons of an unattainable perfectibility of knowledge. They highlighted a specifically human predicament of knowledge, where the corporeal existence of man was singled out as the source of his limited abilities to understand the world. The ultimate purpose of natural history might be to comprehend God's nature, but that world was bigger, both in extent and in depth, than man naturally was capable of understanding. By placing the essential dimension of the external world, its constitutive essences, outside the reach of man, and, at the same time, by making the corporeal existence of man an epistemological impediment, imperfectability became a premise of human knowledge.

With the emergence of such an awareness of a human predicament of knowledge natural, history and philosophy took, in the words of Richard Rorty, an 'epistemological

---

131 J. Locke, *Essay* (1706/1997), p. 151/II,x,9.

132 T. Sprat, *The History of the Royal Society* (1667/1722), p. 102; emph. in org.

133 It was not only in learned texts that angels made their appearance in this period. Also in depictions of scholars at work, and particularly of the experimental philosopher at work in the laboratory, angels frequently appeared as divine assistants. For an analysis of the iconography of puttis, see J. L. Heilbron, 'Domesticating Science' (2000), pp. 5ff.

134 J. Beattie, *Essays* (1776), vol. I, p. 120.

turn':[135] The fusion of epistemology and ontology, which had been possible in the Renaissance due to the idea of the double existence of ideas in the world and in the mind, was no longer sustainable with the rejection of the doctrine of innate ideas and the consequent limitation of man's access to the world. With the introduction of this fundamental distinction between the world and man, man himself and his ways of approaching the world arose as a problem.

In part, the consequences of the human predicament of knowledge were taken account of in that gradation of knowledge that became universally embraced in this period. On an analogous scale, knowledge was gradated into different types according to their approximation to the impossible Truth. With Truth as the ultimate extreme at one end, the scale ranged, within human society, from the 'morally,' or, as it was sometimes appropriately called, the 'humanly certain,' such as mathematical demonstrations, which could be reached by employing the spiritual department of reason alone, over the 'probable' and the 'plausible,' which included all those branches of knowledge which, like zoology, depended also on sensations, to knowledge's antithesis, 'opinion' and 'hearsay.'[136]

In part, the epistemological implications of the predicament was attempted controlled though the development of a rigorous self-government; of, one might say following Taylor,[137] an unprecedented disciplining of the learned persona and his way of approaching the world. In the following, I shall, firstly, specify the causes of the possible distortions of nature in the human realm, and then, turn to a discussion of the self-disciplinary precautions taken against such predicaments.

### Self-Government

Those of the senses' deceptions which arouse as a result of limitations in the sensorium alone, could to some extent be rectified by the use of instruments, or, in other cases, by using other sensations or reason and experience as a supplement to observation (the distant sight of the thumb-high church tower could thus, both be corrected by touching the tower whereby its true dimensions would become evident; or by using reason and experience, the true size of the tower could equally well be inferred from a distance[138]). The deceptions caused by man's interests and preconceived notions were, in contrast, much harder to overcome.

In the *History of the Royal Society*, Sprat vividly described the dangers that lurked inside man, threatening to overturn his ability to understand the world. Alone in his study, a scholar

135 R. Rorty, *Philosophy and the Mirror of Nature* (1980), p. 126.
136 Cf. B. Shapiro, *Probability and Certainty* (1983); I. Hacking, *The Emergence of Probability* (1975).
137 C. Taylor, *Sources of the Self* (1989), pp. 159ff.
138 This example is drawn from L. Monboddo, *Of the Origin* (1774), vol. I, pp. 25 ff.

would naturally be inclined to delude himself in his encounter with the external world, as Sprat lamented: 'Such is the universal Inclination of Mankind, to be misled by themselves'.[139] Although the scholar would begin his inquiries 'with all the Sincerity imaginable', as his observations started to confirm his theories, he would grow 'by little and little warmer in his *Imagination*' and the corruption of knowledge would start:

the Delight of his Success swells him; he triumphs and applauses himself for having found out some *important Truth*: But now his Tryal begins to slacken; now *Impatience* and *Security* creep upon him; now he carelesly [sic] admits the whole crowd of Testimonies, that seem any way to confirm that *Opinion*, which he had before establish'd; now he stops his Survey, which ought to have gone forward to many more *Particulars*; and so at last this *sincere*, this *invincible Observer*, out of Weariness, or Presumption, becomes the most negligent in the latter part of his Work, in which he ought to have been the most exact.[140]

'Warmth of Imagination' and 'Delight of [...] success': These were the vices, as it were, which made the scholar go astray in his pursuit of knowledge by making him 'weary', 'careless', and 'presumptuous', and thus utterly unfit for discovering the Truth. '*Quod volumus, facile credimus*', as both Glanvill and Locke[141] concluded in the same vein: 'What suits our wishes is forwardly believed.'

In his investigation of the causes of 'common Errour' Thomas Browne made the source of such erring perfectly clear: They were inherent to man himself, as they could be unequivocally linked to a 'common infirmity of human nature'.[142] Already in the Garden of Eden, with Adam and Eve standing before the Tree of Wisdom, it had been obvious that

the inservient and brutall faculties controle the suggestion of reason: Pleasure and profit overswaying the instructions of honesty, and sensuality pertubing the reasonable commands of vertue.[143]

Once again, imperfections of man surfaced. And once again, the imperfections were linked to his corporeal existence, because the passions and self-interests, which led man astray led him astray so that he could gratify his private 'appetites'.[144] The body's working in the private threatened to 'cloud minds', as Barrow claimed, and hence, to pervert the course of knowledge.[145]

There were disciplinary remedies taken against this, however. One was conceptualised in terms of the 'public.' Construed as ideally both a guard and a judge, the purpose of the learned public became to counterbalance the perverting powers of the private: '[A]bove all', as Sprat explained *à propos* the weekly meetings of the fellows of the Royal Society, 'they have guarded themselves against themselves, lest the strength of their own Thoughts should lead them into Error'.[146] The principal reason why the Renaissance scholars' practice of keeping

139 T. Sprat, *The History of the Royal Society* (1667/1722), p. 103.
140 Ibid., p. 103, emph. in org.
141 J. Glanvill, *Essays* (1676), Essay I, p. 23; J. Locke, *Essay* (1706/1997), p. 630/IV,xx,12.
142 T. Browne, *Pseudodoxia Epidemica* (1646), p. 1.
143 Ibid., p. 3.
144 Ibid.; cf. J. Locke, *Essay* (1706/1997), p. 630/IV,xx,12.
145 I. Barrow, *Of Industry* (1693), p. 155.
146 T. Sprat, *The History of the Royal Society* (1667/1722), p. 92.

their findings to themselves was found unacceptable by the late seventeenth century was that such secrecy amounted to an altogether suspicious confinement of knowledge to the private sphere. By the last decades of the seventeenth century it was universally agreed that knowledge had to be made public, not only in order for it to be shared – which was also an important impetus, as we will see in the following chapters – but also, in a sense, for it to become knowledge at all. With corporeal, private man made potentially untrustworthy, he needed a public to check his natural inclination to put the 'love [of] ourselves' before the 'love of Truth', in Glanvill's words.[147] From this perspective, the public was made the agent, which guaranteed a probable knowledge, which, in a sense, kept the learned man on the right track in spite of his human nature.[148]

To counteract man's natural weaknesses, a learned public was not only required but also a strict self-government was introduced. Barrow summed this up nicely as he simultaneously outlined the human predicament of knowledge and its remedies:

> Our business [as scholars] is to find truth; the which (even in matters of high importance) is not easily to be discovered; being (as a vain of silver, encompassed with earth, and mixed with dross) deeply laid in the obscurity of things, wrapt up in false appearances, entangeld with objections, and perplexed with debates; being therefore not readily discoverable; especially by minds clouded with prejudices, lusts, passions, partial affections, appetites of honour and interest; whence to decry it requireth the most curious observation, and solicitous circumspection that can be; together with great pains in the preparation and purgation of our minds toward the inquiry of it.[149]

'Only by great pains':[150] With knowledge thus concealed as a vein of silver in the earth, a special kind of man was required to recover it, even in a more imperfect form.

The necessary 'purgation' of the mind could only be reached by a rigorous self-government, as described by Glanvill after he had also emphasised the scholar's need to control his brutish urges:

> [O]ne of the first Rules in the *Art of Self-Government*, is, to be *modest* in Opinions: And *this Wisdom* makes Men *considerate* and *wary*, distrustful of their own Powers, and jealous of their Thoughts: He that would *rule* himself, must be *circumspect* in his Actions; and he that would be *so*, must not be *hasty*, and over *confident* in his Conclusions. 'Tis *Pride*, and *Presumption* of one self that causeth such forwardness and assurance; and where those *reign*, there is neither *Vertue* nor *Reason*; No *regular Government*, but a miserable *Tyranny* of *Passions* and *Self-will*.[151]

The art of self-government had been developed within the conduct literature of the court, and later in polite bourgeois society.[152] In broader terms, the idea of self-government within

147 J. Glanvill, *Essays* (1676), Essay I, p. 23.

148 On the role of the public in early modern learning, see also S. Shapin, 'The House of Experiment' (1988), esp. pp. 399ff., idem., 'Science and the Public' (1990); D. Zaret, 'Religion, Science and Printing' (1992), and for a more general discussion of the relation between the 'private' and the 'public' in this period, see J. Barrell, 'The Public Prospect and the Private View' (1990).

149 I. Barrow, *Of Industry* (1693), p. 155.

150 Barrow was far from the only one to portray the scientific endeavour as painful: That was a common assertion. See also, for instance, T. Sprat, *The History of the Royal Society* (1667/1722), p. 94; R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. xiv.

151 J. Glanvill, *Essays* (1676), Essay I, p. 30; emph. in org.

152 Cf. N. Elias, *The Civilising Process* (2000); A. Bryson, *From Courtesy to Civility* (1998); P. Carter, *Men and the Emergence of Polite Society* (2001), pp. 60ff., and *passim*.

philosophy arouse simultaneously with the dispersion of new modes of discipline in a wider range of institutions: The workhouses, schools, armies, hospitals, etc.[153] As Charles Taylor has argued, this new emphasis on self-discipline articulated a 'growing ideal of a human agent [...] who is able to remake himself by methodological and disciplined action':

> What this calls for is the ability to take an instrumental stance to one's given properties, desires, inclinations, tendencies, habits of thought and feeling, so that they can be *worked on*, doing away with some and strengthening others, until one meets the desired specifications.[154]

Within the workhouses, schools, armies, and hospitals, the new modes of discipline mainly entailed controlling and making effective subjects out of the worker, the pupil, the soldier, the insane. Within Polite Society, the emphasis was placed upon the social implications of self-government as a way to become an agreeable interlocutor in intercourse – 'A man must be Master of himself, his Words, his Gestures and Passions, that nothing must escape him, to give others a just occasion to complain of his Demeanour', as one author of a manual of manners underscored.[155] Within learned society, the stress was laid upon the epistemological implications of self-discipline. As it appears from Glanvill above, the intellectual self-discipline had two objectives: In part, its objective was to overcome the 'Tyranny of Passions and Self-will,' in other words, to subdue all the corporeal surges. In part, self-discipline was directed at making the scholar aware of his 'presumptions,' or as Barrow had it, his 'prejudices' – all of the presupposed ideas and theories about how the world worked which by the time the natural historian commenced on his study, he would already have formed. In order to ensure that natural history remained a pure registration of facts, and, consequently, to ensure that no in-principle polluting theories took precedence over the collecting of facts, in a sense, the natural historian had to strive to overcome his humanness through self-discipline in order to act, in effect, as if he was an angel. Pursuing knowledge was, as Barrow wrote, 'a calling, which doth not employ us in bodily toil, in worldly care, in pursuits of trivial affairs, in sordid drudgeries; but in those angelical operations of the soul, the contemplation of truth, and attainment of wisdom.'[156]

As Taylor has pointed out, such a disciplining of the learned involved both disengagement and objectification.[157] As the scholar himself during the seventeenth-century had been turned into the principal impediment for knowledge, he had to objectify himself and through self-discipline detach himself from those prejudices, interests and passions that impeded the course of knowledge. With natural history defined as a study built solely on facts external to man, and with man turned into a homo duplex, the natural historian had to govern

153 C. Taylor, *Sources of the Self* (1989), p. 159; cf. M. Foucault, *Overvågning og straf* (1977).
154 C. Taylor, *Sources of the Self* (1989), pp. 159-60.
155 Quoted in P. Carter, *Men and the Emergence of Polite Society* (2001), p. 65.
156 I. Barrow, *Of Industry* (1693), p. 163.
157 C. Taylor, *Sources of the Self* (1989), p. 160.

himself in order to subdue the human weaknesses associated with corporeal existence, so that his spirit could work uncorruptedly in understanding matter. Only through such an epistemological disciplining could he approach the matters of facts – those unbreakable, indisputable nuggets of experience of which material nature was made from – as a true natural historian: without entertaining any opinions about them at all. Only in this way, the autonomy of nature and of facts could be secured. Only by this means, finally, could natural history be presented as the basis of zoology.

In the following two chapters I shall look more closely into the practices of gathering and handling facts in order to analyse how these practices also framed the constitution of zoological natural history. With the advantage of the historian's hindsight I shall argue that in spite of the strict self-government the zoologists did not, maybe not too surprisingly, manage to erase themselves and their culturally framed notions in the process. Indeed, as I have tried to show in this chapter, already the exegetical definition of the nature of man, of nature and of facts only became meaningful on the background of assumptions entertained within a culturally integrated period, however blurred it was at its beginning (and end). Although incorporating ideas of a Renaissance origin – most importantly, the idea of an invisible essence, which defined nature – by the latter decades of the seventeenth century, a new and virtually uncontested point of view on nature, had been introduced with the advent of natural history. It was also through that advent that the zoological endeavour was constituted as a distinguishable field. Distinguished by subject matter from other branches of natural history – most importantly, botany and mineralogy – the study of animals was, like botany and mineralogy, virtually unchallenged defined in terms of natural history from the final decades of the seventeenth century onwards.

Chapter 3

# From Nature to Facts

## Transforming Nature into Facts

In the field of natural history, impartial observation of nature herself was preferred to private philosophies or descriptions in books, then. In exegetical theory, facts, existing as they were presumed to do as indisputable nuggets of experience in nature itself, could be brought into light by the purged mind's simple act of observing nature. Given this conception of natural history one might be led to assume that the zoologists of the eighteenth century invariably went out into the field to see for themselves, and that hence, it was out in the wild that they obtained their information about the animals to be described in their books. This, however, was most often not the case. In practice, the transformation of 'raw nature' into learned facts involved more than unmediatedly letting animals free in the wild to imprint themselves on the mind's mirror, as we will see in the present chapter. To begin with, we may note that 'observing' and 'describing from nature' did not necessarily equal going out into the bosom of nature to observe for oneself, but in practice could have a much more extended meaning.

It is not that the zoologists, nor, indeed, gentlefolk more generally, not occasionally roamed the countryside and the coast, the mountains and the woods.[1] Richard Brookes, for instance, made a plea for his six volumes on the three kingdoms of nature by pointing out that he himself had visited a 'variety of countries' both in America and Africa, and hence, had been enabled to make 'some improvements' in zoology, since he was thereby 'less liable to be

1 The popularity among gentlefolk of spending time in nature, and here also collecting flowers or butterflies, was closely connected to a new taste for nature in the wild, often conceptualised in terms of 'picturesque landscape' and 'sentimental sensibilities,' which arose within Polite Society during the eighteenth century. For an analysis of the changing conception of nature, see K. Thomas, *Man and the Natural World* (1983), esp. pp. 254-69; on the advent of picturesque landscape, see M. Andrews, *The Search for the Picturesque* (1989); E. Hirsch, 'Introduction' (1995); K. W. Jørgensen, 'Pittoreske prospekter' (1997).

imposed upon by the hearsay relations of credulity'.[2] George Edwards emphasised that he had drawn and described the birds and animals in his books 'directly from nature', stressing, moreover, that he 'chose [sic] to have old Descriptions farthest from my mind, when I describe any thing, because I thought Nature herself the best Director'.[3] Mark Catesby was grateful to 'the kind dispensation of Providence' for having allowed him to collect 'materials' for his book 'from the living subjects themselves, and in their native abodes' in North Carolina and the Bahamas, because this was 'so very essential to a Natural Historian'. As he explained:

> [T]he Picture of an Animal, taken from its stuffed skin or case, can afford but a very imperfect idea of the creature, compared with what is done from the Life, not only as to what regards their Shape, Spirit, and Gesture, but also their beautiful colours.[4]

Turning from the statements of the virtues of observation to the action itself, we find, for instance, in the manuscript remains of William Anderon, careful descriptions and some drawings of beetles, leeches, caterpillars, butterflies, 'the water sou,' the 'pediculus anquaticus,' different worms and various animalculae.[5] Likewise, we find meticulous observations made by Gilbert White in the columns of the pre-printed *The Naturalist's Journal* during a six-year period, where almost everyday, he took note of the changes in temperature, barometer readings, and the weather in general, the foliation and defoliation of trees, the flowering of plants, the migration of birds, the appearance and disappearance of insects, and the life of animals more generally. To give just one more example, we find Thomas Pennant who set out on a tour to Scotland because, as he said in the introduction to the travel account later published, it had appeared to him to be 'far more prudent to visit the whole than part of my country' in order 'to speak with more precision of the subjects' which were dealt with in his zoological works.[6]

In the zoological literature, it is notable, however, how small a part of the descriptions of animals were actually based on an author's own observations in the field. With regard to the general, taxonomic works, this might, of course, be explained by the fact that it was practically impossible to observe all of the world's animals by one self, or even just one branch of them – regardless of whether it was quadrupeds, birds, insects or fishes. But even such naturalists as Edwards, Catesby or White who underscored the fact that they had taken their descriptions 'from real nature', as Edwards put it elsewhere,[7] actually more often than not did *not* stand in the middle of the field, taking notes and making drawings in the bosom of nature. The vast majority of Edwards' birds and other animals were either caged or, more often as it appears,

2 R. Brookes, *A New and Accurate System* (1763-72), vol. I, xiv.
3 G. Edwards, *A Natural History of Birds* (1743-51), vol. I, pp. xix, xvii.
4 M. Catesby, *The Natural History of Carolina* (1731-43), vol. II, p. 20.
5 W. Anderon, Manuscript remains, British Library, Add. 27,966, ff.184.
6 T. Pennant, *A Tour in Scotland* (1772), p. iv.
7 G. Edwards, *Gleanings of Natural History* (1758-64), vol. II, p. x.

dried and stuffed; Catesby, who in his book praised Providence for enabling him to observe live specimens in their 'native abode,' as it appears from one of his letter, bought a 'Negro boy' for 20 pounds Sterling because he found it too hot to go out collecting for himself in the North Carolinean summer;[8] White had numerous specimens 'procured' – killed by and brought to him by servants; and Pennant did not set out on his tour of Scotland until *after* he had finished three volumes of his *British Zoology* (a work, it should be noted, which was not organised geographically, but taxonomically).[9]

This is not to suggest that the natural historians did not ever base their descriptions on 'genuine observations made in the field,' for certainly they did that at times. This is rather to suggest that for observation of nature to take place, and hence essentially for facts to emerge, it was not *necessary* to go out into the field oneself. It could just as well be done in other ways and in other places, and one could still legitimately claim that one was describing 'directly from Nature.' The field did not necessarily equal nature, and facts were not necessarily born through an encounter with an animal in its natural habitat.

In this chapter, I shall examine how facts were born in practice. The contemporary ideas of what observing nature involved were important in framing the formation of facts, and I shall discuss these as I go along. But questioning the very idea of the possibility of transparent observation and representation, and arguing that we have to look at the structuring practices through which categories, like that of 'facts,' are constructed and made meaningful from the natives' point of view, as I did in Chapter 1, means that we also have to turn our attention to what happened at the level of practices in the transformation of raw nature into facts, and how these practices contributed to the conceptualisation of facts.

To begin with, a transformation of raw nature into facts could be said to imply a selection. Out of the infinitude of natural productions, which potentially could be observed, some would, in the first place, be selected as objects to be actually worked on. Not only eighteenth-century zoology, but, as Lorraine Daston and Peter Gallison have argued, every science which confronts this problem of 'selecting and constituting "working objects," as opposed to the too plentiful and too various natural objects': 'No science can do without such standardized working objects, for unrefined natural objects are too quirkily particular to cooperate in generalisations and comparisons.'[10] In exegetical theory, the zoologists' field of objects might be each and every animal in the world, but in practice, they, as other scientists

8 M. Catesby to W. Sherard, Royal Society, London, Sh. 165.

9 Often rather than describing the animals he met on his tour 'from nature,' Pennant, moreover, usually referred the reader of the *Tour in Scotland* to his zoological works when an animal appeared to be in need of a description at all. This tendency to refer to books rather than to describe from nature, though not the rule, was by no means uncommon in travel accounts from the period, see, for instance, also W. Paterson, *A Narrative of Four Journeys* (1789), e.g. pp. 9, 12, 13.

10 L. Daston and P. Gallison, 'The Image of Objectivity' (1992), p. 85.

also do, restricted this unmanageably larged and particularised field drastically, by delimiting a field of objects, and by turning these objects into standardised and, thus, manageable objects which they could work on. In this way, delimiting a field and constructing working objects entails selection.[11] The selection of working objects, on one hand, involves a mere choosing of some of raw nature's phenomena, of, say, one animal rather than another, among all of nature's productions. It involves a selection of animals, which for one reason or another are deemed to be worth the attention of the zoologists. On the other hand, these selected phenomena are further fashioned in the representation as standardised working objects as certain traits in them here are highlighted, while others are ignored, and, furthermore, as they are described as objects of a particular kind. The natural objects are hence in representation construed in specific ways, whereby becoming working objects, facts, suitable for zoology.

Secondly, working objects not only need to be selected and through representation construed as a particular kind of objects, they also need to be validated as matters of facts to become acceptable for scientists as *credible* building blocks which can be worked on in science, as other authors have pointed out.[12] Practices of authorising matters as facts are, then, also at work in the fashioning of working objects.

Finally, a social dimension is also at play in this transformation of raw nature into facts. In the process, multiple different people may, as was the case in eighteenth-century zoology, be involved each with their different roles to play.

From this perspective, facts never simply existed in nature in order to be observed. Although part of the nature of facts in eighteenth-century natural history was certainly also defined by the indigenous idea of facts as actually existing in nature waiting to be observed, they were in practice only introduced into zoological discourse through a complex epistemological and social process. In practice, the observation of nature was not only framed by exegetical theory, but also mediated by practices of selection, of validation, and of a social division of labour in this process.

It is this complex process that I shall attempt to untangle in the present chapter by examining these three dimensions in the act of transforming raw nature into facts. I shall, firstly, discuss a certain bias in the zoologists' mode of selecting individual specimens, which set the stage for deciding what was interesting to choose and, hence, to collect from nature. Then, zooming out, I shall examine the social division of labour in the process of collecting such specimens, as well as the modes of validating matters of facts brought into play here. Turning to the representation of specimens in both writing and illustrations I then examine how the animals in the zoologists' accounts were standardised as working objects through

11 Ibid.

12 Cf. esp. S. Shapin, *A Social History of Truth* (1994); P. Dear, '*Totius in verba*' (1985).

different modes of representation – as zoological facts, characterised by particular attributes. In conclusion I shall, finally, return to the question of why it was that nature could equally well be observed in, as well as away from the field.

## Collecting Animals

### Selecting Specimens

Something like an urge for information about animals of all kinds, and especially for 'non-descripts' – animals that had never before been described (by any learned European, in any case) – seems to have prevailed among eighteenth-century zoologists. All kinds of people were called upon to observe, describe and draw, collect and preserve. In letter after letter, zoologists implored correspondents at home and abroad to send them information about animals. Gilbert White of Selborne, for instance, had written to an acquaintance at Gilbraltar, and as he told Thomas Pennant,

> urged him to take up the study of Nature a little; to habitude his mind to attend to the migration of birds & fishes; and to the plants, fossils, & insects of that part of the world.[13]

Thomas Pennant himself, notoriously asking for some kind of information or another in every single one of his letters, confessed his thirst for specimens to Lord Lyttleton, after the Lord in response to a previous letter had gone through numerous hardships in order to collect some shells and muscles for Pennant in a distant North England river:

> my thirst after natural history is unquenchable, & should I give loose to my wishes I should request your Lordship & every Prelate on the Bench to give in charge to their Clergy to collect everything uncommon in the animal Kingdom & and to transmit it to my museum.
>
> But I shall have modesty and moderation enough left to suppress my desires; and I say that should anything rare fall in the way of your friends, the communication would be extremely acceptable.[14]

As we have seen in the previous chapter, in exegetical theory, all natural productions, regardless of their extraordinarity or triviality would be equally interesting to the natural historian. In zoology, every animal (except for the monstrous, anomalous ones) from the smallest animalcula to the orang-utan, from the armadillo to the mole were, in principle, entitled to equal attention, and ought to be collected all alike. This doctrine of 'the importance of everything'[15] is apparent in contemporary guidebooks on how to collect. John Woodward, for instance, giving directions for the general collection of natural history items, pointed out that,

13 G. White to T. Pennant, Nov. 28, 1768, British Library, Add. 35,138, f.22.

14 T. Pennant to Lord Lyttleton, June 28, 1768, British Library, Stowe 754, f.247.

15 The concept is taken from M. Abenius, 'Allt är viktigt' (1971), who analyses the representational implications of this doctrine in the works of Linné in this article.

In the *Choice* of these Things, *neglect not any*, tho' the most *ordinary* and *trivial*; the *Commonest* Peble or Flint, Cockle or Oyster-shell, Grass, Moss, Fern, or Thistle, will be as *useful*, and as *proper to be gathered* and sent, as any the rarest productions of the Country.[16]

In practice, however, a certain pattern of selectivity is evident. In some preliminary thoughts on the collecting of birds in foreign places, George Edwards suggested that every traveller should make himself thoroughly acquainted with the natural history of his native country before he went abroad, in order not to 'expose himself, as many have done, by going abroad, telling us at their return many such things as were already known, or might have been easily discovered in our own Country.'[17] In particular, in travel accounts from the period this demand for the unfamiliar and unknown was taken *ad notam*. John Barrow, for instance, in his *Account of Travels into the interior Parts of Southern Africa*, mentioned solely the already well-known animals he encountered by name, and only gave a more elaborate description of 'non-descripts,' the slightly or insufficiently described animals, or such animals as would appear to have a lasting attraction for the public's imagination (for instance, the lion and the ostrich).[18] The same pattern can be observed in John Bell's description of animals he encountered on his travels in the Asian parts of Russia. Near Astrachan, for instance, he met with 'a great variety of uncommon birds, whereof I shall describe a few that seemed most extraordinary'.[19] Four birds, three of which were so extraordinary that they did not even have a name, were then described, before Bell, not untypically, noted that 'There are also partridges and bustards, which need no description [...]'.[20] There was no chance of exposing one's ignorance here.

This does not mean that animals already known were never collected or described anew. Obviously they were. But it does mean that although every animal, in principle, was claimed to be as interesting as the next, the high value put on the new and uncommon – and the accompanying exposure of those who were not familiar with the limits of what was common within zoology – in practice came to undermine the doctrine of 'everything is important' at this practical level of collecting. It was this preoccupation with the new and the rare that often guided the actual mechanism of inclusion and exclusion of animals in the process of selection in the field.

The most valued of all were the non-descripts. Zoologists would congratulate each other on the 'discovery' of one;[21] and they would present them as gifts to patrons,[22] or to friends.[23] The non-descripts might not quite make the world go round for the zoologists as one

16 J. Woodward, *Brief Instructions* (1696), p. 10; emph. in org.

17 G. Edwards, *A Natural History of Birds* (1743-51), vol. I, pp. x-xi.

18 For a particular poignant example of this mechanism of in- and exclusion, see J. Barrow, *An Account of Travels* (1801-04), vol. I, pp. 217-31.

19 J. Bell, *Travels* (1763), vol. I, p. 40.

20 Ibid., p. 41.

21 See for instance G. White to T. Pennant, Jul. 25, 1768, British Library, Add. 35,138, f.16.

22 E.g. M. Catesby to H. Sloane, May 10, 1723, British Library, Sl. 4046, ff.352-3.

23 E.g. D. Skene to J. Ellis, Jul. 5, 1765, Linnean Society, London, Ellis Corr., vol.II.95.

satirical author suggested;[24] but they do indicate a certain, systematic bias towards the rare in the practical selection of animals. This quest for the rare even spilled over into at least some of those zoological books, which were primarily concerned with the description of specimens. Balancing on a knife's edge between the unacceptable marvels, associated with the Renaissance, and the acceptable appreciation of the non-descripts and the rare, we find zoologists presenting their books with titles such as: *A Natural History of Uncommon Birds, and of some Other Rare and Undescribed Animals, Quadrupeds, Reptiles, Fishes, Insects, &c* (Edwards, 1743-51); *New Illustrations of Zoology, Containing Fifty Coloured Plates of New, Curious, and non-descript Birds, with a Few Quadrupeds, Reptiles and Insects. Together with a Short and Scientific Description of the Same* (Brown, 1776); or still more discreet: *A Natural History: Containing many not common Observations* (Blount, 1693).[25]

This practice of selection might, of course, not be so surprising given the fact that the unknown within the logic of taxonomic zoology would correspond to 'missing links' in the taxonomic schemes and hence be especially valuable in elucidating the Great Chain of Being, as we later shall see. The downright exposure of those who dwelled upon the familiar, however, indicates that there was more to this than simply a search for missing links. Being able to determine something as unknown, and something as known, some animals as worthy of description, and others as not, indicated that a man was learned and familiar with the field of zoology. Describing the non-descripts as non-descripts, and the common as common, a man could position himself, and would be more likely to be accepted as a man of learning whose accounts would more readily be trusted, as also Edwards intimated above. Although, in principle, all natural productions were equally interesting there were good reasons, then, to ignore Woodward's and Bacon's command and choose some of the more uncommon creatures.

Although the common animals would also be collected, if not always so eagerly, or quite so frequently as the non-descripts and rare, there was one category of animals which, entirely in tune with Bacon's commands, only rarely would be picked out at all: the deformed, anomalous individuals. In Chapter 6, I shall return to the question of why these were virtually

24 'Twice happy he whose ten years search decries
Some *Non descript*, a silbert maggot's size:
Though ign'rance think, that since this globe has run
So many a stated circle round the sun,
So many a year had held compact and fair,
Unblest with knowledge of this insect rare,
It might *perchance*, had it not yet been found,
Have held together still, and still gone round.'
Anonymous, *An Historic Epistle* (1775), p. 17; emph. in org.

25 An analogous pattern of selectivity can also be observed in descriptions of species. Although every known species would obviously be mentioned in a taxonomic account, there was a clear tendency to pass over the most common animals very quickly, with such phrases, as – in this case with reference to the common mouse – 'An animal that needs no description.' T. Pennant, *Synopsis of Quadrupeds* (1771), p. 229.

excluded from zoology altogether. For now it suffices to observe that at the level of individuals it would be the common and the extraordinary, with the emphasis on the latter, which were generally chose from the infinitude of nature's productions, as zoologically interesting animals.

## The Gatherers

So far I have talked as though the choosing of animals in nature happened by itself. Obviously it didn't. Although the zoologists' ideas of what was zoologically interesting phenomena framed the actual process of collecting, the animals had, in a concrete and trivial sense, to be collected by someone as well.

We have already seen above that while the zoologists at times would go out into the bosom of nature to collect, they were far from alone in this endeavour. Indeed, the zoologists relied on a wide range of people to collect and convey either specimens or information about specimens to them. We might get a first indication of the extent of gatherers in the large networks of correspondents maintained by the zoologists. Hence Pennant, for instance, made frequent references in all of his zoological books to multiple people both at home and abroad that had contributed in some way or another with information. Likewise, John Ray had numerous helpers both all over Britain and abroad who sent him information on every parts of natural history.[26] Sir Joseph Banks, to give one last example, though not a significant author himself, became eminently important in the latter part of the eighteenth century as one of the period's greatest collectors. According to David Mackay, he had at least 126 persons collecting for him outside Europe in the period 1770-1820, and, it seems reasonable to assume, probably also a fair number within.[27]

Although it was primarily, but not exclusively, the contributions of male helpers of some social standing that would be acknowledged in the printed accounts, it is noteworthy that, in practice, also people of the lower echelons were engaged in the gathering of specimens. The enterprise of gathering cut through social strata. Hence, the Royal Society addressed their *Directions* on how to observe and collect abroad to seamen in general.[28] Likewise, John Woodward stressed in his manual of collecting, after having detailed how different animals should be collected and preserved, that there

> are many of these things, especially the *gathering* and *preserving* of Insects, Shells, Plants, Minerals, &c. [that] *may be done by the Hands of Servants*; and that too at their spare and *leisure times*.[29]

---

26 Some of the helpers are explicitly thanked in J. Ray, 'The Preface' (1728) (unpaged); others have been detected by C. E. Raven, *John Ray* (1986), *passim*.

27 D. Mackay, 'Agents of Empire' (1996), p. 39; cf. D. P. Miller, 'Joseph Banks' (1996).

28 Royal Society, 'Directions for Sea-Men' (1665).

29 J. Woodward, *Brief Instructions* (1696), p. 16; emph. in org.

Likewise, in the letters and notebooks of naturalists we find servants, peasants, women, black people and even slaves collecting, and contributing information. White, for instance, appears to have had a horde of 'procurers,' as they were called, engaged in collecting for him, among these some were his own servants, and some peasants from the neighbourhood. 'One of my procurers', he told Pennant in letter, had brought him 'a new Salicaria' which the procurer had recently shot;[30] another day a procurer brought him a 'Gallincula ochra' and a 'Blalus porzaha', and so on.[31] Both John Ellis and David Skene hired people to collect for them at the seaside – in Ellis' case, some fishermen, and in Skene's case, a parson.[32] The Reverend William Borlase had his wife out collecting.[33]

At the margins of the known world, natural history became intermingled with the colonial enterprise as colonial agents opened up new land not only for exploit and commerce but also for research. Often the two enterprises went hand in hand. As Bernard Smith notes regarding colonial-explorative ships like Captain Cook's, they 'combined the values of a fortress and a travelling laboratory'.[34] To some extent, the exotic fields opened up by the colonial expanse would be brought under investigation if not by state organised research, then at least by state patronised researchers.[35] Such was, most spectacularly, the case with the three expeditions of Captain Cook to the South Sea. On each expedition instructions were carried from both the Admirality and the Royal Society on how to carefully and accurately observe all kinds of natural phenomena and collect specimens.[36] In addition, the ships had been equipped with facilities and a natural historian crew to take care of this research.[37] In addition to Cook, a number of other expeditions where scientific explorations played at least a part were launched during the eighteenth century, although none rivalled the gathering of zoological specimens of

30 G. White to T. Pennant, May 29, 1769, British Library, Add. 35,138, ff. 27-8.

31 G. White to Royal Society, Nov. 4, 1774, Royal Society, London, L&P.VI.95; underlining in org.

32 J. Ellis, *A Description of the Mangostan* (1775), p. xi; D. Skene to J. Ellis, Dec. 5, 1765, Linnean Society, London, Ellis Corr., vol.II.97.

33 W. Borlase to J. Ellis, May 25, 1754, Linnean Society, London, Ellis Corr., vol.I.34.

34 B. S. Smith, *European Vision and the South Pacific* (1960), p. 2. For a discussion of relations between science and colonialism, see ibid., *passim*; M. L. Pratt, *Imperial Eyes* (1992), Part I; and for an analysis of the political and military-strategic motivation to scientific exploration, see A. Frost, 'Science for Political Purposes' (1988); D. A. Baugh, 'Seapower and Science' (1990).

35 See J. Gascoigne, *Science in the Service of Empire* (1998), for an analysis of the emergence of more organised and comprehensive research under the auspices of the state around 1800.

36 B. S. Smith, *European Vision and the South Pacific* (1960), pp. 1ff.

37 Each expedition carried several natural historians – Sir Joseph Banks as the natural historian in charge, and Daniel Solander and Herman Spörig as assistants on the first expedition; John Reinhold Forster and his son George Forster and the astronomer and the meteorologist William Wales on the second one; and, finally, the two Forsters on the third. In addition also one or two artists, engaged with, among other things, making drawings and paintings of natural specimens were brought along (Alexander Bucham and Sydney Parkinson on the first, William Hodges on the second, and John Webber on the third). For a more elaborate treatment of the Cook-expeditions seen in relation to natural history and art, see B. S. Smith, *European Vision and the South Pacific* (1960), esp. chs. 2-4.


Ill. 3.1 METHODS OF CATCHING BIRDS (F. Willughby and J. Ray, *The Ornithology*, 1678/1972). Willughby and Ray not only described and classified a wide range of birds in their influential ornithological work; they also offered advice on how to catch birds with this engraving. Though devising methods for catching birds may have been the learned men's task, the actual act of catching them – the dressing up in animal masks (see the lower left corner), or the hunting down of birds with dog and nests – was the servants' job.

the Cook expeditions,[38] and few were as lavishly equipped: Dampier, Wallis, Vancouver. Under the auspices of the East India Company (though a private company, it obtained state-like functions in India in the latter part of the eighteenth century[39]), research was carried out into the natural history of India under the auspices of the Asiatic Society in Calcutta and later also at the College at Fort Williams.[40]

However, most of the zoological investigations abroad would be carried out under more informal circumstances. Travellers, who voyaged for a number of different reasons and usually with some kind of connection to the colonial expanse, gathered information and specimens that came to play a crucial role in the zoological enterprise. In Aleppo, Syria, Alexander Russel collected and described fish, among other things;[41] at the Cape of Good Hope, the Lieutenant William Paterson and John Barrow, auditor-general of public accounts, spent their spare time collecting information about South African nature, among other things;[42] in New South Wales, the Surgeon General John White and the Captain of the marines William Tench were both collecting around Sidney Cove, Port Jackson;[43] in South American Guiana, the physician Edward Bancroft was gathering all kinds of information about the natural history of that area,[44] etc. Innumerable people were engaged or engaging themselves in the collecting of information and the gathering of specimens abroad.

Men such as these could communicate their observations, or even specimens, in letters and boxes to zoologically interested friends in Britain. They might also present their findings themselves in published accounts, and in that case most often as part of a travel account. Indeed, during the eighteenth century, information on the natural history of an area visited became an almost obligatory part of any travel account.[45]

Furthermore, Travellers of a high social standing would at times engage local people to help them in their endeavour as well. We have already heard of Mark Catesby who bought a 'Negro Boy' to collect for him in the hot Carolinean summer. In Guiana, Bancroft paid every Indian who brought him a dead snake a glass of rum, and was thus enabled to collect more than three hundred snakes in just three months;[46] and at the Turkish sea side, Mordach

38 On the zoological specimens collected on Cook's expeditions, and on their fate in Britain, see P. J. P. Whitehead, 'Zoological Specimens' (1969).

39 P. Spear, 'The British in India' (1961).

40 D. Kopf, *British Orientalism* (1969), pp. 48ff.; D. Mackay, 'Agents of Empire' (1996), p. 43; cf. S. W. Jones, 'The Tenth Aniversary Discourse' (1793/1993).

41 A. Russel, 'An Account' (1756).

42 W. Paterson, *A Narrative of Four Journeys* (1789); J. Barrow, *An Account of Travels* (1801-04).

43 C. W. Tench, *A Narrative of the Expedition* (1789); J. White, *Journal of a Voyage to New South Wales* (1790).

44 E. Bancroft, *An Essay on the Natural History of Guiana* (1769).

45 M. L. Pratt, *Imperial Eyes* (1992), pp. 27-8.

46 E. Bancroft, *An Essay on the Natural History of Guiana* (1769), pp. 220-1.

Mackenzie and the British ambassador in Constantinoble hired some fishermen 'to rag for some rock Oysters'.[47]

Lords and gentlefolk, men and women, travellers, black people and white people, servants, savages and slaves - they were all involved in the gathering of specimens and zoological information. At this level, the zoological enterprise was generously inclusive.

## The Credibility of Collectors, the Truth of Facts

As previously indicated, 'the vulgar' and the women were not regarded as the trustworthiest of people. We might, in passing, also note that the same held true for travellers in general. '[T]ravellers', John Millar hence observed, had a 'character and situation in literature [which] neither set themselves above the suspicion of being easily deceived, nor of endeavouring to misrepresent the facts which they have related.'[48] Fuelled by the exposure of a number of frauds, similar fears were voiced time and again of the travellers filling out the space between the known and the unknown with fabrics of their own. As it was also often explained, this was done in order to make their accounts more saleable.[49] Nevertheless, the zoological information presented in the travel accounts, just like that received from common people, was frequently made use of by the zoologists.[50]

As mentioned in Chapter 1, in recent decades, especially within studies of seventeenth-century experimental philosophy it has been argued that credibility was intimately tied to social position.[51] We saw there, furthermore, how this relation between the gentleman and the natural historian was weakened in some measure during our period, as the natural historians increasingly defined their position in terms of learning. We also saw, however, how being a gentleman still was virtually a prerequisite for being a scholar, even if being so was no longer enough, because the gentleman was still rather, much rather, to be trusted that 'the vulgar' or women for that matter. In the face of this conception of credibility as defined if not exclusively, then at least still partially in terms of social position, how was it possible within eighteenth-century zoology to allow such untrustworthy people as the vulgar and the travellers to contribute information? How could they offer credible information on animals?

47 M. Mackenzie to J. Ellis, Jan. 3, 1758, Linnean Society, London, Ellis Corr., vol.II.15.

48 J. Millar, *Observations* (1771), p. xiii.

49 For a more general discussion of the precarious relation between travellers and the truth in eighteenth-century Britain, see C. L. Batten, *Pleasurable Instructions* (1978), pp. 4ff., 38ff., 63ff., and *passim*.

50 For a more general discussion of what kind of knowledge was provided by and appropriated from travel literature, see D. Carey, 'Compiling Nature's History' (1997); P. J. Marshall and G. Williams, *The Great Map of Mankind* (1982), ch. 2.

51 P. Dear, '*Totius in verba*' (1985); S. Shapin, *A Social History of Truth* (1994).

I shall suggest, firstly, that the inclusion of these 'unlearned' people into the zoological endeavour at this level of gathering had something to do with the particular kind of facts that the zoologists were dealing with. This becomes especially clear if we compare the zoological type of facts with those of the experimental philosophers, because, in contrast to the zoologists, their type of facts would also during the eighteenth-century require a man of learning as their explicit originator in order for them to become valid as matters of fact at all.[52]

As Lorraine Daston reminds us, facts 'are protean creatures [...;] the salient properties of, say, statistical and anomalous facts differ crucially'.[53] So, I will suggest, did the salient properties of experimental facts and zoological facts differ as well. The facts of experimental philosophy were, in a fundamental sense, not given from the outset. They had to be produced in some way or another in the laboratory, often through complicated experiments which could not always be reproduced in other laboratories by other experimental philosophers, and which would, in any case, not be attempted reproduced by the vast majority of readers. There was something transient, less tangible about this kind of experimental facts. The experimental philosopher not only had to be trusted on his observation of a fact; he had also – and the importance of this is clearly evident in the detailed laboratory reports, which emerged in this period, reciting every step in the course of the experiment[54] – to be trusted on his word that his way of manipulating matter through the experiments actually revealed the facts.

In contrast, the facts of zoology were not predicated on that kind of manipulation of matter. As we shall see, although zoologists might have applied a particular gaze, their facts were of a kind which, on their own account, could be readily observed: 'The nature of things', one writer observed, 'depends on their properties, alike discernible by all who will examine them with equal care and with the same Degree of Attention.'[55] Moreover, as we have seen in the previous chapter, that kind of readily observable facts, regardless of whether one was gentle or vulgar, learned or traveller would invariably be reflected on one's mind. A common man or a traveller might distort the impressions made upon his mind's mirror when communicating them by colouring his account with his private interests or general ignorance. But as eighteenth-century men and women all alike had minds that reflected the objects of the world in the same manner, they might also simply be telling the truth. As Sprat pointed out, in some ways the vulgar might even be better observers than some of the learned men would be, since the unlearned did not have any private, philosophical schemes of their own to pursue:

If we cannot have a sufficient Choice of those that are skill'd in all *Divine* and *Humam* [sic] Things [to gather information...] it suffices, if many of them be plain, diligent, and laborious Observers: such, who though they bring

52 For an analysis of the ways such authorisation could work, see S. Schaffer, 'Self Evidence' (1994).

53 L. Daston, 'Historical Epistemology' (1994), p. 284.

54 On such laboratory reports, see P. Dear, *Discipline and Experience* (1995), pp. 13ff.; S. Shapin and S. Schaffer, *Leviathan and the Air-Pump* (1985), pp. 60f.

55 Anonymous, *Memoirs of the Revolution* (1760), p. 2.

> not much Knowledge, yet bring their Hand, and their Eyes uncorrupted: such as have not their Brains infected by false Images, and can honest assist in the *examining* and *registering* what the others represent to their View.[56]

If ideal collectors could not be found in sufficient numbers, then, one would have to do with those who were at hand: the slaves, the servants, the travellers.[57] But this was only possible within zoology, in contrast to experimental philosophy, because the facts dealt with in the latter case were of a different kind.

Secondly, the zoologists did not simply leave it at that, as is evident from the zoological books themselves. The possibility of frauds and distortions was countered by a number of strategies of critical appropriation of information that emerged in this period. To begin with, the contents of a report itself could be evaluated. By comparing a reported observation on a novel subject to the stock of knowledge already at hand, or, just as often, to one's idea of 'the common course of nature,' the truth of a proposition could in some cases be determined. Thus, Thomas Browne, for instance, related how some authors had claimed that the offspring of the bear was born 'informous and unshapen', and that it was the mother bear who after their birth 'fashioneth [them] after by licking them over'. This report, however, had to be rejected. Not only had other authors reported the bear to conceive fully-fashioned offspring; what was more, the very idea of the newborn bear as a formless bundle was also in conflict with the way nature was known to work:

> It is moreover injurious unto reason, and much impugeth the course and providence of nature, to conceive a birth should be ordained before there is a formation[.][58]

In the idea of nature's common course, two principle dimensions merged. Firstly, the idea, as is clearly indicated here, implied a normative dimension, an idea of nature as following some settled standards in her mode of producing animals that precluded the production of certain kinds of creatures (such as formless bear babies). The idea of nature's common course was, in addition, also based on a notion of normativity – it relied on ideas about what normal as opposed to abnormal among the animals actually living in the world (a one-headed snake as opposed to a two-headed snake, for instance). While the last dimension became of importance in the formation of species, as we shall see in more detail in Chapter 6, it was the first dimension which was of significance in the evaluation of second hand reports, as knowledge of nature's common standards of production could be transposed from the realm of the known to the realm of the unknown. The difficult thing with relying on such a transposition in the evaluation of reports was, however, that the zoologists did not always know all of nature's ways of working. 'I am far from thinking that the Operations of Nature should be limited by the very little that we know of them,' Davis Skene hence underscored in a letter to John Ellis:

56 T. Sprat, *The History of the Royal Society* (1667/1722), pp. 72-3; emph. in org.
57 Also cf. D. Carey, 'Compiling Nature's History' (1997).
58 T. Browne, *Pseudodoxia Epidemica* (1646), p. 116.

She may have produc'd many modes of Existence of which as yet we are entirely ignorant – but for fear of being confin'd in our way of thinking we should not run mad – Where the proofs are nearly equal, the probability I think, is always on the side of whatever is most analogous to the common course of Nature.[59]

Although knowledge of nature's common course might help to determine what were matters of facts, it did not work invariably, then. At times reports on animals defying any of nature's known standards turned out to be true. Such was the case with the giraffe, for instance, which Thomas Pennant himself had to see a stuffed specimen of in Leyden in order to believe in its existence: 'otherwise', as he admitted after having described it in his *Synopsis*, '[I] might possibly have entertained doubts in respect to the existence of so extraordinary a quadruped.'[60] Relying on nature's common course did not always suffice in evaluating zoological information.

When it was not possible for the zoologist himself to verify the existence of extraordinary creatures, more witnesses than one would sometimes do the trick. Having described how some snakes at Cape Horn would lure birds into their vicinity by charms of their eyes so that they could catch them, John Barrow, himself a traveller in South Africa but not having been lucky enough to witness such an event, assured his readers that they might believe such snakes existed as many other people had witnessed their peculiar way of catching prey:

When a fact is mentioned of so extraordinary a nature that the generality of mankind could not have observed it, individual testimony is not always of sufficient force to establish general belief. [...V]ery few of the peasantry will hesitate to vouch for the truth of it from personal observation.[61]

Likewise Henry Smeathman, describing the extraordinary 'commonwealths' of some African white ants, he had occasion to observe on a journey in Africa (and to which we shall later have occasion to return), stressed:

The sagacity of these little insects is so infinitely beyond that of any other animals I have ever heard of, that it is possible the account I have here communicated would not appear credible to many, without such vouchers and such corroborating testimony as I am fortunately able to produce, and are now before you. There are also many living witnesses in England to most of the extraordinary relations that I have given, so that I hope to have full credit for such remarks as no one but myself has properly had time and opportunities enough to make, and which are not susceptible of demonstration, except in those places where the insects are found.[62]

In the same vein, and as the most frequently used method of validating other people's claims about extraordinary animals in the zoological literature, an author might compare descriptions of the same animal in a number of sources in order to determine the matter of the fact:[63] Probability was linked to frequency.[64]

59 D. Skene to J. Ellis, Jun. 5, 1765, Linnean Society, London, Ellis Corr., vol.II.95.

60 T. Pennant, *Synopsis of Quadrupeds* (1771), p. 21.

61 J. Barrow, *An Account of Travels* (1801-04), vol. I, p. 178; the same snakes were described in Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. I, Rattle Snake (unpaged). Also here the question of the existence of these extraordinary creatures was discussed.

62 H. Smeathman, 'Some Account of the Termites' (1781), p. 140.

63 See, for instance, T. Pennant on the size of the American elk, reported by some as being more than 12 feet high, in his *Synopsis of Quadrupeds* (1771), p. 41-2. For a more general statement, see also J. Hill, *A General Natural History* (1751-58), vol. III, Preface (unpaged).

64 Cf. I. Hacking, *The Emergence of Probability* (1975).

The social standing of the reporter could, indeed, also be evaluated – and here we find that logic at play of social standing vouching for credibility, as pointed to by Dear and Shapin. Hence, Bancroft, for instance, when describing a two-headed snake (see Ill. 3.2), stressed that, 'This Serpent was a perfect monster, of whose existence I should strongly doubt, did I not think the veracity of the Gentleman, from whom I have this information, and by whom it was actually killed, unquestionable.'[65] Although non-gentle people could also be telling the truth, a gentleman was certainly more likely to do so. The accounts of gentlemen, as Sprat pointed out, 'bring with them a good Assurance of Likelihood, by the Integrity of the *Relators*'.[66]

Often, however, it was not the gentility of a man that would be foregrounded in evaluations of the credibility of a reporter, but rather the extent of his learning. Thus, to give just one example, before citing a letter at third hand, as it were, from the well-known natural historian Emanuel da Costa, in which da Costa quoted a Father Torrubia's account of the 'vegetating Wasp,' Edwards made explicit the connection between extraordinary reports and the reporter's extent of learning. Having determined Father Torrubia to be a 'man of letters,' though liable to some 'vulgar errors,' Edwards noted: 'I remark this the rather, as characters are necessary to be noted, when extraordinary phænomenons are set forth.' Except for the vulgar errors, Torrubia proved by and large to be a credible man whose report could be accepted.[67]

With regard to the accounts, a zoologist would have received from other people – whether they were gentlemen, travellers or common people – he might, then, position himself as a judge to determine the truth of a matter by reviewing the social standing of the reporter, his extent of learning, the number of witnesses, and by examining how a report tallied with his ideas of the regular working of nature.[68]

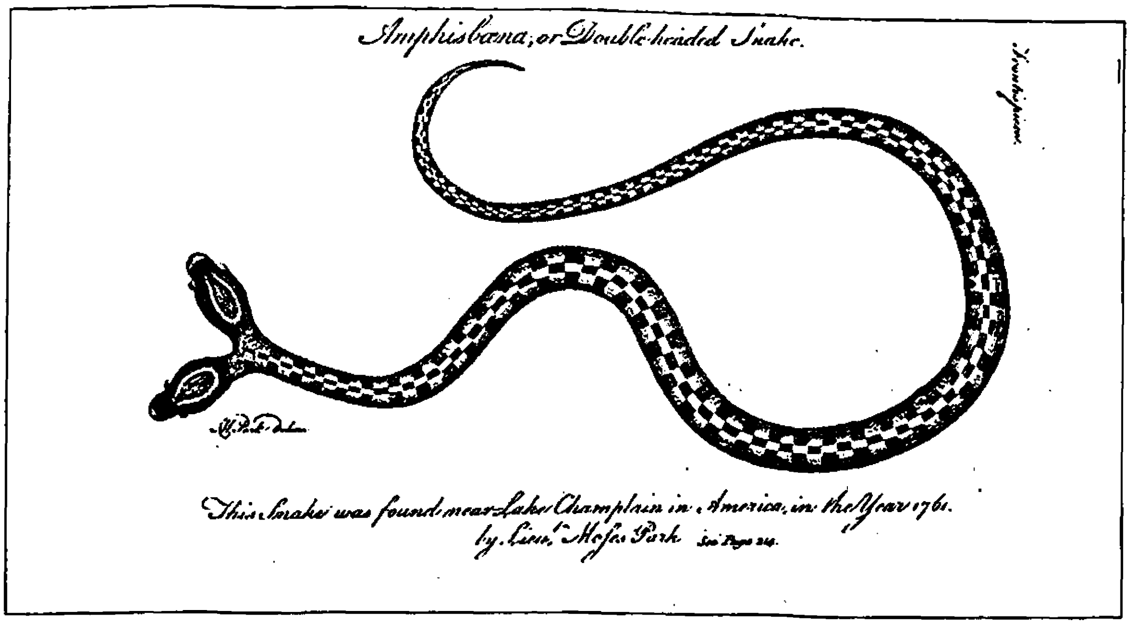
It is noteworthy, however, that in the overwhelming number of cases, a report would *not* be accompanied by any evaluation at all in the zoological literature. The further out of the ordinary a second hand description appeared to be, the more likely it was to be explicitly evaluated in the zoological works. Although social standing and the reporter's extent of learning certainly played its role, the idea of the 'ordinary course of nature' became the most important criteria for deciding whether a report needed an evaluation at all in order to be accepted as a matter of fact or not. In conjunction with the idea of natural phenomena invariably imprinting themselves alike on all men's minds, I will suggest that this allowed for

65 E. Bancroft, *An Essay on the Natural History of Guiana* (1769), p. 215.

66 T. Sprat, *The History of the Royal Society* (1667/1722), p. 195; emph. in org.

67 G. Edwards, *Gleanings of Natural History* (1758-64), vol. IV, pp. 265-6. This evaluation is, in fact, a direct quote from da Costa's letter to Edwards, E. da Costa to G. Edwards, Mar. 5, 1761, British Library, Add. 28,536, f.250.

68 See S. Shapin, *A Social History of Truth* (1994), pp. 211ff., for a more thorough discussion of the evaluation of testimonies.




Ill. 3.2 A TWO-HEADED SNAKE (E. Bancroft, *An Essay on the Natural History of Guiana*, 1769). Natural historians often doubted reports on monstrous animals, like this two-headed snake, which disobeyed the 'common course of nature' with their extra limbs, and consequently, authors often took elaborate precautions in order to warrant the truth of their accounts. To authorise the existence of this snake, the traveller, E. Bancroft, stressed both in the text and on the engraving that a man who could be trusted on his word, the Lieutenant Moses Park, had observed it.

the much more generous inclusion of information from women and people of a the lower echelons within zoology than was possible in experimental philosophy.

## The Social Division of Labour

Even though the ideal collector might have been a male of some social standing,[69] – a melange of people from all ranks of society were, then, in practice incorporated into the compilation of material for zoology. This 'promiscuous'[70] incorporation did not, however, mean that everyone took part in the enterprise on an equal footing. While contributions of gentlefolk, both women and more often men, would be acknowledged in the printed accounts, as noted above, the contributions of the vulgar would most often only leave faint traces. Frequently their work would only be acknowledged by implication in statements such as 'I had procured...', 'I was informed ...'.

The vulgar collector and the gentle collector tended to play asymmetrical roles in the accounts of the gathering of specimens, then. The vulgar were, to the extent that they were mentioned at all, generally portrayed as mere vehicles for the conveyance of animals from the field to the zoologist. Gilbert White's explanation in a letter, for instance, of the way some locks came into his possession is typical in this respect: 'I sent a Servant over to that town [Ambresbury], & procured several living specimens of locks, which he brought safe & brisk in a glass-decanter.'[71] As the initiator White, like the other zoologists, tended to be represented as the active whereas the vulgar would be portrayed as merely passive instruments for the bringing about of animals.

This division of roles was underscored in the published accounts by a tendency to highlight the more heroic moments, not least of hunting, of the writer's own involvement in the gathering of specimens. William Paterson, for instance, recounted of all the hardships that a naturalist had to go through in order to collect in South Africa. He described how he had had to cross trackless land of stony desert, filled with deadly, venomous snakes and scorpions in order to be finally able to shoot a camelopardalis, a giraffe that is, 'a beast so little known to the

69 In a letter to Lord Lyttleton Pennant suggested that the clergy in particular would be suited for this task in Britain, since they were well dispersed throughout the country, and presumably would know their parish well. T. Pennant to Lord Lyttleton, Jun. 28, 1768, British Library, Stowe 754, f.247. Pennant restated this call for clergymen, and in addition 'Gentlemen' of all sorts, to collect in a manual of queries in conclusion to his *A Tour in Scotland* (1772). He listed 27 questions here 'with a View of exiting them to favour the World with a fuller and more satisfactory Account of their County'. The questions covered everything from the location of bridges and burial places over interesting pictures in the houses of gentlemen to the natural and civil history of the county. Ibid., pp. 302-13.

70 As Daniel Carey has termed it in a discussion of the inclusion of travellers' accounts into the stock of material the Royal Society found it legitimate to work on, around 1700, D. Carey, 'Compiling Nature's History' (1997).

71 G. White to T. Pennant, Jul. 25, 1768, British Library, Add. 35,138, f. 15.

Europeans'.[72] In India, Charles Ives not only had to arm himself with patience, but had also to overcome the superstitions of his vulgar palanquin bearers in order to get within shooting range of a specimen of 'an extraordinary species of birds' outside Calcutta (the Hindu bearers believed, according to Ives, that the birds were possessed by Brahmin souls, and were hence, reluctant to assist him in this endeavour). After several attempts, when he finally succeeded, the event was narrated in detail.[73] Finally, regarding Sir Joseph Banks, White rhetorically asked at a time when he had disturbing intelligence about the first voyage of Captain Cook, if it would not have been better if Banks had sent 'a proxy' on the tour, but answered himself: 'But then he would have foregone the honour & praise due to such a disinterested hazarding of his life.'[74]

For their part, the vulgar not only brought physical specimens, but also provided information about animals, though also in this respect their position as originators of such information remained only faintly visible in the published accounts. Paterson used the names by which some animals and animal poisons were 'distinguished in their native regions' at the Cape of Good Hope to designate these objects;[75] so did the traveller in Barbary, Thomas Shaw, and, moreover, he occasionally intimated that he had obtained further information about the animals from the natives.[76] Bancroft, who as we saw was having snakes procured in Guiana for a glass of rum, made the relationship with the natives more transparent as he at one and the same time made use of the information provided by them, and put them in their place. In his book he noted that, 'To have the names and properties of these Snakes, I have recurred to the assistance of the *Indians*'.[77] Rather than in the same place telling the public what he had learned from the Indians, however, Bancroft went on to recount some of the 'fables' – of innocent snakes being poisonous to the highest degree, for instance – which the Indians had also told him:

> I am on these occasions, entertained by these people with many fables, which are so absurd, that I am in no danger of being deceived by them. But the vulgar, in all nations, are exposed to errors, and the *Indians* are all vulgar.[78]

By portraying the Indians as vulgar and as such 'exposed to errors' rather than straightaway reporting their 'useful' information, the zoological information was partly disassociated from its point of origin, the Indians. Thus, when recounting the names and properties of the snakes, although the Indian names were mentioned, the description was kept in third person, singular,

72 W. Paterson, *A Narrative of Four Journeys* (1789), pp. 167f., 124ff.

73 E. Ives, *A Voyage* (1773), pp. 183-4.

74 G. White to T. Pennant, Nov. 28, 1768, British Library, add 35,138, f.21. It was, indeed, dangerous to go abroad collecting, as Sverker Sörlin highlights in his portrayal of all the young men who died abroad, collecting specimens for Carl von Linné, S. Sörling, 'Offer for en samler' (1993). Thanks are due to Kirsten Marie Raahauge for sending me this disturbing article.

75 W. Paterson, *A Narrative of Four Journeys* (1789), pp. 161ff.

76 T. Shaw, *Travels* (1738), see, for instance, p. 251, and pp. 238ff., plus idem., *A Supplement* (1746), pp. 66ff.

77 E. Bancroft, *An Essay on the Natural History of Guiana* (1769), p. 221; emph. in org.

78 Ibid., pp. 221-2; emph. in org.

impersonal: a description 'from nowhere.'[79] The information obtained from and the natural objects procured by the vulgar, though probably extensive, were ever so silently incorporated into the field of facts, indeed, almost without leaving a trace.

Although a multitude of different people were engaged in the gathering of specimens, it was the zoologist or his gentle companions, then, who were portrayed as the active agents in the published accounts, and even at times as the heroic collectors, while the vulgar were reduced to little more than mediums for the specimens' procurement. In the first place, the facts became gentlemen's facts because the zoologists in their representations appointed the vulgar an insignificant role as sheer means of procurement, if any role or place at all.

The fact that people of all echelons were more or less promiscuously included into the zoological endeavour as gatherers did not mean that the fashioning of facts was a collective affair as well, then. The common people could partake in procuring specimens and providing information, but as we have seen, it was the zoologists who, in the first place, determined what was, and what was not credible information. Moreover, as we now shall see, the zoologists did not leave it at that. In their own accounts, specimens observed at first or second hand were further refined, and thereby transformed into zoologically standardised facts.

## Standardising Animals

Collecting animals with all that implied in terms of the selection of individual specimens, of the social division of labour in the process, and of critically evaluating, or not evaluating, second hand reports constituted a crucial step in the transformation of the animals of raw nature into objects of knowledge. However, this act of collecting was in itself not enough to turn the animals into standardised working objects. Confronted with the collected specimens, the zoologists systematically highlighted some traits in the specimens in their representations, while ignoring others altogether. Hereby the specimens were turned into standardised facts of a particular kind, which were characterised by specific attributes. In this section I shall examine how this fashioning of zoological facts unfolded in practice by looking into how animals were represented in both the zoologists' written accounts and illustrations, and, furthermore, how they were authorised as matters of facts in the representations. In both writing and illustrating, the fashioning of facts was closely tied to the indigenous conception of what both writing and illustrating implied, and I shall thus, in both cases start out with some general remarks on the

79 Ibid., pp. 203ff. Not altogether unlike the servants-technicians of Boyle who carried out many of Boyle's experiments, but who were also disassociated from the knowledge they produced and made anonymous and silent in Boyle's representations, see S. Shapin, *A Social History of Truth* (1994), ch. 8. The idea of a 'perspective from nowhere' is taken from T. Nagel, *The View from Nowhere* (1986).

indigenous conception of representation before I look more closely into the modes of representing specimens.

## The Representing Potential of Language

It was a fundamental tenet of early modern language theory, marking a break with the Renaissance Adamic theories of a divine language given by the beginning of time and naming all things according to the divine will, that words, or signs, were arbitrary vis-à-vis the world.[80] As John Locke, in accordance with contemporaries, stressed, when dealing with language one had to be wary of the 'cheat of words'– of falling into the trap of believing that the relation between a word and an object of the world was natural.[81] Nothing could be more wrong. Words were, argued Locke, removed from the external world by a double separation. In the first place, words did not refer directly to the material objects of the world itself, but merely to the ideas of the mind. Moreover, the relationship between words and ideas was perfectly arbitrary:

> Thus we may conceive how *words* [...] come to be made use of by men, as the *signs of* their *ideas*; not by any natural connection, that there is between particular articulate sounds and certain ideas, for then there would be but one language amongst all men; but by a voluntary imposition, whereby such a word is made arbitrarily the mark of such an idea. The use then of words, is to be sensible marks of ideas; and the ideas they stand for, are their proper and immediate signification.[82]

Words, then, were human inventions, coined through the ages and framed by the 'customs and manners of life'.[83] The objects of the world could imprint themselves on the mind but were silent as to how they should be communicated: It was man's task to name.

Ideally, the act of naming would work through the help of a 'double conformity,' as Locke had it.[84] A double conformity which, firstly, tied the object or a collection of objects to an idea in the mind and which, secondly, tied that idea to a sign: Object-Idea, Idea-Sign. As Locke emphasised in a manuscript note to his *Essay*, it was only by virtue of such plain ties that man in his representations could begin to approach the transparent discourse of the angels.[85] It was only thus, that the world could be represented true to nature.

As Foucault points out, as the signs, ideally, served as pure representations of the external world, language emerged as a transparent medium:

> From an extreme point of view, one might say that language in the Classical era does not exist. But that it functions: its whole existence is located in its representative role, is limited precisely to that role and finally exhausts it.[86]

---

80 On the break between the Renaissance and early modern conceptions of language, see N. Hudson, *Writing and European Thought* (1994), esp. chs. 1 and 2.

81 J. Locke, *Essay* (1706/1997), p. 365/III,ii,4-5; cf. H. Aarsleff, *From Locke to Saussure* (1982), p. 43.

82 J. Locke, *Essay* (1706/1997), p. 363/III,ii,1; emph. in org.

83 Ibid., p. 387/III,v,8.

84 Ibid., p. 347/II, xxxii,8.

85 Locke quoted in H. Aarsleff, *From Locke to Saussure* (1982), p. 79; cf. J. Locke, *Essay* (1706/1997), III,x.

86 M. Foucault, *The Order of Things* (1970), p. 79.

Signification became (in principle, as I will add) unproblematic.[87]

In practice, signification might not be so unproblematic, however, and language might manifest itself and impede an angelic transparency. This became obvious not least in the seventeenth and eighteenth-century scholars' reading of Renaissance literature. 'Who can behold, without Indignation', Sprat asked with reference to Renaissance texts,

> how many Mists and Uncertainties, these species of *Tropes* and *Figures* have brought on our Knowledge? [...] And in a few Words, I dare say, that of all the Studies of Men, nothing may be sooner obtain'd, than this vicious Abundance of *Phrase*, this Trick of *Metaphor*, this Volubility of *Tongue*, which makes so great a Noise in the World.[88]

The indignation on the part of Sprat was due to the fact that figurative language confused the relationship between the sign and its object of reference as it directed the attention away from the object to language itself. John Ray also underscored this point:

> those arts [of 'polishing and adoring language'] are by wise men censured, as far inferior to the study of things, words being but the pictures of things; and to be wholly occupied about them, is to fall in love with a picture, and neglect the life; and oratory, which is the best of these arts, is but a kind of voluptuary one, like cookery, which sophisticates meats, and cheats the palate, spoiling wholesome viands, and helping unwholsome.[89]

The representative potential of the sign, then, was contingent upon its use:

> Language, like light, is a medium; and the true philosophic style, like light from a north-window, exhibits objects clearly, and distinctly, without soliciting attention to itself. In painting subjects of amusement indeed, language may gild somewhat more, and colour with the dies of fancy: but where information is of more importance, than entertainment, tho' you cannot throw too *strong* a light, you should carefully avoid a *coloured* one.[90]

The 'true philosophic style' was, of course, equal to that 'plain style' which from the seventeenth-century was championed as *the* style in relating matters of knowledge. In an oft-cited passage from the *History of the Royal Society*, by giving an account of the usage of the fellows of the Royal Society, Sprat described the ideals of the plain style:

> it has been a constant Resolution, to reject all the Amplifications, Digressions, and Swellings of Style; to return back to the primitive Purity and Shortness, when Men deliver'd so many *Things*, almost in an equal Number of *Words*. They have exacted from all their Members a close, naked, natural way of Speaking; positive Expressions, clear Senses; a native Easiness; bringing all things as near the mathematical Plainness as they can; and preferring the Language of Artizans, Countrymen, and Merchants, before that of Wits, or Scholars.[91]

The philosophic style, then, was that in which the words depicted the world as closely as possible, one to one, one by one, it was that in which the sign was safely tied to its object of reference.

We might note here that not only was the (philosophical) system of signs thereby construed as a pure system of representation; but the world was also assumed to be fundamentally 'representable.' I will suggest that this only became possible because the world, as we have seen, was conceived of as a simple assemblage of material facts with essentially quantifiable features. Nature was not only essentially perceptible but, for the same reason, also

87 Ibid., p. 66.

88 T. Sprat, *The History of the Royal Society* (1667/1722), p. 112.

89 Ray to Dr. Robinson, Dec. 1690, reprinted in W. Macgillivray, *Lives of Eminent Zoologists* (1834), p. 162.

90 W. Gilpin, *Three Essays* (1792), Essay I, p. 18; emph. in org.

91 T. Sprat, *The History of the Royal Society* (1667/1722), p. 113; emph. in org.

essentially describable: 'Natural History, like that of other Sciences, has its peculiar language, and the criterion, like that of Nature's operations, is simplicity'.[92] Although the signs were arbitrary vis-à-vis the world, one could still reproduce nature in representation by help of the double conformity. This was precisely the objective in representing specimens in zoological texts.

## Animals in Language

In practice, however, not quite every single feature of a specimen was reproduced one to on, one by one, in the zoologists' representations. Practices of selection were also at play here, as we will see. Furthermore, the 'plain style' of writing was in practice, translated into two different modes of representation, into what may be termed a 'circumstantial mode of representation,' and a 'concise mode of representation,' respectively, with each their different implications for the fashioning of facts. I shall take these two modes as my point of departure for the discussion of how zoological facts were fashioned in the following. To avoid any confusion, it must be stressed from the outset that these two different modes of representing specimens do not correspond to the different generic styles of representation in the two zoological sub-genres, as discussed in Chapter 1. Focusing in the following on how the specimens were construed through these two modes as standardised and credible working objects, the focus will be on how animals were initially brought into learned discourse, and I shall consequently leave out of focus the later reworkings of such working objects within the frame of the General Introduction or the Specialised Account. What I am after here is, in other words, not what characterised these two genres, but, in a sense, what went before both of them.

Let me start with the circumstantial mode of representation. In the introduction to his first volume on *The Natural History of Birds,* George Edwards gave some advice concerning the description of animals:

> Authors, Naturalists especially, should consult, first of all, the outward Forms of things in order farther to explain them by Descriptions and other Marks; and deliver them down to Posterity [...]. In describing natural Things nothing ought to be omitted, that is any way remarkable, and may fix and establish the Character of the thing described, so as plainly to distinguish it from all other things: This may be done without following the minute Steps of some Authors, who have wrote large Books on single Birds or Plants, for long Descriptions lead the Mind into Mazes and Confusion, and tire rather than instruct. On the other hand too brief Descriptions should be avoided; for very often these are found to consist only of such general Forms and Colourings that are common to many things of the same Genus, with the things so briefly described, which makes the Description uncertain, or rather no natural Description at all.[93]

92 E. Bancroft, *An Essay on the Natural History of Guiana* (1769), p. 118.
93 G. Edwards, *A Natural History of Birds* (1743-51), vol. I, p. xiv; emph. removed.

As Edwards later summed up, the naturalist had to keep a 'medium'[94] between an explosion of words – it is probably the Renaissance representations Edwards had in mind here – which would only confuse, and provide a too brief description which would be useless. Useless, that is with regard to zoological classification. As it is here indicated, the description of specimens was only a prelude, foreshadowing a classification at a later stage. I shall later return to what kind of classification was implied in the description, but let us first take a closer look at what was actually communicated and how it was communicated in such circumstantial descriptions.

The circumstantial description would at times, but not always, be communicated in first person singular. A typical example of such an account is to be found in a letter read at the 13th of March 1745/6 at the Royal Society.

> Being at Killeamstadt in Holland and having procured some Eels taken out of the River Maese to shew a gentleman of My Acquaintance the Circulation of the Blood in the Finny part of their Tails, He a short while afterwards surprized me by telling Me he could see the Motion of the Blood with his naked Eyes. Without the Assistance of my Microscope; this I found True upon Inspection that part of the Tail which is Connected to the Abovementioned Finny part, and which was Transparent enough In most of the Eels I examin'd to afford a View of the Phænomenon. I could observe the Blood moving from the Tail, not in A Continued Stream, as it does in the Veins, but by starts, as it were; And Taking up my microscope and Viewing it, I Discover'd a kind of a Musculus Cavus or Muscular Sac from which it proceeded, and which by Alternate contractions and Dilatations caused that Interrupted Motion I observed in the Blood.[95]

By recounting a phenomenon from an observer's point of view as here, the phenomenon were – not unlike those of the experimental philosophy[96] – tied to a particular person's discrete experience at a specific time and place, whereby, to the extent that the observer was deemed trustworthy, they gained authority as a matter of fact. As Peter Dear has observed with regard to such a strategy of representation: 'Located, explicitly or implicitly, at a precise point in space and time, the observer's reported experience of a singular phenomenon constituted his authority.'[97] It is as if the mode of representation itself communicates: 'I was there, I saw this, hence the described was there.' The objects of description were securely tied to an existence in the external world, as the 'double conformity' between sign and referent was authorised by the presence of an experiencing subject.

Quite often, however, a specimen would not be described from a first person perspective in the circumstantial mode of representation, but would be divorced from a specific person's historical act of experiencing in the description. Although the distinction is not absolutely clear cut, a clear tendency can be observed in describing animals which were relatively well-known from a third person perspective, and to describe exotic or unfamiliar animals from a first person perspective. As in the case of the evaluation of second hand information, some phenomena appear to have been too obvious or well known to need the

94 Ibid.; emph. removed.
95 W.B. to M. Folkes, Mar 13, 1745, Royal Society, London, L&P.I.466.
96 Cf. P. Dear, '*Totius in verba*' (1985), pp. 152ff.
97 Ibid., p. 159.

attestation of a trustworthy person to become facts – no author ever attested to having seen a sparrow or a common fox, for instance. Such animals could be presented as facts from a perspective from nowhere, while other usually more exotic animals needed an observer in order to become valid as matters of fact. The line of distinction between these two classes of facts was never made explicit in the representations, but it was closely linked to proximity. Like the blood in the tail of the Dutch eels, the Surinam 'frog-fish,' to give another example, described by Maria Sybilla Merian and the Dutch pharmacist and zoologist Albertus Seba as an animal which allegedly metamorphosed from fish to frog and back again to fish, was in contrast to the fox or sparrow very much in need of a trustworthy observer. As Henry Barker stated, after having cited a letter from Dr. Mounsey who had seen Seba's specimen of the frog-fish preserved in spirits in the Chamber of Rarities in St. Petersburg:

> However it must be confessed, that our Knowledge of this Animal is hitherto very imperfect. Seba's Account seems taken from common report, which we find so frequently erroneous that it is not to be credited on a Case so extraordinary; Dr Mounsey's Letter only gives us his own Opinion; and all we can collect from having seen the Animal itself, is so little Satisfactory, that it still remains very uncertain, whether, as to Form, it does or does not undergo any of the Changes imputed to it: nor can this Point I think be reasonably determined, but by careful Observations made in Surinam.[98]

The farther away, and the more out of the ordinary an object was conceived to be, the greater the need to expressly validate the fact, to author-ise the link between the sign and its object of reference by describing it from a specific perspective. The choice of perspective in the circumstantial descriptions, whether first person or third person, depended on an evaluation of the familiarity of the animal described.

Regardless of which perspective was chosen, a zoologist had to economise in his description of specimens, as everything could not be described, nor as Edwards stressed, was it desirable to have everything described. That would only confuse. Even though what was actually described differed between accounts we might note more general patterns of selectivity in the circumstantial mode of representation. All descriptions contained an account of the morphology of the animal – we saw also Edwards emphasise the importance of this above. That was the *sine qua non* of the factual description. In general, the figure, often the size and colours would be described. In addition, a number of different morphological traits were likely to receive special attention within different classes of animals. This would often include number, kind and position of teeth, kind of feet (hoofed, cloven, claw), number of toes or claws and their position in quadrupeds, and, in addition, with regard to the hoofed and cloven animals also horns or antlers or the lack of them; fins and tail and their position, teeth or lack of teeth in fishes; wings, tail, beak, the composition of feathers in birds; number and position of wings, number and position of feet, and patterns on wings in insects.

98 H. Baker to T. Birch, Apr. 17, 1760, Royal Society, London, L&P. IV.5; underlining in org.

Besides morphology, an animal's number of offspring and their way of bringing them forth would at times be described. Less frequently, an animal's 'manners' would be mentioned – for instance, whether it was a fierce or a docile animal. Regarding the beaver, for example, one would almost invariably hear about its way of building houses and manner of living in 'communities.' The nature and movement of some specimens, especially cats, would also often be described; as would the manners of apes, and most particularly the human-like manners of 'great apes.' In addition, an animal's food and their way of foraging would occasionally be commented on. At times its anatomy, or part of it, would be mentioned, and, finally, at times the usage made of an animal by the people at its native abode might be mentioned. On rare occasions extra-visual traits might also be described – the smell of the musk or the corallines, the sound of birds' song, the touch of a fur.

We might, inversely, observe what was *not*, or only very infrequently, described in the zoologists' circumstantial representations of specimens: The relation of the animal to its habitat, including the climate and vegetation of its surroundings; an animal's relation to other animals (except for the chance mentioning of its food, and at times the relation between hunter and prey); with the possible exception of insects and frogs, the different stages in an animal's life would neither be described, nor would its behavioural patterns (with the exception of the rather meek descriptions of some animals' 'manners'). Other traits generally excluded from the descriptions could easily be listed, but these will serve to make my point. The systematic selection of certain traits and the equally systematic neglecting of others in the representations, indicate a cultural framing of the facts. The animal represented as a matter of fact in the circumstantial representations was, first and foremost, a discrete, visual creature, primarily characterised by its morphological gestalt, and secondarily characterised by its anatomy, manners and habits, and in the third place characterised by the use put to it by man.

Thus the circumstantial description preconditioned certain ideas about what was essential in an animal – evidently, especially its morphology. At the same time, it also helped to construe animals as a specific kind of creature in the representations by institutionalising specific practices of selecting traits to be described. Thereby, a horizon for an explanatory space was demarcated: such descriptions of animals would be more suitable for some kinds of explanations than others.

We can specify the idea of the 'implied explanatory space' further, if we compare the circumstantial accounts with the 'concise' representation of specimens. Take, for instance, this, by no means uncommon description of the 'Silk Starling' by Peter Brown, which he had seen in the collection of Marmaduke Tunstall:

SIZE, of the common Starling.
BILL, deep orange.
HEAD, entirely of a fine pale grey; the whole plumage glossy, and of a silky look.

WINGS, black, with a single bar of white.
TAIL, black.
LEGS, of a reddish yellow.
PLACE, China.[99]

Or take this account by Pennant, which was made in his private journal while on a Grand Tour on the Continent in 1765, of that giraffe which he saw at the 'Physick Garden' in Leyden and led him believe in the existence of such 'an extraordinary animal.' The only reference to the giraffe in the journal reads as follows:[100]

The rarest [in the Physick Garden] is a Rhinocerous bird, quite entire, and a young Giraffa, – the horns of which are about two inches long, covered with hair, and on their ends is a thick tuft of hair in length two inches; it has also a short mane that runs quite to the middle of the back; in the lower jaw it has eight broad teeth: the two outmost are divided thus ꝏ

We might, at first, observe that this concise mode of representation entailed a pointed gaze. The circumstantial mode of representation also implied this, but in contrast to that, the gaze here was expertly pointed, singling out only a very few traits of the animal as worthy of description. Such a pointed gaze, as Ludwig Fleck has indicated, though in another empirical context,[101] require experience. Only a person who was familiar with eighteenth-century zoology would probably consider highlighting 'bibolated' teeth, a short mane, and two inches long horns with hair on their ends in a description of a giraffe (others might, for instance, have focused on its long neck). This exclusive selection of traits in the concise representations, in turn, points to a narrowly defined idea of what was the 'key to the essence' of such animals.[102] Within eighteenth-century zoology, that 'key' was defined to a very large extent by the prevalent modes of classification. In the concise mode of description a *definite* classification was anticipated – it was exactly as an animal with two hairy horns and eighth teeth in the lower jaw, the two outmost bibolated, that the giraffe would later be distinguished as a species in the taxonomic scheme of Pennant's *Synopsis of Quadrupeds* (to be fair, Pennant did here also mention its long neck).[103] In the concise mode, the animals were brought into discourse as facts predisposed to be classified in a very specific way.

The circumstantial mode of representation also put restrictions on the kinds of classifications that a described animal could enter into. It would be hard, for instance, if not impossible, to classify animals described in this mode according to an evolutionary, environmental or behavioural scheme. Yet, this mode of description did not anticipate any *single* classification because a much broader variety of traits would be described here, though it foreshadowed a certain *kind* of classification: the eighteenth-century taxonomy. As Daniel

99 P. Brown, *New Illustrations of Zoology* (1776), p. 48.
100 T. Pennant, *Tour on the Continent 1765* (1948), p. 156.
101 L. Fleck, *Uppkomsten* (1997), p. 94.
102 L. Daston and P. Gallison, 'The Image of Objectivity' (1992), p. 85. Daston and Gallison's remark is not made in connection with zoology, but in a discussion of the implications of selection more generally.
103 T. Pennant, *Synopsis of Quadrupeds* (1771), p. 20.

Solander indicated, though in connection with botanical descriptions rather than zoological ones, the more minutely described something was, the more general the application of the description:

> D. Solander has taken care to describe all those [botanical specimens] so minutely, that any Botanist whatsoever, may range them according to his own favourite System.[104]

Animals circumstantially described could thus be put to use in more – but by no means infinitely different – ways, than was the case with the concisely delimited ones. The circumstantially described animals entered discourse as facts with a broader application.

In sum, what the concise and the circumstantial modes of representations had in common, to sum up, was that they both tended to foreground such traits as would work to construe the animal as an almost lifeless conglomerate of mainly visual, material traits. The zoological fact was in both cases born of an experienced gaze and a 'plain style' of representation, whether it was circumstantial or concise. The experienced gaze allowed the observer to select what within the context of eighteenth-century zoology was deemed the essential traits – in the circumstantial mode, a large range of morphological, and less frequently extra-morphological traits, and in the concise mode, a much more limited selection of mainly morphological traits. The plain style allowed the zoologist to depict these one to one in his representation.

## Animals Illustrated

Words did not always suffice to capture the essential traits of an animal. In particular, some of those zoologists who had specialised also in illustrating specimens went at times so far as to claim that illustrations actually provided the reader with a better guide to nature than descriptions did. Said, for instance, Mark Catesby:

> The illuminating Natural History is so particular Essential to the perfect understanding of it, that I may aver a clearer Idea may be conceived from the Figures of Animals and Plants in their proper Colours, than from the most exact Description without them: Wherefore [sic] I have been less prolix in the Description, judging it unnecessary to tire the Reader with describing every Feather, yet I hope sufficient to distinguish them without confusion.[105]

Although Edwards in his books on birds stressed that 'the Descriptions and Figures served to explain each other',[106] nevertheless, in tune with Catesby, he pointed also out that 'real representations of animals, &c. properly delineated and coloured, are characters that all nations are taught by nature to understand; and, in many respects, good figures from nature

104 Daniel Solander, Reports and Diary, June 29, 1765, British Library, Add. 45,874.

105 M. Catesby, *The Natural History of Carolina* (1731-43), vol. I, p. xi. For a not entirely complete list of zoological illustrations in eighteenth-century England, see C. Nissen, *Die zoologische Buchillistration* (1978), vol. II, pp. 136-44.

106 G. Edwards, *A Natural History of Birds* (1743-51), vol. III, Advertisement (unpaged).

surpass the best verbal description.'[107] Such illustrations could thus even 'save such curious persons as have not leisure, the trouble of reading the descriptions.'[108]

Although there might not have been a general agreement as to the primacy of figures over descriptions within eighteenth-century zoology, there appears to have been a general appreciation of a particular communicative value of illustrations. This appreciation hinged on a conception of visual representation as imitative. J. Harris explained, contrasting pictures with words:

if *Pictures* and *Images* are all of them *Imitations*, it will follow, that whoever has natural faculties to know the Original, will by the help of the same faculties know also its Imitations. But it by no means follows, that he who knows any Being, should know for that reason its *Greek* or *Latin* name.

The Truth is, that every Medium thro' which we exhibit any thing to another's Contemplation, is either derived from *Natural Attributes*, and then it is an IMITATION; or else from *Accidents quite arbitrary*, and then it is a SYMBOL.[109]

In contrast to words, which stood in an entirely arbitrary relation to the world, pictures, then, were believed to imitate the world.

In general, the shortcomings of arbitrary words and, inversely, the advantages of imitative art became especially clear in an inability of words to capture the fine nuances of colours and the precise shapes of things:

Language is very Imperfect: There are innumerable Colours, and Figures for which we have no name, and an infinity of other Ideas which have no certain Words universally agreed upon as denoting them[.][110]

Within zoology, the lack of words became especially evident in descriptions of exotic and colourful specimens. 'The form of this Fish', as Catesby complained while describing an 'acataune' or 'angel fish,' 'is so odd and singular, that without exhibiting its figure, it would be difficult to give an idea of it by words only'.[111] For the majority of zoologists, the solution to the problem was to give both a verbal description and an engraving of the animal: The accompanying pictures not only served as ornaments – though they certainly at times also did that – but also as illuminations, which with their analogous code of representation could supplement the information on specimens given in the digitised textual accounts.

While pictorial language might be conceived as 'universal' because it was 'imitative,' naturalists were not blind to the fact that there were different ways of using this language. William Hunter pointed out two different modes of pictorial representation in relation to anatomical illustration, which appear to be just as valid for zoological illustration:[112] 'One is a simple portrait in which the object is represented exactly as it is seen'. Characteristic of this

107 G. Edwards, *Gleanings of Natural History* (1758-64), vol. II, p. x.

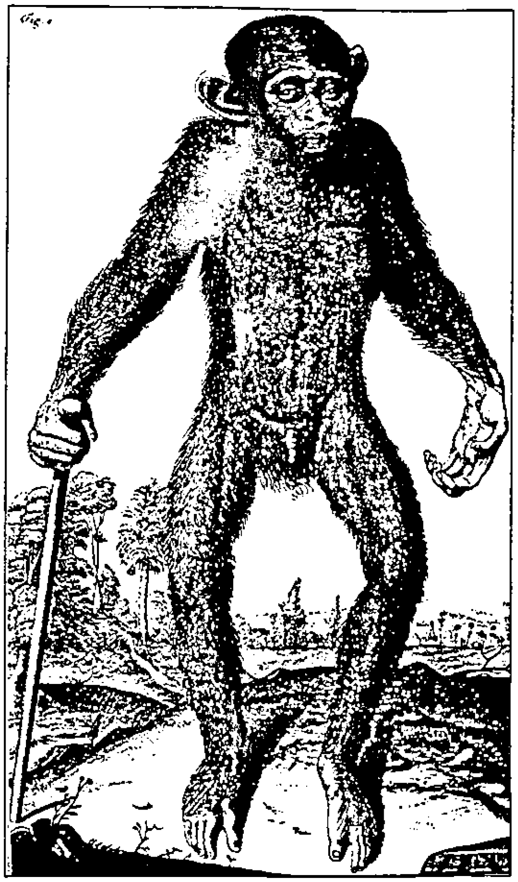
108 Ibid., vol. II, p. xi.

109 J. Harris, *Hermes* (1751), p. 330; emph. and cap. in org.

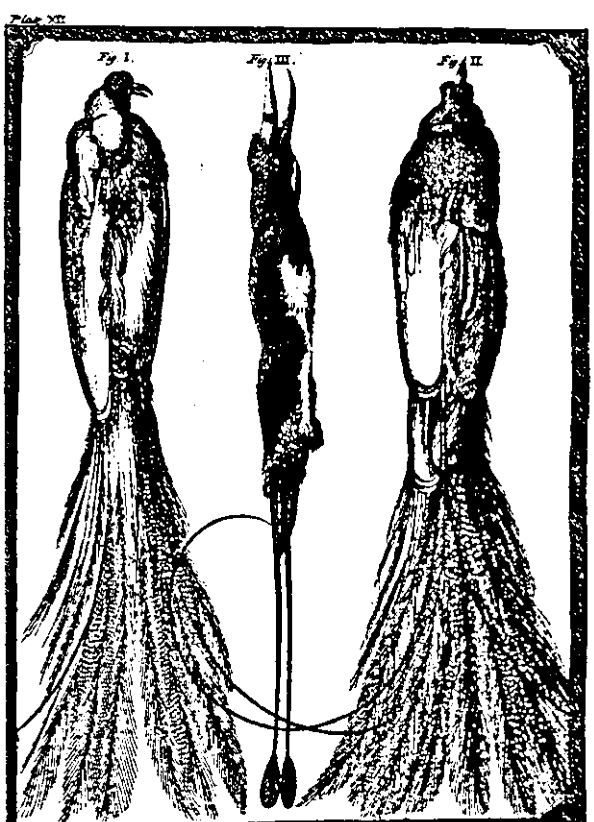
110 J. Richardson, *An Essay* (1725), p. 3.

111 M. Catesby, *The Natural History of Carolina* (1731-43), vol. II, Preface, p. 31.

112 Also L. Daston and P. Gallison, 'The Image of Objectivity' (1992), pp. 88ff., discuss these two modes of illustration.



Ill. 3.3 THE ORANG-OUTANG OR PYGMIE APE ( E. Tyson, *Orang-Outang*, 1699).



Ill. 3.4 THREE BIRDS OF PARADISE (R. Bradley, *A Philosophic Account of the Works of Nature*, 1721).

Although many illustrations were made from dead, dried and sometimes stuffed specimens, the animals would most often be depicted as alive in the zoological illustrations, like in E. Tyson's of the Pygmie Ape above. It was only rarely that the animals would be depicted as dead, like in R. Bradley's illustration below.

mode of pictorial description was that a particular object, even though 'somewhat indistinct in some parts', was depicted with all its blemishes and imperfections, one to one. The other mode of illustration, Hunter went on, 'is a representation of the object under such circumstances as were not actually seen, but conceived in the imagination'. This mode of illustration would thus 'exhibit in one view, what could only be seen in several objects.'[113] This mode, then, entailed a transcending of the particular material at hand, and thus a generalisation.

Through the first mode of illustration, the 'warts-and-all style' as I shall call it following Martin Kemp,[114] a specific specimen would be depicted without any attempt to ignore its peculiarities. Edwards described this mode of illustration within zoology *en detail* as he compared it to historical painting:

They who draw after Nature, on account of Natural History, should represent things justly and according to Nature, and not strive to exalt or raise her above herself; for by so doing, instead of instructing, they will lead the World into Errors [...]. The historical Painter, especially he that would represent the Fictions of Poets, may take greater Liberties, and study all Methods to elevate his Subject by adding the highest Strokes of Art, in order to please the Eye [...]: Yet everyone who reads Natural History, and sees Figures and Descriptions of things in Nature, supposes they are, or ought to have been immediately drawn and described from Nature. [...I]n drawing after Nature a most religious and scrupulous Strictness is to be observed, and by this means only we can demonstrate, that Nature is or is not the same through all Times.[115]

An example of such a 'warts-and-all' style is, at least in one respect, to be found in Edward Tyson's or rather in his artist's, William Cowper's, figure of a 'pygmy ape,' which Tyson dissected. As Tyson explained, the figure was not entirely true to the living ape, because the '*Figure* being made after he was dead, the *Head* seems too much fallen in between the Shoulders, as if it had a very short or little or no *Neck*', which not only took 'off from the Beauty of the *Figure*', but which also gave an inaccurate idea of the ape when alive (see Ill. 3.3 and 3.4).[116] The very short neck was reproduced, nevertheless.

However, this example of Tyson's also shows that depicting a specimen with warts-and-all did not necessarily involve depicting it as it 'really' was at the time of portraying. Tyson's ape was raised from the dead in the illustration, and placed in the middle of an agreeable landscape, though it was given a stick 'to support him,' 'weak' (dead, in fact) as he was at the time of drawing, as Tyson explained.[117] The same interpretation of the warts-and-all style was given by Edwards, and I would suggest by a host of other zoologists also.[118] Edwards explained how, when drawing birds from stuffed or dried specimens, he took care to render them alive according to their nature by getting inspiration from birds of a similar 'genus' that

113 William Hunter, *Anatomia uteri humani gravidi* (1774), Preface; quoted in M. Kemp, 'The Mark of Truth' (1993), p. 113.

114 Ibid., p. 117.

115 G. Edwards, *A Natural History of Birds* (1743-51), vol. I, p. xv.

116 E. Tyson, *Orang-Outang, sive Homo Sylvestris* (1699), p. 16, emph. in org.

117 Ibid., p. 16.

118 If we compare the illustration of an animal with the notes on the original that it was made from, it appears that the animals illustrated as alive would quite often be taken from dead specimens.

he had been able to observe alive.[119] Elsewhere, Edwards similarly told how he, 'for variety's sake' had given some birds 'as many different Turns and Attitudes as I could invent.'[120] Warts-and-all were not – especially when it came to life and death – quite all warts, then.

Even though matters such as life and death, attitude and posture, might be manipulated for the sake of variety or with a view to depicting animals alive rather than dead, the important traits of an individual specimen, its morphological features were – at least according to the illustrators themselves – not subject to 'invention,' to use Edwards' term. In this respect, the warts-and-all style entailed a basic 'anti-generalising' mode of representation, and that, I will suggest, was its distinguishing feature.

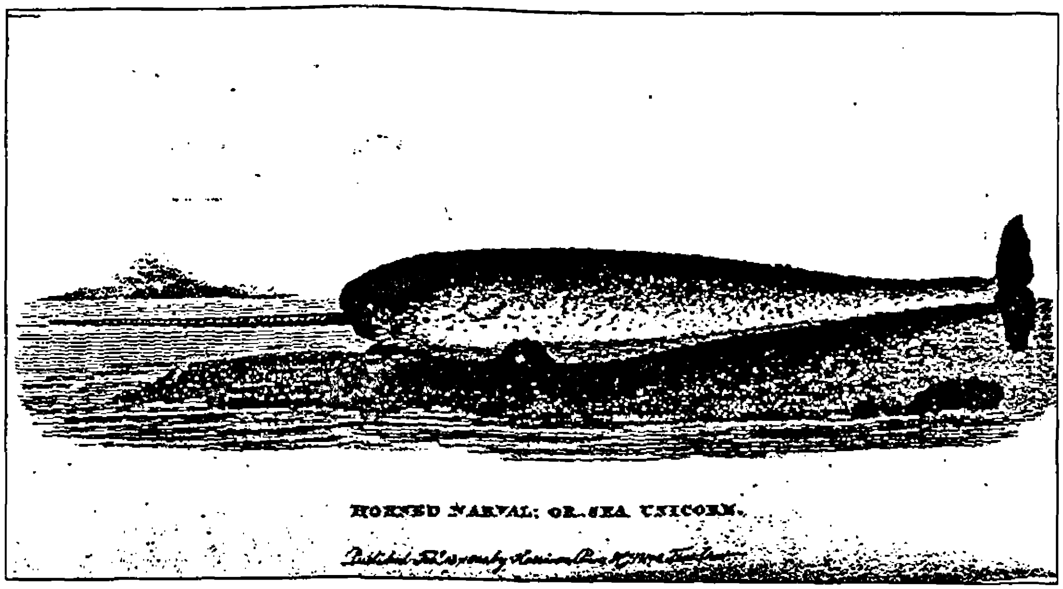
In contrast to the warts-and-all style, the second and more common mode of representation within zoology allowed for a generalisation from the level of specimen to the level of species. As the imagination was put to work in making a fusion of 'what could only be seen in several objects' in one depiction, the typical specimen came into being which could be posited as a representative of a species. Most often the zoologists did not comment on this transition from the specimen to the species in the illustration. Usually, it was only made apparent in the text accompanying the picture, as the animal illustrated would be presented as a species (see Ill. 3.5, 3.6). This mode of illustration was thereby generalising, often silently making the move from the level of specimen to the level of species, and, hence, in the very act of illustrating, introducing the species as a fact.

Regardless of which style was chosen, the animal would often be depicted in some kind of setting – often just a scene of nature, but at times also in a landscape with houses or artefacts. Some authors, like Catesby, emphasised how they had taken care to place the animals in some kind of environment which was true to nature: 'where it would admit of', as Catesby states in the introduction, 'I have adapted the Birds to those Plants on which they fed or have any relation to.'[121] We find other authors following suit, such as the author of *Naturalist's Pocket Magazine* who had a 'sea unicorn,' which he had seen as a stuffed specimen at the Mecklenburgh coffee-house at Charing Cross, placed on a small sand bank at sea in the illustration (Ill. 3.6, see also Ill. 3.7).[122] An animals' place of origin would, moreover, at times also be communicated by means of some iconographically recognisable building in the background – a mosque for Arabia, a hut for Africa etc. (Ill. 3.8).

Somehow making an animal's place of origin explicit in the illustration did, however, not become widespread, nor, indeed, did it become a more generally voiced requirement, until

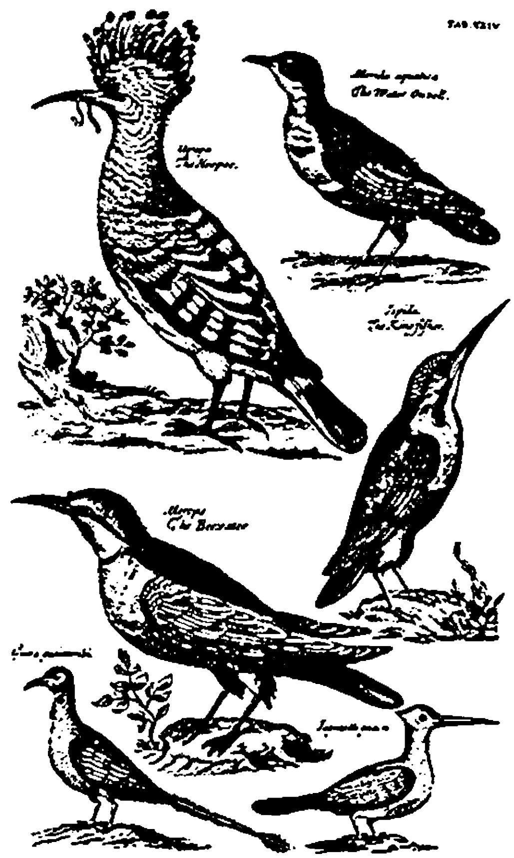
119 G. Edwards, *A Natural History of Birds* (1743-51), vol. II, pp. 111-3.
120 Ibid., vol. I, p. xix.
121 M. Catesby, *The Natural History of Carolina* (1731-43), vol. I, p. xi.
122 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. V, (unpaged).


Ill. 3.5 THE ZEBRA, THE AMERICAN FOX, THE CARIBOU AND THE CARCAJOU ( R. Brookes, *A New and Accurate System*, vol. I, 1763-72).

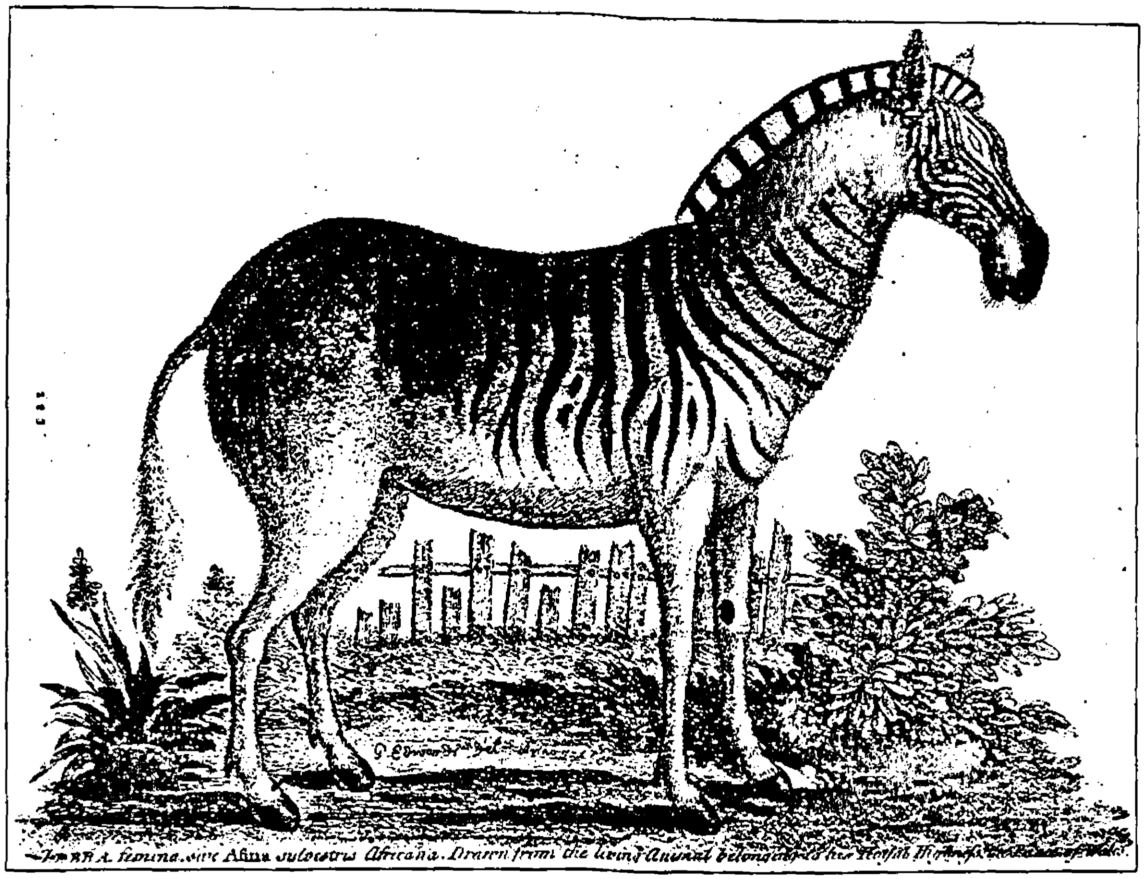


Ill. 3.6 HORNED NARVAL; OR SEA UNICORN (Anonymous, *Naturalist's Pocket Magazine*, vol. V, 1799-1802). In both these illustrations, a generalising mode of representation was employed, whereby the animals depicted were presented as representatives of the species as such.

Ill. 3.7 THE VIRGINIAN OPOSSUM (G. Shaw, *Museum Leveriani explicato*, 1792). Like the 'sea unicorn' in Ill. 3.6, also the family of Virginian opossums in this illustration were placed in a 'natural setting.' Towards the end of the eighteenth century, it became increasingly more common to use the backgrounds in zoological illustrations to communicate something about the geographical place of origin of a species.

Ill. 3.8 (left) THE OSTRICH AND THE CASSOWARY (F. Willughby and J. Ray, *The Ornithology*, 1678/1972). Ill. 3.9 (right) THE WATER OUZELL, THE HOOPOE, THE KINGFISHER, THE BEE-EATER, THE GUIRA GUIAI-NUMBI, AND THE IAGUACATI GUACU (F. Willughby and J. Ray, *The Ornithology*, 1678/1972). At times, an animal's place of origin would be communicated by an iconographically recognisable building in the background, like the pyramid signalling Egypt behind the ostrich and the cassowary in the illustration to the left. Characteristically, however, this was the only one plate out of 78 in Willughby and Ray's book where the place of origin was communicated in the illustration. Usually, animals would stand alone, as in the illustration to the right.



Ill. 3.10 THE ZEBRA (G. Edwards, *Gleanings of Natural History*, vol. I, 1758-64). For the better part of the eighteenth century, in the more lavishly illustrated zoological books, it was not unusual, as in this illustration, to see an animal placed in an invented, but agreeable landscape. Backgrounds, the illustrator G. Edwards claimed in the middle of the century, did not form a part of the zoological illustration proper; only the animals did. According to Edwards, the sole function of the backgrounds was to please the viewer with their variety.

the end of the eighteenth century.[123] For the better part of our period, an animal would either not be placed in any setting at all (Ill. 3.9, see also 3.5), or else, it would be placed in a landscape which did not bear any resemblance in the least to its native abode, and which, it appears, was not intended to do so either (Ill. 3.10). As Edwards observed regarding the backgrounds in his engravings:

> I observed [in the illustrations by another animal illustrator] in his Trees, Stumps, and Grounds, a poorness [sic] of Invention; therefore to amend that Part in mine, I have taken the Counsel and Assistance of some Painters my particular Friends, in order to make the Work not only as natural and agreeable as I could in the subject Matter, but to decorate the Birds with airy Grounds, having some little Invention in them: The better to set off the whole, I have in a few Plates, where the Birds were very small, added some foreign Insects to fill up the naked Spaces in the Plates; these I esteem to be no part of the proposed Work[.][124]

There were foregrounds and backgrounds, subject matter and foreign matter, then. Although an animal might be placed in some kind of natural setting, this was by no means a requirement for a zoological illustration for the better part of the eighteenth-century. An animal could just as easily, and would indeed much more commonly, be placed in an agreeable setting provided by art, and the representation would still be regarded as true to nature. With the zoological specimen defined as a principally morphological being, and with this definition reinforced alike through both these modes of pictorial representation, the background became zoologically insignificant. It could just as well be filled out by delightful inventions.

In the illustrations, then, the animals were even more thoroughly construed as generally detached, morphological creatures, than in the textual representation. Regardless of whether they were represented as specimens in the warts-and-all style, or as representatives of species in the generalising style, it was their colours and shapes that were brought into focus. Although their relationship with their place of origin might be communicated occasionally, the animals were more likely to stand alone in the illustrations, or, what amounted to the same thing, be placed in an imagined, but agreeable setting.

## Compiling Zoology's Natural History

In exegetical theory, to recapitulate, facts were indisputable nuggets of experience, matters in the world that could be observed and transparently represented, one to one. In practice, it took more than just observation to compile zoological facts – it took collecting, validating, selecting, and specific modes of representation. As I have argued in this chapter, these practices added in crucial ways to the construction of facts: The process of collecting not only, trivially, brought the animals from the field to the hands of the zoologists, but also helped to distinguish the

123 Cf. B. S. Smith, *European Vision and the South Pacific* (1960), ch. 1.
124 G. Edwards, *A Natural History of Birds* (1743-51), vol. I, p. xix.

zoologist within the broader social context of people involved in the collecting of animals. The practices of validating, both in terms of critical appropriation of reports, and in terms of representational strategies of authorising information, worked to turn observations, and especially those of more uncommon animals, into what facts in theory was preconditioned always to be: *credible* nuggets of experience. The practices of selection and representation added to the constitution of facts by subtraction: By selecting some animals, over others, and by highlighting some traits in representation, and not others, specimens were standardised and turned into working objects proper to zoology.

Through this process, raw nature was transformed into a particular standardised type of facts. By singling out principally morphological features in both pictorial and written representation, and, at the same time, by severing the animals from their place of origin, the specimens were, in practice, construed as discrete and detached morphological creatures. As such, on one hand, they put limits on the kind of explanations that they could be put to. At the same time, the explanations prevalent in eighteenth-century zoology, on the other hand, also put limits to the way animals were construed as zoological facts. As we have seen, the general explanatory context – the taxonomic system (be that one's own, or taxonomic schemes in general) – would inform the process of selection of traits to be represented, and thereby the fashioning of facts.

In practice, then, there was more involved in the construction of zoological facts than simply an empty mind mirroring nature and a transparent representation, which brought nature's productions into discourse one by one, one to one. Theories about what was interesting and meaningful to know about nature, and ideas about which traits were of key significance to explain it, were implicated in the very construction of working objects for zoology. There was, then, also much more to 'observing nature' than a mere encounter with animals in the bosom of nature, returning to the problematique touched upon in the introduction to this chapter. Indeed, these practices of transforming raw nature into zoological facts helped to shape the semantics of the categories of 'observing' and 'nature' in crucial ways.

Compiling zoological facts involved, as we have seen, a collective effort, but not everyone was included in this enterprise on an equal footing: 'some must gather, some must bring, some separate, some examine', as Sprat observed:

> and to use a similitude [...] it is in *Philosophy*, as in *Husbandry*; wherein we see, that a few Hands will serve to measure out, and fill into Sacks, that Corn, which requires very many more Labourers, to sow, and reap, and bind, and bring into the barn.[125]

Although some of the information received by the zoologist in the barn would be critically evaluated by the zoologist turned judge, quite a lot of the information would not be evaluated at all. This relatively easy incorporation into zoological works of a host of information obtained

125 T. Sprat, *The History of the Royal Society* (1667/1722), pp. 20-1; emph. in org.

second-hand, to return to indigenous linguistics, took the working of the 'double conformity' – the tying of an impression of an object to an idea to a sign – in the representation of such information for granted. According to James Beattie:

> When we believe the declaration of an honest man, in regard to facts of which he has had experience, we suppose, that by the view or perception of those facts, his senses have been affected in the same manner as ours would have been, if we had been in his place. So that faith in testimony is in part resolvable into that conviction which is produced by the evidence of sense; at least, if we did not believe our senses, we could not, without absurdity, believe testimony; if we have any tendency to doubt the evidence of sense, we must, in regard to testimony, be equally sceptical.[126]

When the reports of other people on animals were accepted uncritically, the double conformity of the reporter's representation was, in effect, simply reaffirmed by being doubled in the re-representation: Object1-Idea1 Idea1-Sign1, Sign1-Idea2 Idea2-Sign2. For all practical purposes, Sign2 came to represent Object1. In the credible second hand accounts, the zoologist would consequently, as Chambers explained, be observing nature itself 'by proxy':

> By means of language our ideas and notices, though things in their own nature merely personal, and adapted only to private use, are extended to others, to improve their stock. And thus, by a kind of second sense, a man gets perceptions of the objects that are perceived by all mankind; and is present, as it were by proxy, to things at all distances from him: we hear sounds made a thousand years ago, and see things that pass a thousand miles off. If the eagle really sees, the raven smell, and the hare hears, farther and better than man; their sense, at best, is but narrow, in comparison with ours, which is extended, by the artifice of language, over the whole globe. They see with their own eyes only; we with those of a whole species. – In effect, by language, we are upon much the same footing, in respect to knowledge, as if each individual had the natural sense of a thousand: an accession, which, alone, must have set us far above any other animals.[127]

Thanks to language, then, animals could be observed at a distance.[128] Ironically, the reading of books hereby was also rehabilitated (and even Renaissance books could be plundered for information as well). 'By whim the world in all its view is shown,/Our guide through Nature's work, and in our own,' George Crabbe hence stated in praise of natural history books,

> These are thy volumes; and in these we look,
> As abstracts drawn from Nature's larger book[129]

To the extent that they complied with the common course of nature and were plain, other people's representations of animals were far from seen, in practice, as obstacles to learning, but rather approached and used as descriptions of the world which read as observations.

It was, however, not only the possibility of observing by proxy that made it possible for the zoologist to observe animals away from the bosom of nature. A certain idea about the nature of animals was also involved. By defining an animal as an ensemble of basically observable and hence, representable traits, among which none or only some more insignificant concerned the relation to its habitat, the animal was made, essentially, transferable. Its

---

126 J. Beattie, *Essays* (1776), p. 113-4.

127 E. Chambers, *Cyclopædia* (1741), vol. I, p. viii.

128 This idea of observing by proxy should be compared to the mode of 'virtual witnessing' experiments within experimental philosophy, S. Shapin and S. Schaffer, *Leviathan and the Air-Pump* (1985), p. 60.

129 G. Crabbe, *The Library* (1788), p. 11.

principal nature did not depend on its relation to its place of origin, but it was rather incarnated in the animal-as-an-ensemble-of-morphological-traits itself. As a zoological fact the animal could, indeed should, stand alone. Sometimes it might be more convenient to observe an animal alive – so that, for instance, its natural posture could be studied and reproduced in an illustration. Sometimes it might be more convenient to have observations on extra-morphological traits of an animal, especially, as we will see in Chapter 6, to determine differences between some species and varieties. However, such traits were not a *sine qua non* of the zoological fact. With the *sine qua non* defined as the animal's morphology, in general animals could fairly easily be conveyed in some form or another – alive, dead, and maybe dried and stuffed, represented in words or pictures – from the field to the study without losing any crucial meaning. It was this idea of the animals as essentially transferable, because defined primarily by their morphological traits, then, which made it possible to bring 'nature' into the study of the zoologists, or, as we shall see in the following chapter, into a variety of other places, where the zoologists could also observe and describe them 'from nature.'

Chapter 4

# The Social Life of Animals

So, nature's animals could be transformed into facts of natural history – lifeless, detached, moveable – by a series of hands, eyes and pens which worked together in introduce the animals into the social world. For the specimens to be actually put to use in zoological studies, however, the individual zoologists had to somehow and somewhere encounter the specimens. In a very basic and even trivial sense, the animals had to be encountered by a zoologist, before they could be incorporated into a zoological work. So far I have taken the trajectories of animals from the field to the study for granted, merely noting that it was relatively easy to move animals, in some form or another, and possible to observe them at a distance. Often, however, the animals did not arrive directly at a zoologist's study, but travelled to a host of other places where the zoologist would have to go in order to encounter them. It is time to take a closer look at the impact of the sites of encounter on the animals and the way in which the zoologists received them.

Within contemporary experimental philosophy, the production of knowledge was to a very large extent limited to one location – the laboratory, even if the exact definition of that space remained intricate.[1] In the laboratory, the production of facts coalesced with their study, even if a certain division of labour was found in the laboratory between the servants or assistants who often operated the laboratory equipment, and the scholars who made the philosophical conclusions on the basis of the facts thus produced.[2] Within zoology, there did not exist any analogous single and relatively clearly defined location in which specimens, in one form or another, could both be encountered and studied. The trajectories of some animals were, indeed, fairly direct from the field to the study, as we have seen in some examples in the previous chapter: as when a servant was sent into the field to collect mice, an acquaintance

1 S. Shapin, 'The House of Experiment' (1988); O. Hannaway, 'Laboratory Design' (1986).
2 S. Shapin, *A Social History of Truth* (1994), ch. 8.

abroad sent descriptions home to a zoologist-friend, or the zoologist himself went into the field. But in many cases, the animals' way to the zoologists would be much more complicated, and the places of encounter far transcend the zoologist's study. The zoologist would hence, encounter animals, which would be incorporated into his work, not only in letters circulating in the Republic of Letters, but also in connoisseurs' cabinets and in public museums; in fur shops in London's East End and retail stores with exotic animals at the Tower Dock, at freak shows at market places, and in taverns and coffee-houses. Obviously, with the exception of the Republic of Letters, at most of these locations the animals would not be introduced into the social world as objects of knowledge, but they could be converted into facts and used by the zoologists, nonetheless. Even those animals which were introduced into discourse as matters of fact from the beginning, circulated through different routes in the social world of the learned, before they would finally be made use of in a study. The animals, in one form or another, went round and around in the social world of the eighteenth century, being put to different uses, being incorporated into different kinds of displays, and somewhere along their trajectories, the zoologist would encounter them, use them for his purposes, and often let the merry-go-round continue. Using a metaphor introduced by Arjun Appadurai in a study of commodities, we could say that the animals got 'a social life' of their own.[3] As the animals travelled around in the social world and were displayed in different contexts, different kinds of meanings were inscribed on them, and hence they would, in a sense, emerge as different kinds of creatures.

As Steven Shapin has argued, the location of the production of knowledge has implications for what kind of knowledge is produced.[4] Within different social contexts, or 'spheres' as I shall be call them in the following, practices were institutionalised in partly different ways; different social spheres – such as the private cabinet, the public freak show, or the Republic of Letters – were organised differently, instituting different sets of norms and forms of conduct. Moreover, the animals were used for various purposes within the different spheres, and hence, they were conceptualised in widely differing ways. The social spheres, consequently, framed not only the conceptualisation of animals, but also the different kinds of activities that took place within their realm.

With the exception of the Republic of Letters and a few museums, none of the social spheres in which the zoologists would encounter animals were exclusively dedicated to learning. In the private cabinets, the public museums, the coffee houses, and at the freak shows, the zoologists entered social spheres which were framed by extra-zoological concerns, in which the zoologists had to conform to the social conventions at play there in order to gain access to the animals, and, finally, in which the zoologists shared space with a variety of non-

3 A. Appadurai, 'Introduction' (1986).

4 S. Shapin, 'The House of Experiment' (1988), pp. 373-5. See also A. Ophir and S. Shapin, 'The Place of Knowledge' (1991) for a more general discussion of space and knowledge production.

zoologists, from the vulgar at the freak shows to the noble connoisseur in the private cabinets. Even the Republic of Letters and those few museums, which were directed solely towards learning, were not entirely autonomous institutions of learning either. As we will see, the norms and forms guiding the social interaction in these places were drawn to a large extent from Polite Society. As there was no professional zoologist, neither was there, then, a single location dedicated solely to the study of zoology. The social spheres the zoologists moved in as zoologists were multifarious; their ways of actually encountering animals intricate.

It is to an analysis of these spheres and their implications for the zoologist's study of animals that the present chapter will be devoted. In the following quite a few of the places, where animals would also be encountered in some form or another in the eighteenth century will left out of view – the stable, the kitchen, the dinner table, for example – as none of these places played any role or – as with the breeding of animals in the stable – only an insignificant role in the zoological literature.[5] Instead, the emphasis will be placed on the places where the animals gained a social life of interest to the zoologists. Starting with the Republic of Letters, we shall move on to an analysis of the private cabinet and the public museum, and then consider the freak shows, coffee houses, and different kinds of shops in which animals were also encountered. Although the zoologists – again with the exception of the Republic of Letters – most often shared the space of encounter with many different kinds of people, this did not mean that they took the same stance vis-à-vis the animals as the non-learned. Following the zoologist as he moved between the different locations of display will, hence, on one hand, allow us to elucidate his means of appropriating the animals as he turned them into matters of fact, and thereby, to further specify the construction of zoological facts. At the same time, enquiring into how the zoologist positioned himself vis-à-vis the other people taking other kinds of interest in the animals at these sites will, on the other hand, make it possible to situate this construction and the zoologist himself within the wider social world. It will hence, finally, allow us to encircle what was conceived to be particularly zoological, or learned, about both the zoological fact, and the zoologist's position in the construction of such facts.

## Animals in the Republic of Letters

Letters appears, in conjunction with books, to have been the zoologists' main source of information about animals. In almost every single letter between naturalists – and their correspondence were usually extensive, as indicated in the previous chapter – some kind of information was offered, some kind of acknowledgements were given for information

5 Others have dealt with animals in such places. See especially, K. Thomas, *Man and the Natural World* (1983).

previously received, and in the packages, occasionally accompanying the letters, preserved specimens were sent around in Britain. The network of correspondents constituted 'the vital sinews' of eighteenth-century natural history, as David E. Allen has observed.[6] It was one of the most important means through which the animals travelled around.

The trajectories of animals in the Republic of Letters were usually quite mundane, if at times intricate. An 'inquilinus moth,' for instance, was taken towards the end of July 1779 in Bunhill Fields, London, by a gentleman, who communicated it to a Mr. Ellis, Mr. Ellis in turn sent it to Mr. Francillon, a renowned collector, who incorporated it into his collection, from where the entomologist Moses Harries was allowed to take a drawing and description, which again was used as the basis for the description in *The Naturalist's Pocket Magazine*.[7] A 'spotted tringa' and a 'pine-creeper' were sent to George Edwards as preserved specimens from Mr. William Bartram of Pennsylvania, who appears to have been a keen hunter of American animals for various friends in Britain.[8] As was Mr. Aston Blackburne, who 'with indefatigable industry and great judgement, annually enriches the cabinets of his friends with the rarest natural productions' of North America. Among these was a 'wolverene' that Pennant had received.[9] In July 1770, from that young man in Gibraltar, whom Gilbert White had 'urged to take up the study of Nature a little', White received a box of Spanish curiosities – Iberian birds, fishes, and insects – some of which were forwarded to Pennant, who also received, among other things, a falcon and some non-descript mice from White at Selborne.[10] The mice were later incorporated into the second edition of Pennant's *British Zoology* as the 'less long tailed field mouse'.[11] More spectacularly, a parcel of birds from Terra Firma considered 'so very rare' that one of the greatest authorities on ornithology in the eighteenth century, George Edwards, could not 'recollect ever to have seen a single bird of them,' fell into the hands of the said ornithologist. Originally intended for Madame Pompadour, the parcel was taken by an English ship of war from a French merchant ship and communicated to Edwards by the commander of the English ship, Captain Shirley, later Earl Ferrers.[12] And so on and so forth – the animals went round and round in the Republic of Letters, providing zoologists with their essential means for study: Facts.

6 D. E. Allen, *Naturalist in Britain* (1994), p. 17.
7 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), Inquilinus Moth (unpaged).
8 G. Edwards, *Gleanings of Natural History* (1758-64), vol. II, pp. 139-42.
9 T. Pennant, *Synopsis of Quadrupeds* (1771), p. 196.
10 G. White to T. Pennant, Mar. 14, 1768, and Jul. 12, 1770, British Library, Add. 35,138, ff.9, and Aug. 1, 1770, ibid. ff.37, 39.
11 T. Pennant, *British Zoology* (1768-77), vol. II, p. 498.
12 G. Edwards, *Gleanings of Natural History* (1758-64), vol. III, Dedication (unpaged); G. Edwards to Lord Willoughby, May 10, 1759, Royal Society, London, L&P.III.383. For examples of other trajectories of animals, almost exclusively from the seventeenth-century, see W. George, 'Alive or Dead' (1985), pp. 183ff.

The animals did not get around by themselves, of course. The circulation of animals within the Republic of Letters was mediated by a set of social practices. To understand the circulation, it might be useful to take a closer look at the Republic of Letters itself.[13] The Republic of Letters was an amorphous institution without any clearly defined beginning or end. It neither had any explicitly defined rules for entering, nor any official requirements of admission. It had tacit ones, though. To enter, one had to commence correspondence with someone who was already a participant, and that would often be someone with whom one had some acquaintance. This person could then act as a broker for the novice, introducing him to other correspondents, whereby his network of correspondents would gradually evolve. Not only the novice needed a broker, however. Even scholars who were well established within the Republic of Letters would most often use a broker to make the necessary introductions to new correspondents. Hence, Dr. Peter Canvane, for instance, introduced Emanuel da Costa to Dr. Limbourgh in Achen;[14] John Ellis introduced Thomas Pennant to Dr. Hope and Dr. Skene,[15] and Ellis also introduced Dr. Skene to Carl von Linné, with whom Ellis had been corresponding for some time.[16]

The first letters exchanged would as a rule be very polite, epitomising the, within Polite Society, cherished art of letter writing.[17] The sender would position himself humbly, often pointing to his own innumerable faults and, inversely, praise the supreme qualities of the recipient. A good example of this can be found in Gilbert White's first letter to Thomas Pennant. Here White first explained humbly that he only dared to 'enter into a Correspondence' with Pennant because when the two of them had met in London the previous year, Pennant had expressed an interest in some of White's observations, and had later had mentioned his name to White's brother. Then, before turning to a description of the passage of birds and other natural history subjects, White once again stressed his humble position by noting that while he himself would probably not be able to send Pennant 'any Information worthy of your attention', White would surely profit greatly by such a correspondence.[18]

The first letter would usually also include some kind of gift. It might be a non-descript coral, as in the case of Skene, who offered this in his first letter to Ellis, the great coral researcher of the mid-eighteenth century;[19] it might be a small tract on a natural history subject, like Patrick Blair offering a two page *Manualo Pharmaco Botanicum* to Sir Hans Sloane in his first

13 The following outline of the *commerce de lettres* draws on the detailed study of the Republic of Letters in A. Goldgar, *Impolite Learning* (1995).

14 E. M. da Costa to P. Canvane, Jan. 6, 1767, British Library, Add. 28,536.

15 T. Pennant to J. Ellis, Sept. 14, 1769, Linnean Society, London, Ellis Corr., vol.II.40.

16 D. Skene to J. Ellis, May. 16, 1765, Linnean Society, Ellis Corr., vol.II.94.

17 Anna Bryson discusses the art of letter writing, in her *From Courtesy to Civility* (1998), ch. 5

18 G. White to T. Pennant, Aug. 10, 1767, British Library, Add. 35,138, ff.1-3.

19 D. Skene to J. Ellis, Mar. 15, 1765, Linnean Society, London, Ellis Corr., vol.II.92.

letter;[20] or it might, as in the case of White to Pennant, be some new observations on the birds of passage (a topic Pennant had been keenly interested in). What was explicitly denied by the humble way of positioning oneself in the first letter was indirectly demonstrated by the initial gift: That one would, indeed, be a worthy correspondent in the Republic of Letters.

As time passed in a correspondence relationship, the polite phraseology of the introductory and final sections of the letters tended to become shorter until the correspondents reached a point where the exchange of niceties were almost dispensed with. One thing, which was not to be dispensed with, however, was the exchange of information. In fact, in most cases all that was left in the letters after the niceties had been truncated, was the recounting of information of relevance to the correspondents' scholarly fields of interest.

Anne Goldgar has argued, in her study of the eighteenth-century Republic of Letters, that the *commerce de lettres* was framed to a large extent by a code of exchange. A pure Maussian reciprocity, in fact – an observation for an observation, a specimen for a specimen, a book for a book.[21] As in the Kula ring, the information about animals was passed around in the Republic of Letters because each gift received needed to be reciprocated. Often the ethos of exchange was made quite explicit, as when White sent Pennant those non-descript mice and a falcon and in return, asked for some 'lampetra caeca', which could be found in the streams near Downing in Flinshire where Pennant lived;[22] or, when Skene sent three non-descript corallines to Ellis, humbly asking him to 'adopt and christen them', in exchange for Ellis having been so kind as to pick out a suitable microscope in London for Skene who, due to living far off the beaten tracks in Aberdeen, could not take hand on that matter himself;[23] or when Pennant, after having asked John Strange, a British resident in Venice and a keen collector, for Adriatic fish, crabs, lobsters, tortoises, birds, and, in general, 'anything you favour me with', offered any help he could provide in exchange;[24] or, when William Borlase sent Ellis some plates of fishes, to be included in a future book by Borlase, asking Ellis for their names and for his opinion of whether some of them might be 'too common to be inserted' in the book, and stressed that he was hereby 'desiring you to do no more for me than I shall always be ready to do for you on like occasion.'[25]

Valued within Polite Society as a whole, the willingness to do services in exchange for services was further underscored within the Republic of Letters, where it became not only one

20 P. Blair to H. Sloane, Sept. 10, 1705, British Library, Sloane 4040, f.66.

21 A. Goldgar, *Impolite Learning* (1995), pp. 19-26, and *passim*; M. Mauss, *The Gift* (1969).

22 G. White to T. Pennant, Nov. 6, 1767, British Library, Add. 35,138, ff.4-5.

23 D. Skene to J. Ellis, Jul. 5, 1765, Linnean Society, London, Ellis Corr., vol.II.95-6.

24 T. Pennant to J. Strange, Jun. 11, 1771, British Library, Egerton 2001, ff.31; on John Strange's collections and involvement in Venetian natural history, see K. Pomian, *Collectors and Curiosities* (1990), pp. 214-5, 219.

25 W. Borlase to J. Ellis, Sept. 16, 1756, Linnean Society, London, Ellis Corr., vol.I.35.

of the principal means of forging and maintaining bonds between men of learning, but also, as Goldgar points out, a crucial way of obtaining 'tools of scholarship'.[26]

The importance of the information obtained by letter for the zoological work becomes apparent if the information about animals communicated through letters is compared with the descriptions in the printed accounts. Even to the point of citing whole letters, the information was extensively incorporated into the zoological books. As Thomas Pennant noted in the introduction to the second edition of *British Zoology*:

> [W]e own with pleasure that we have been greatly aided by the lovers of natural history, who since the appearance of the first edition have contributed to enrich the present with several valuable observations; by collecting and digesting these materials, we have not only rendered the work more complete, but are also encouraged to trace the *British Zoology* thro' some of the remaining classes, with all possible speed.[27]

The circulation of animals in some form or another within the Republic of Letters became vital for zoology.

In the letters, the animals would be represented according to the representational modes I have already analysed in the previous chapter. In general, they would either be circumstantially described, if it was a relatively unknown animal, or it would be described in a concise mode or even just mentioned by name if it was a fairly well known animal. In either case, it would invariably be treated as an object of knowledge – as a zoological creature with definable features which could be made an object of observation and representation one to one, and which through the communication in the letters would be made available for an observation by proxy.

In the Republic of Letters, then, animals were transformed into gifts, and facts were turned into tokens of exchange. In order to gain access to these, a naturalist would not only need a broker, but would also have to master the art of writing polite letters, and, finally, and maybe most importantly, he would have to have something to offer himself – some specimens, some observations, some thoughts – in order to engage other naturalists in an exchange with him. It was the implied ethos of reciprocity which to a very large extent made the natural history world of the Republic of Letters go round, as it crucially enabled and at the same time reinforced the circulation of facts.

Within the Republic of Letters, the animals would remain within a restricted social sphere, marked by a basic agreement on the conception of animals – the circulating animals were from the outset presented as objects of knowledge. In the museums and private cabinets the meaning of animals became multifarious. The animals were here put on display for a variety of reasons – of which learning usually would be just one, and in many cases only a secondary one – and used in exhibitions, which would more often than not be organised with

26 A. Goldgar, *Impolite Learning* (1995), p. 26.

27 T. Pennant, *British Zoology* (1768-77), vol. I, p. xii; emph. in org.; see also Appendices in vol. II and III, respectively.

different purposes rather than learning itself. Meanings were, hence, inscribed on the animals that differed, at times radically, from the zoologist's factual conception of animals as facts. At the same time and in close connection to this, the museums and cabinets would in many cases be populated by a variety of people, whose primary concern would be neither learning, nor, indeed in most cases, specialised zoology, but who in some way or another conditioned the work of the zoologist within this sphere. It is to these social spheres, partly established outside the confines of learning and marked, to a large extent, by other kinds of institutionalised practices, I shall now turn to investigate how zoologists made facts out of the animals on display. By way of situating the eighteenth-century museums and collections, I shall give a brief review of the history of museums, move on to the eighteenth-century private cabinets and, finally, consider the public museums, which emerged during this period.

## Animals in Museums

'[L]arge sums of mony [sic] have been expended in our own and other countries of Europe, in the formation of those collections which do honour to the taste of a refined people, and mark the munificence of an enlightened age', Richard Kentish observed at a speech given at the inaugural meeting of the *Societas naturæ studiosum* in Edinburgh, 1782, before he identified a dual usage of such collections:

> The attention of foreigners has been constantly attracted by these repositories of curiosities, and though the greater part of travellers are admitted but to gaze with wonder on the strange appearances presented to their view, yet to a philosophical enquirer, the effect is widely different.[28]

There was nothing new about the museum as a locus of both 'wonder' and 'philosophical' enquiry. So had it been throughout the Renaissance as well. However, the separation between the two, and the conception of wonder as the response of the unlearned was new. That separation resulted not only in the emergence of a new type of museum, but also in a new way of using the museum, and most importantly for this study, in a new way of approaching and dealing with the objects in the museum.

Although by the eighteenth century, the museum had a history of some 400 years in Europe,[29] its history in Britain was quite a lot shorter. In contrast to the Renaissance and predominantly Italian, but also French, Spanish and German princes, patricians and clergy who had been collecting valuables in their palaces or monasteries since the last decades of the fourteenth century, collecting only got under way on any grand scale in Britain during Elizabeth's reign, and it was not until well into the seventeenth century that the appetite for

28 R. Kentish, *An Essay on the Method* (1787), p. 8.

29 Pomian traces this history of the museums as well as its antecedents in the much longer history of collection in his *Collectors and Curiosities* (1990), ch. 1; and idem., 'Museet' (1993).

collecting had become more widespread among the higher echelons.[30] There had been collections of relics in the medieval churches in Britain, but these collections had neither been as grand and miscellaneous as those found in places on the Continent, nor had more than just a handful of the relics survived the Reformation and the iconoclastic campaign that followed.[31] The immediate ancestor to the British early modern collections was not to be found in Britain, but in the Renaissance museums on the Continent.

## The Renaissance Cabinet of Curiosities

Although the Renaissance cabinet had been encyclopaedic in its scope, the emphasis had been on the rare, the extraordinary and the wondrous – with regard to animals, for instance, five-legged pigs, two-headed cats, sea cucumbers, razor shells, ostrich eggs, the chameleon, the unicorn, or the crocodile.[32] It was first and foremost a cabinet of curiosities. Alongside with these natural wonders, however, one would at times also find more mundane natural objects, such as comprehensive *hortus siccus*, stones and fossils from the vicinity of the cabinet, common birds and snakes. In the displays, these natural objects were mixed with different kinds of crafted natural curiosities – such as gold-rimmed ostrich eggs, finely carved ivory, or, as Philip Hainhofe's masterpiece at the Uppsala cabinet, a centrepiece consisting of 'a carved coconut, coral, and silver drinking vessels with statues of Neptune and Venus [and] a top a distinctive montage of minerals [...] and shells'.[33] Besides these, one would also find artificial curiosities – mirrors, telescopes and microscopes, and other kinds of scientific instruments and man-made 'machines' – as well as, finally, antiquities, coins, pieces of art, books and manuscripts.

With this generous inclusion of anything curious, the Renaissance cabinet of curiosities aimed at displaying the universe in its entirety, as Krzysztof Pomian has stressed. With its heterogeneous contents, it aimed at encompassing 'the entire contents of the universe: the sacred and the secular, the natural and the artificial, the animate and the inanimate, the far and the near.'[34] Bringing the Renaissance practice of interpretation into play, natural and artificial curiosities would be placed side by side, in order to display the correspondences, resemblances

30 Arthur MacGregor gives a review of some of the most important cabinets and collectors in the seventeenth-century Britain, in 'The Cabinet of Curiosities' (1985). See also R. Altick, *The Shows of London* (1978), pp. 8-9; and B. J. Balsiger, *The Kunst- und Wunderkammern* (1971), for a comprehensive Catalogue Raissonné of European cabinets of curiosities in the early modern period.

31 R. Altick, *The Shows of London* (1978), p. 6.

32 The following sketch draws heavily on P. Findlen, *Possessing Nature* (1994); L. Daston and K. Park, *Wonders and the Order of Nature* (1998); and K. Pomian, *Collectors and Curiosities* (1990).

33 P. C. Ritterbush, 'Art and science' (1969), pp. 568-9.

34 K. Pomian, *Collectors and Curiosities* (1990), p. 49.

and analogies between the objects, and thereby to highlight the plentitude of nature and subvert 'the boundaries of familiar categories'.[35] In the Renaissance cabinet, as in the Renaissance zoological work, the animals never stood alone. They gained their meaning by being incorporated into a network of analogies and correspondences by being placed next to antique sculptures, mirrors, books, plants.

The things on display were arranged to arouse in the spectator the 'wonder of astonishment'.[36] It was a wonder of the virtuoso, who in the face of the unknown and rare would acknowledge its extraordinarity, and hence, manifest his taste and erudition with his response of wonder; it was the wonder of preternatural philosophers who in the extraordinary would find signs of God's intent; and its was the wonder of the philosopher because it led him to mediate on the order and meaning of the universe.[37]

The Renaissance cabinet was, as Findlen and Pomian have shown, a place of learning, also of zoological learning.[38] But this was far from the only, and often not even the principal, function it served. Privately owned as the Renaissance cabinets invariably were – by princes and patricians, members of the urban elite, wealthy scholars and by the (mainly Catholic) church – the cabinets, as exclusive sites of the elite, became in addition, as Daston and Park point out, reservoirs of both economic, symbolic and magical power.[39] Economic, because the curiosities, rare and exceptional as they were, often represented a notable value which could, and indeed would, be realised in times of need. Symbolic, because the possession of valuable wonders reflected their owners' position and enhanced their status. Magical, because at least some of the objects in the museums could be used in *materia medica*. The cabinets of all these multifaceted, potent and wondrous curiosities were, finally, closed for the majority of people. Their owners strictly guarded the access to the cabinets, in general by only allowing members, and mainly male members, of the social elite in. The exclusivity of their wonders was guarded also at a social level.

During the seventeenth century, collecting gained momentum, not only on the Continent, but also among the well-to-do in Britain, to whom I shall now turn. As Allen notes, the possession of a cabinet came 'to be regarded as one of the essential furnishings of every member of the leisured class with claims to be considered cultivated.'[40] The seventeenth century, hence, witnessed the establishing of a range of new cabinets. Some carried on the

35 L. Daston and K. Park, *Wonders and the Order of Nature* (1998), p. 273; cf. ch. 7. K. Pomian, *Collectors and Curiosities* (1990), p. 47; E. Hooper-Greenhill, *Museums* (1992), pp. 82-4.

36 L. Daston and K. Park, *Wonders and the Order of Nature* (1998), p. 276.

37 Ibid., pp. 120ff., 170; P. Findlen, *Possessing Nature* (1994), pp. 54ff.; cf. S. Greenblatt, *Marvellous Possessions* (1991), pp. 14ff.

38 P. Findlen, *Possessing Nature* (1994); K. Pomian, *Collectors and Curiosities* (1990), ch. 7.

39 L. Daston and K. Park, *Wonders and the Order of Nature* (1998), pp. 74-7.

40 D. E. Allen, *Naturalist in Britain* (1994), p. 26.

tradition of the Renaissance with regard to the manner of ownership, contents and organisation. But at the same time new kinds of museums arouse: With the foundation of the Ashmolean Museum at Oxford in 1683, what has often been considered the first public museum in Europe came into being.[41] With the establishment of the Royal Society's Repository at Gresham House in the 1660s, one of the first museums solely dedicated to learning of the 'new philosophy' kind was founded. These different museums housed animals that were sought after by the zoologists, although the meaning inscribed on the animals would vary greatly from one kind of museum to the next.

The notable rise in the number of cabinets and museums, which housed zoological specimens in this period, was also made possible through the introduction of partly new techniques of taxidermy. I shall look at this technological prelude to the spread of zoological specimens within the cabinets and museums, before turning to the cabinets and museums themselves.

## Taxidermy

From the seventeenth century onwards, the art of taxidermy became increasingly important for zoology because the introduction of new ways of preserving animals allowed for the animals to be transported from far away places to Europe, and hence, allowed the zoologist at home to get some kind of first-hand observation of these exotic creatures. As one author poetically observed regarding the specimens on display in collections:

> What in this world can more delight
> Than the nobility of creatures studied as they really are?
> What can excite joy and wonder in the soul
> More than viewing the reality of nature?[42]

Another zoologist, Frederick Watson, exemplified the advantages of such observations, while describing sloths and noting the difficulties in the past in determining the various species:

> Of late, however, it has become a Fashion to preserve the Animals which are curious in Foreign Nations; and instead of Descriptions of them, to send the Creatures themselves preserved in Spirits into *Europe*. To this excellent Custom has been owing a great deal of the present Improvement of Natural History. Those who saw so slow and unwieldy an Animal in the East, and had heard of such an one in the West, would not doubt their being the same; but by those

41 The definition of 'public' is, of course, intricate, and depending on the definition, the honour of being the first public museum can be placed at different places and times, as Pomian has shown in *Collectors and Curiosities* (1990), ch. 8. For a discussion of other candidates to the title in Britain, all preceding the Ashmolean museum by only a few decades, see R. F. Ovenell, *The Ashmolean Museum* (1986), pp. 28-9. The notion of 'public museums,' as I shall use it in the following, is to be understood as museums which gave access to a general public, although not necessarily to the entire population (no museums in Britain allowed this during our period), usually by payment of a fee, regardless of whether the museum was owned by the public or not. Hence, they differed from the private cabinets in the sense that access to the latter could only be gained by different kinds of social means, as we will see.

42 Quoted in P. C. Ritterbush, 'Art and science' (1969), p. 576.

sent over from *Madagascar* and *Ceylon*, we find that the Sloth of the *East Indies*, though very like that of *America*, is a different Species.[43]

The same point could be made more generally: The accumulation of preserved specimens in the museums and cabinets not only entailed a broadening of the empirical basis of zoology, but also allowed the zoologists to observe and hence, compare preserved animals from all over the world. As Lawrence Faber has shown with special reference to ornithology, this became crucial for the development of specialised zoological studies.[44]

Generally speaking, taxidermy did not become a professional craft in the period under consideration here. It was the traveller, or his servants as we might wonder,[45] who generally performed the task. When travelling with a natural historian intent, part of a gentleman's luggage – or, as Mark Catesby intimated, rather his servant's luggage[46] – would hence be filled with at least some of the instruments and paraphernalia necessary for the catching and preserving of animals: knives, scissors, pincers, needles, thread, gun, gauze net, bottles, boxes, putty, camphor, mercury, arsenic, and rum or brandy.

The methods of taxidermy varied not only between different kinds of animals, but also over time.[47] In 1663, Robert Boyle had suggested using alcohol for preserving animals,[48] and this method became crucial for the augmentation of preserved specimens. Smaller animals and molluscs, such as fish, snakes, as well as small lizards, small birds and ditto quadrupeds, were preserved in bottles filled with rum, brandy or other sorts of cheap alcohol. Although the animals would keep well for some time when preserved in alcohol, this method had the disadvantage that the colours of the animals quickly fainted, and that their feathers or fur and flesh disintegrated after having been immersed for some time in the alcohol.[49] Nevertheless, it remained an important taxidermic method throughout the entire period.

Larger birds and quadrupeds would have to be skinned, the taxidermist being careful, as J. R. Forster stressed, not to stain the fur with blood or make a bigger hole than needed for skinning the animal.[50] Their skins would be dried, often for hours or even days in an oven, and the skin had then to be tanned in some way. Throughout most of the period, insect pests proved to be a severe threat to the collections of preserved animals, literally destroying them as

43 F. Watson, *The Animal World Display'd* (1754), p. 49; emph. in org.; cf. pp. 48-9.

44 P. L. Farber, 'The Development of Taxidermy' (1977); and idem., 'The Development of Ornithological Collections' (1980).

45 Cf. J. Woodward, *Brief Instructions* (1696), p. 16.

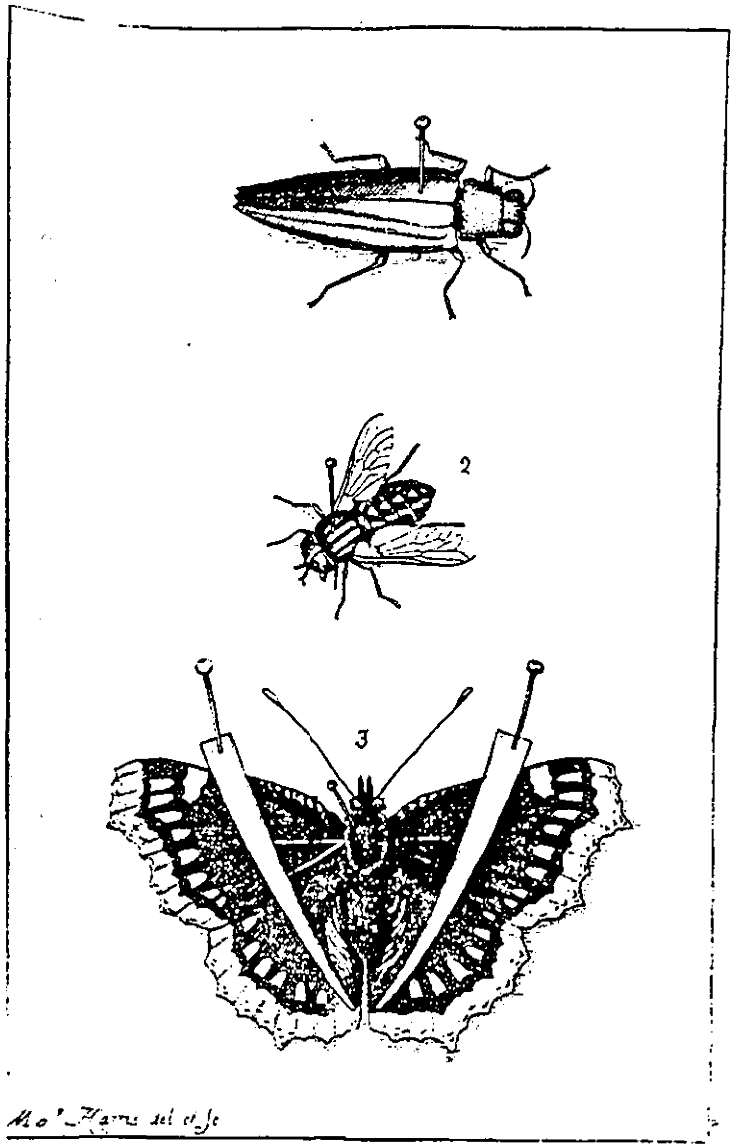
46 M. Catesby, *The Natural History of Carolina* (1731-43), vol. I, p. viii.

47 Where nothing else is noted the following outline of taxidemic methods is drawn from J. R. Forster, *A Catalogue of the Animals of North America* (1771), pp. 35ff.; E. Bancroft, *An Essay on the Natural History of Guiana* (1769), pp. 183-5, 219-20; J. C. Lettsom, *Naturalist's and Travellers's companion* (1772), pp. 2-19; J. Woodward, *Brief Instructions* (1696), pp. 14ff.; P. L. Farber, 'The Development of Taxidermy' (1977); idem., 'The Development of Ornithological Collections' (1980).

48 S. Atran, *Cognitive Foundations of Natural History* (1990), p. 190.

49 Cf. P. L. Farber, 'The Development of Taxidermy' (1977), p. 553.

50 J. R. Forster, *A Catalogue of the Animals of North America* (1771), pp. 35-6.



Ill. 4.1 THREE INSECTS ON PINS (J. C. Lettsom, *Naturalist's and Traveller's Companion*, 1772). In his book on collecting and preserving insects, J. C. Lettsom also gave instructions on how to display insects to their best advantage.

they ate their way through the stuffed animals.[51] A variety of different kinds of preparations were tried on the skins – for example, a solution of sal-ammoniac and mercury, embalming with different kinds of herbs, or soaking in alcohol for a period of time before drying etc. However, it was not before arsenic was introduced into the preparations in the later part of the eighteenth century that the insect pests could be brought under control in some measure.[52]

Regardless of which method was used, after the animals had been skinned and tanned, the taxidermist would either leave it at that – also skins could be valuable for collections – or else they would attempt to stuff them, with a view to reconstructing the animal in some 'natural posture.' As a Swedish naturalist's emphasis on taking down the measures of the animal before beginning the process of preservation indicates, in the stuffing of animals taxidermists were not always faithful to the live original.[53]

Insects would be caught with a gauze net or a pair of forceps covered with gauze, or better still, as John Coakley Lettsom advised regarding butterflies, they should be collected as larvae or caterpillars and brought up in a box by the collector himself. This being the 'best method of having the most perfect butterflies', as they would, hence, not be damaged in the hunt.[54] When caught, whether out in the open or in the box, a pin should be stuck 'thro' the middle of one of the hard wings, and pass[ed ...] through the body'[55] (see Ill. 4.1).

In sum, through taxidermy animals would, again, be detached from their place of origin – in this case by being killed and preserved – before they would enter the private cabinets and public museums in the eighteenth century. As a result of such technological means here, the zoologist together with a variety of other people could view precious birds of paradise, stuffed crocodiles, skinned polar bears and a variety of other animals which otherwise belonged to another, more exotic world. Exotic animals that, as is evident from the numerous references to them in the zoological literature, became crucial to the zoological endeavour.

---

51 For complaints of insect pests, see, for instance, J. C. Lettsom, *Naturalist's and Travellers's companion* (1772), p. 12; cf. P. L. Farber, 'The Development of Taxidermy' (1977), pp. 551ff.; A. C. Chitnis, 'The University of Edinburgh' (1970), p. 86.

52 The French apothecary Jean-Baptiste Bécoeur is often attributed with the honour of being the first to introduce arsenic into taxidermy, e. g. P. L. Farber, 'The Development of Taxidermy' (1977), pp. 557ff. His formula of arsenic soap was, however, not revealed until after his death in 1777, and at least as early as 1771, J. R. Forster had suggested using arsenic in the preparation of skins; J. R. Forster, *A Catalogue of the Animals of North America* (1771), pp. 35-6.

53 P. G. Lindroth, *Underrättelse* (1796) (unpaged).

54 J. C. Lettsom, *Naturalist's and Travellers's companion* (1772), p. 7-8.

55 Ibid., p. 7.

## Eighteenth-Century Cabinets and Museums

As the conception of nature and of facts changed with the advent of natural history and philosophy during the seventeenth century, so too did the cabinets, or in many instances, as Findlen has underscored, the rhetoric surrounding the cabinets – for the objects and also the arrangement of the cabinets in many cases remained unchanged well into the eighteenth century.[56] As we will see, the changes took place in different tempi and in different ways. Until the end of the eighteenth century, the zoologist could easily find himself in a private cabinet where the animals, together with a range of other miscellaneous objects, would be displayed in a way reminiscent of the Renaissance cabinet of curiosities. He might, on the other hand, also find himself in museums where the animals were put on display according to the newest taxonomic standards of the day. In the following, I shall attempt to encircle and contextualise the new learned rhetoric surrounding the museums by following the zoologist studying animals in the private cabinets and public museums.

### *Private Cabinets*

As had been the case in the Renaissance, the majority of collections in the seventeenth and eighteenth century were privately owned, most often by male and sometimes by female members of the aristocratic or bourgeois elite. For the zoologists, entering a private cabinet meant entering a social sphere that was foreign to the majority of zoologists, middling sort of people as they generally were. It also often implied entering a cultural sphere where the animals would be inscribed with meanings often entirely at odds with the zoologists' conceptions. I shall return to question of how access to the élitist sphere was negotiated below, but let us first take a closer look at what the cabinets had to offer.

During the seventeenth century, in best Renaissance style the emphasis in the private cabinets had been rather undiscriminating on everything rare and curious from all ranks of nature and art alike. During the eighteenth century, however, while the stress was certainly still on the extraordinary and rare, a new hierarchy of objects gradually evolved, as John Brewer has pointed out:

> At top were the materials of the connoisseur: paintings, sculpture, prints and drawings, metals and gems, valued both for their taste and for what they revealed about the exquisite sensibility of the ancients; at the bottom were natural and manmade objects that had been the pride of the seventeenth-century *Wunderkammer*: shells and items of curiously wrought and exquisite workmanship.[57]

Although art, antique and contemporary, was now receiving the main attention, natural curiosities would still find their way into the private cabinets. Though it might not have been

56 P. Findlen, *Possessing Nature* (1994), pp. 393ff.

57 J. Brewer, *Pleasures of Imagination* (1997), p. 256.

the top of fashion, some of the private collectors even paid special attention to natural curiosities and these, obviously, became the most valuable places to visit for the zoologists.

Among these we find Sir Hans Sloane's cabinet. Having married a wealthy widow and in addition having earned considerable wealth on the sale of chocolate among other things, Sloane built up an enormous collection that was later to form the basis of the British Museum. Situated within an extraordinarily extensive network of correspondents, and being in an economic position to buy objects on a large scale as well as to dispatch collectors to various parts of the world,[58] Sloane built up a collection, which was unprecedented within Britain. Reflecting on his luck in being allowed into this cabinet, George Edwards in the dedication to Sloane of the second volume of his *Natural History of Birds*, highlighted its magnificence:

> I have often reflected on my own good Fortune, when I have considered that the Benefit which I enjoy has for many Years been an improvement and pleasant Entertainment, not only to the greatest of our Nobility, but even to the Royal Family of these Kingdoms, as well as to all Foreigners of Distinction who have visited this Kingdom, of which Number some are Sovereign Princes and Princes of Sovereign Houses: In the Front of the latter may be placed his present Imperial Majesty, whose great Taste for Natural Knowledge, and other Sciences, led him several Times to indulge his Curiosity in viewing such valuable Rarities as are no where to be met with but in your Compleat *Museum*, and at the same Time honoured their worthy Possessor with his Visits, during the short Stay he made in *London*.[59]

Being sought after by men of distinction and visited even by royalties, this private cabinet was prestigious, indeed.

Although Sloane's cabinet might have been without comparison in extent and uncommonly distinguished by noble visitors, its contents, as they appear from the codicil to Sloane's will, still give us some idea of the objects which were considered worthy to collect at this time: 347 volumes of drawings and illuminated books, 3516 volumes of manuscripts, which 'together with the Books of Prints, consists of about 50,000 volumes'; medals, coins, antiquities, seals, stones, fossils, flints, metals, earths, sands, salts, sulphurs, ambers, shells (in sum 5,843 items), corals, sponges, etc. (1,421), echini, echinites, etc. (659), astriæ, trochi, entrochi (241), crustacean, or crabs (363), stellæ marinæ (273), fish, and their parts (1,555), birds and their parts, eggs and nests (1,172), vipers, serpents (521), quadrupeds (1,886), insects (5,439), anatomical preparations (756), vegetables, seeds, gums, woods, roots, etc. (12,506), 334 volumes of Hortus siccus, miscellaneous natural things (2098), pictures and drawings (310), and some mathematical instruments.[60] Sloane's collection, like that of most of his contemporaries, was wide ranging.

---

58 Such as Mark Catesby who was sent to Carolina in America in 1722 on a collecting tour, jointly paid by Sloane and some of the other major collectors at the time such as Richard Mead, Charles Dubois, and W. Sherard. Catesby's job was to gather both botanical and zoological specimens, which were to be sent home with proper descriptions at regular intervals. M. Catesby, *The Natural History of Carolina* (1731-43), vol. I, p. vi; M. Catesby to H. Sloane, British Library, Sloane 4046, ff.352-3, Sloane 4047, ff.90, 213, 290; M. Catesby to W. Sherard, Royal Society, London, Sh.163, 164, 170, 176, 184.

59 G. Edwards, *A Natural History of Birds* (1743-51), vol. II, pp. iii-iv; emph. in org.

60 H. Sloane, Authentic Copies of the Codicils, British Library, Add. 36,269, ff.33-5.

Second only to the collection of Sloane's, was Lady Margaret Cavendish Bentinck's collection. In 1734, she married the second Duke of Portland, and from then on, she spent the rest of her life and the better part of her fortune forming a collection, which included all branches of natural history and fine art. In addition, the Duchess established a botanical garden and a menagerie, which were all housed in her mansion and park at Bulstrode, Buckinghamshire, where she also received zoologists and other natural historians on visits.[61]

Beside these collections, we find among the more sought after privately owned collections that of James Petiver, consisting of all kinds of natural and artificial specimens from all over the world;[62] Marmaduke Tunstall's significant collection of birds;[63] and, later in the eighteenth century, William Hunter's collection which included, besides papers and books, anatomical preparations, fossils, minerals, natural history objects, including specimens from the first voyage of Captain Cook, insects, and even the corpse of a zebra and an elephant donated to his collection by Queen Charlotte;[64] towards the end of the eighteenth century, James Edward Smith came into possession of a major collection when his father bought him the collection of Carl von Linné;[65] at the same time, the brother of William Hunter, John, built up a collection of mainly zoological and anatomical specimens; and Sir Joseph Banks, not least as a result of his extensive network of collectors around the globe, established one of the greatest late eighteenth-century collections of natural curiosities, although these were mainly botanical.[66]

Though they differed in scope, collections such as these – together with many more of a similar kind – had a number of things in common. To begin with, they were all *private* collections and as such guarded by their owners. It was at the owners' discretion alone, that a zoologist could gain access to the exotic treasures of the private cabinets and hence, to often essential specimens for their work – the overwhelming majority of zoologists in this study made use in one way or another of specimens in one or more private collections in their works. Some like Peter Brown and George Edwards based most of their work on specimens in private cabinets,[67] while the majority of zoologists supplemented the information they obtained through other channels with visits to private collections.

61 D. E. Allen, *Naturalist in Britain* (1994), p. 25.

62 Ibid., p. 33.

63 P. L. Farber, *The Emergence of Ornitology* (1982), p. 52.

64 C. H. Brock, 'Dr William Hunter's Museum' (1980). On the distribution of the specimens from Cook's three voyages, see P. J. P. Whitehead, 'Zoological Specimens' (1969).

65 P. J. P. Whitehead, 'Museums in the History of Zoology' (1970), p. 156.

66 Ibid., pp. 156-7; on John Hunter, see also J. Dobson, 'Curiosities of Natural History' (1970); S. J. Cross, 'John Hunter' (1981); on Banks, see J. Gascoigne, *Science in the Service of Empire* (1998); D. Mackay, 'Agents of Empire' (1996); D. P. Miller, 'Joseph Banks' (1996).

67 P. Brown, *New Illustrations of Zoology* (1776); G. Edwards, *A Natural History of Birds* (1743-51); idem., *Gleanings of Natural History* (1758-64).

As we saw in the introductory chapter, the zoologists mainly belonged to the middle echelons, and hence, in social terms, generally ranked under the owners of the collections – entering the private cabinets, the zoologist entered a social sphere of another social strata. In contrast to the fairly egalitarian ethos of exchange in the Republic of Letters,[68] the zoologist would have to engage in an exchange of an entirely different sort as he entered the private cabinet. Usually conceptualised in terms of patronage, the zoologist would enter into a relationship of unequal exchange with the collector: 'your patron', as Richard Steele observed in an article in *The Spectator*, 'is of a species above you' in relation to whom the patronaged became 'a sort of creditor[...]'.[69]

A patron of such high standing could usually not be approached by a naturalist himself, if he was not previously acquainted with the owner. Access to a privately owned collection could be gained, though, through an introduction – also here a zoologist would often be in need of a broker. In exchange for access, the zoologist turned creditor would have to pay his debt. The repayment would often take the form of a reference or a dedication to the patron or patrons in the published work. Hence George Edwards, for instance, in the general introduction to *A Natural History of Birds* underscored the invaluable 'help' of a number of gentlemen who 'by furnishing me with matter' had enabled Edwards to bring his work 'into a Length, that I at first imagined, it could never attain.'[70] In a letter to Dr. Birch, the secretary of the Royal Society, Edwards once again stressed his debt to these 'Pattrons [sic] and Friends', making his method of repayment explicit. It was his intention to lay before the Royal Society fifty two coloured prints, later to form the third volume of *Gleanings of Natural History*, and in connection to that he wrote:

> to Remind the Society of the Particular Benefactors to this Work, I have wrote the names of each Noble and Generous Person to whom I am Obliged for the subject matter contain'd in each Print, in the Blank Pages oposit [sic] to the Prints.[71]

In the volume itself, each patron was specifically mentioned in connection with each description of the animal originating from his collection, as was often the case in zoological books more generally.[72]

---

68 'Fairly' because, as Anne Goldgar reminds us, even though an ethos of egalitarian exchange would be upheld, the number of correspondents, renown in the circles of learning, and access to patronage, certainly helped to differentiate status between scholars and to frame the terms of the actual exchange. A. Goldgar, *Impolite Learning* (1995), pp. 28ff.

69 Steele, *The Spectator*, no. 214, Nov. 5, 1711, reprinted in G. A. Aitken, *The Spectator* (1898), vol. III, p. 220. On patronage more generally in relation to the production of knowledge in this period, see also J. Gascoigne, 'Politics, Patronage and Newtonianism' (1984); L. Stewart, 'Public Lectures and Private Patronage' (1986); A. J. G. Cummings and L. Stewart, 'The Case of the Eighteeenth-Century Projector' (1991); and on patronage in the seventeenth-century, see L. T. Sarasohn, 'Thomas Hobbes and the Duke of Newcastle' (1999); M. Biagioli, 'Galileo's System of Patronage' (1990); and on patronage in broader contemporary society, see G. E. Aylmer, 'From Office-Holding to Civil Service' (1980).

70 G. Edwards, *A Natural History of Birds* (1743-51), vol. I, General Introduction (unpaged).

71 G. Edwards to T. Birch, Oct. 9, 1762, Royal Society, London, L&P.IV.125.

As is here made clear, the granting of access to animals in privately owned collections was repaid with a public acknowledgement. The significance of this exchange, from the collector's point of view, is evident when the symbolic prestige associated with possessing such collections is taken into account. Although there would have certainly been more non-utilitarian motives for permitting a zoologist into a cabinet, one obvious consequence of this exchange was that by allowing his or her specimens to be drawn or described, a patron would be publicly recognised as an important collector. As the zoologists praised the collections of extraordinary precious animals in their works, the zoologists were hence reinforcing their prestige.

The second common feature of the private collections was their heterogeneous character, as is also apparent from the short sketch above. Although in general, art, metals and gems were appreciated the most, and although a collector might overturn this hierarchy and also concentrate on one or more areas of natural curiosities in their collections – such as Banks on botany, or Tunstall on birds – their collections usually also included a wealth of other miscellaneous items, thus, nevertheless keeping something of the encyclopaedic nature of the Renaissance collection.

The vast majority of collectors, moreover, would still select the extraordinary for their cabinets. With regard to animals, exotic specimens were still preferred to domestic, the rare still preferred to the commonplace, the beautiful to the trivial.[73] In this way, the world of animals represented in the cabinets was still a world of extraordinary specimens.

A few collectors, such as Hans Sloane, would organise their displays according to the methods of taxonomy, and other collectors, like the Duchess of Portland, would hire naturalists to make taxonomic order in a catalogue of the objects in the collection.[74] In most collections, however, the objects on display would rather follow the layout of the Renaissance cabinet of curiosities, than any 'methodical order,' as it were, comparable to that of the tree of knowledge or, with regard to the animals, that of the zoologists' taxonomies. Alongside the crocodile or bird of paradise, as in the Renaissance cabinet, one was more likely to find here medals, paintings, chinaware, dried flowers, and various manuscripts, for example, rather than their neighbouring creatures on the Great Chain of Being.[75]

As this inclusion of a variety of objects and the mode of display indicates: the agenda of the owner and his relation to the objects differed from that of the zoologist. With few exceptions the items of a collection would be arranged in a display in order rather to please by

72 See also, for instance, P. Brown, *New Illustrations of Zoology* (1776); C. Owen, *An Essay towards a Natural History of Serpents* (1742).

73 R. Altick, *The Shows of London* (1978), pp. 8ff. Cf. D. E. Allen, *Naturalist in Britain* (1994), pp. 24ff.; K. Pomian, *Collectors and Curiosities* (1990), pp. 271ff.

74 D. E. Allen, *Naturalist in Britain* (1994), p. 25.

75 Cf. R. Altick, *The Shows of London* (1978), p. 15.

its beauty and delight by its variety, than to satisfy the quest of the natural historian. The cabinet was the connoisseur's creation. The connoisseur, as a figure, was first and foremost distinguished by his good taste and certain judgement. By his ability to determine with a glance the artistic worth of a painting, the preciousness of a gem, or the extraordinarity of a natural curiosity: The connoisseur was a man who was able to make proper distinctions.[76] That kind of taste which would allow one thus to distinctively identify the merit of objects equalled, as Thomas Pennant had it, 'a quick sensibility of imagination refined by judgement', which was 'directed by experience', and such experience in turn was 'another term for knowledge.'[77] The connoisseur's appreciation of objects hence hinged on learning but it was learning, or 'erudition' as it was more commonly called, of another kind than that of the naturalist, with another objective in view. The 'connoisseur's gaze,' as Ann Bermingham has called it,[78] would be educated through a general study of philosophy, history, classical literature, rhetoric, religion and even natural history, and, as the final and indispensable touch, it would be sharpened by visiting all the ancient and modern sites of fashion on the Grand Tour at the Continent.[79] Moreover, the objective of this general education of the connoisseur was not so much learning for knowledge's sake, but for the sake of educating his sensibilities: The aim would exactly be to create such a connoisseur who, in an entirely non-utilitarian fashion, would be able to judge and distinguish between objects (and women among them[80]) and to take a reasoned delight in those which (or who) were judged worth it. As a result of this education, the connoisseur would, finally, be able to approach the objects and appreciate them as things in themselves: 'Coins or pictures, shells or insects, none are valued for use,' as Walter Houghton remarks of the connoisseur's relation to his objects, 'neither for the advancement of learning nor for immediate gain: they are valued in themselves because they arouse curiosity and stimulate delight'.[81] In the connoisseur's universe, the objects would became self-referential: they would, in a word, become fetishes[82] – but only after they had been judged extraordinary enough to be deemed worthy of the connoisseur's attention.

---

76 A. Bermingham, 'Elegant Females and Gentlemen Connoisseur' (1993), p. 503.

77 T. Pennant, *British Zoology* (1768-77), vol. I, p. ix.

78 A. Bermingham, 'Elegant Females and Gentlemen Connoisseur' (1993), p. 492.

79 J. Barrell discusses the education of the gentleman at length in his 'The Public Prospect and the Private View' (1990). For the assets of the Grand Tour, see J. Black, *The British and the Grand Tour* (1985); A. Wilton and I. Bignamini, *Grand Tour* (1996).

80 A. Bermingham, 'Elegant Females and Gentlemen Connoisseur' (1993), and J. Brewer, *Pleasures of Imagination* (1997), ch. 6, discuss this sensual aspect of connoiseurship.

81 W. E. Houghton, 'The English Virtuoso' (1942), p. 56.

82 Ann Bermingham has introduced the concept of the fetish into the analysis of the connoisseur in her 'Elegant Females and Gentlemen Connoisseur' (1993), esp. pp. 402, 502-9. But whereas Bermingham understands the concept in a psychoanalytical sense, following Inger Sjørslev, I do here use it in a more general sense to signify that approach to objects which turns the objects into an 'irreducible materiality': 'The fetish does not refer to *anything*', it is hence, a representation 'which has become a *signifier*, something in itself, which does not convey

Such a 'fetishsation' of the objects in the private cabinets was entirely at odds with the zoologists' way of approaching the stuffed curiosities. In the cabinet, the zoologist met a display, which was organised to satisfy tastes other than his. Although the difference in approach received less attention in the zoological literature than it did in the artists' writing where an analogous distinction was discerned,[83] the zoologists commented on it from time to time, using the portray of the connoisseur's approach to situate their own endeavour.

It was principally the 'idleness,' as it became known, of the connoisseur's approach to objects that was targeted by the learned – their manner of valuing objects for pure delight. The 'pleasure, sensuality and dissipation' which naturalists came to associate with such idleness, was contrasted with 'the spirit' of 'learning',[84] and the connoisseurs' interest only in 'such as bring with it immediate Profit or sensual Pleasure' was opposed to the pursuit of making 'Discoveries and Knowledge.'[85] Ultimately, it was the utility of the zoologist's enterprise, which emerged most strongly against the fetishism of the connoisseur. 'Happy the man!' as Gilbert White wrote to Thomas Pennant, who was a gentleman of fortune and decent himself,

> who knows like you how to keep himself innocently and usefully employed; especially where his studies tend to amusement of knowledge, and the benefit of Society. And happy would it be for more men of fortune if they knew what to do with their time; if they knew how to shun
>
> 'The pains and penalties of Idleness'
>
> how much dissipation, rito, and excess would they escape; not without the complacency of finding themselves growing still better neighbours & better commonwealth-men?[86]

As indicated here, engaging in such useful pursuits as the study of zoology might even make the zoologist a man of more propriety than the idle connoisseur:

> A habit of observation refines our feelings. It is a source of interesting amusement, prevents idle or vicious propensities, and exalts the mind to the love of virtue and rational entertainment.[87]

At base, this contrast of natural history to connoisseurship, of the zoologist to the connoisseur, rested on their different approaches to the animals. Where the connoisseur would value the extraordinary objects as fetishes, the zoologist would put them to use for the sake of knowledge. However, doing that meant emptying them of their extraordinary potential as objects of delight.

As we saw in Chapter 2, within natural history the extraordinary had, in principle, been reduced to frequency: every single animal had been made trivial vis-à-vis a uniform nature. But as we also saw in Chapter 3, in practice, extraordinary specimens, or 'non-

---

any meaning nor represent anything beyond itself.' In approaching an object as a fetish, then, one 'stops by the thing.' I. Sjørslev, 'At standse ved tingen' (1990), pp. 31, 39; emph. in org.

83 Cf. J. Brewer, *Pleasures of Imagination* (1997), ch. 6; J. Barrell, *The Political Theory of Painting* (1986), ch. 1. On connoisseurship in arts in general, and on Richard Payne Knight in particular, see also M. Clarke and N. Penny, *The Arrogant Connoisseur* (1982).

84 G. Edwards, *Gleanings of Natural History* (1758-64), vol. I, pp. vi-vii.

85 G. Edwards, *A Natural History of Birds* (1743-51), vol. I, p. xiv.

86 G. White to T. Pennant, Nov 28, 1768, British Library, Add. 35,138, f.21.

87 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, p. vii.

descripts' as they were matter-of-factly rephrased within zoology, did not entirely lose their appeal within eighteenth-century zoology. Indeed, the observation of non-descripts was often the main reason for the zoologists to visit the private cabinets of the connoisseur. But as the rephrasing also indicates, the extraordinary character of these animals did not have any bearing on the meaning inscribed on the animal *an sich*. In turning the non-descript into a zoological fact, it would be transformed into a lifeless, and principally morphological creature, just like the most common of animals. Herein lay the main difference between the zoologist's and the connoisseur's appropriation of the animal. An example of this can be found in Pennant's description, quoted in full below, of a visit to the Prince of Orange's cabinet, renowned among connoisseurs in the second half of the eighteenth century for its extraordinary contents:[88]

> Visited the Prince's Cabinets, under the direction of M. Vosmaer [the Cabinet's director], a frenchified Dutchman, extremely ignorant. The curiosities are kept in five rooms and are very fine; the animals in spirits are numerous, among them Lizard with a fin on its back engraved by Seba.
>
> There is a skeleton of a vast Antelope.
>
> Among the birds is the male and female Cormorant; the former has a white spot on the chin and crest and a white spot on each thigh.
>
> Anas dunca shot near the Hague is black except a white spot under the bill and the quill feathers, which are white.
>
> In another room is the large scull of some beast; in the upper jaw are two Incisors, two Canine and fine Molares, in the lower all the same except the Incisores, which are four in number. The minerals and shells in his cabinet are very good.[89]

Although a zoologist might, just as the connoisseur in his way, display his learning by distinguishing some animals as non-descripts, and others as common, the zoologist did not dwell on that distinction with 'idle pleasure,' and leave it at that. Rather, the fetishized animals of the private cabinets would be reduced, as Pennant did, to morphological, and in a sense, meaningless creatures, which at a later stage would obtain their principal meaning as part of a species in a taxonomic scheme by being incorporated into a zoological work and here being related to other animals. In contrast to the connoisseur, the zoologist did *not* stop at the thing. That was the whole point of the zoological endeavour.

Ironically, the zoologist, by the same token, undermined the very conditions, which made these collections prestigious within elite society. He emptied the connoisseur's objects of their extraordinary symbolic potential by incorporating them into the taxonomic scheme on an equal footing with the common animals, though possibly offering a few more words on them than the common in the descriptions: A panther would here be placed next to the common cat, an armadillo next to a mole. However, this was not done without recognition. The zoologist entering the social world of the affluent connoisseurs still needed to appreciate the symbolic potential of the extraordinary animals as signs of the collectors' prestige as the zoologists,

88 Cf. F. F. J. M. Pieters, 'Notes on the menagerie's (1980).

89 T. Pennant, *Tour on the Continent 1765* (1948), pp. 155-6.

indeed, also did publicly in their dedications, in order to, through the right means of negotiating a relation of patronage, gain access to the extraordinary/non-descript animals in the first place.

*Public Museums*

If the zoologist had to share space with the connoisseur in the private collection, he had to share space with the vulgar in at least some of the public museums to which I now shall turn. One of the first museums to emphasis its public character was the Royal Society's Repository. Its status as a public museum might be considered debatable,[90] or at least it depended on a strict definition of the 'public' as the learned public – in practice, it was only open to the Society's fellows, and besides these solely to men of learning or consequence by appointment. It is worth taking a look at the motives given for envisioning this museum as public upon its foundation in the 1660s, as these illuminate some of the basic reasons for making museums public.

In the *History*, Thomas Sprat acclaimed the *'heroick Intention'* of the Royal Society to make public what had previously been 'close lock'd up in *Cabinets*'. By purchases or through gifts[91] the Society intended 'to bring' such things 'into one common Stock, which shall be upon all Occasions expos'd to all Men's Use'.[92] This intention fit well, of course, with the general assertion that knowledge should be public – in the Repository everybody should be able to observe the matters of fact for themselves.

It was not only with regard to the idea of 'public' access that the Repository departed from the Renaissance and connoisseur model. Also with regard to its contents and organisation the founders envisioned a new style more in tune with contemporary learned ideals: every object of art and nature, rather than just the rare, would be allowed into the Repository. Displaying the Society's 'Disposition to be [...] *universal*', the Repository hence 'propos'd to accomplish [...] a General Collection of all the Effects of *Arts*, and the Common, or Monstrous *Works* of *Nature*.'[93] It should be a complete collection. The collection would, furthermore, be organised along taxonomic lines. As Sprat explained, the first 'curator' of the Repository, Robert Hooke, 'has begun to reduce [the objects] under its several heads, according to the exact

90 Michael Hunter describes the Repository as occupying 'an intermediate position between private cabinets and public museums', in his 'The Cabinet Institutionalized' (1985), p. 159. Strictly speaking, Hunter's characterisation is more correct than mine. Since, however, the natives themselves emphasised the 'public' character of the Repository, it still seems legitimate to inquire into what being 'public' meant from their point of view. For a review of continental 'institutional collections,' predating the Royal Society's Repository, see W. Schupbach, 'Some Cabinets of Curiosities' (1985).

91 T. Sprat, *The History of the Royal Society* (1667/1722), p. 251; emph. in org.

92 Ibid., p. 75.

93 Ibid., p. 251; emph. in org.

Method of the Ranks of all the *Species* of *Nature*, which has been compos'd by Dr. *Wilkins*'.[94] In stark contrast to the displays at the private cabinets, with a complete collection and such a mode of ordering it was hoped that in time the Repository would be able to display the very Chain of Being with all its links and intermediate species. Here the scholar should be on home ground. Indeed, as Hooke stressed, these displays should be for men of learning alone:

> The use of such a Collection is not for Divertisement [sic], and wonder, and Gazing, as 'tis for the most part thought and esteemed, and like pictures for Children to admire and be pleased with, but for the most serious and diligent study of the most able proficient in Natural Philosophy.[95]

Divorced from delight, open to the (learned or aristocratic) public, being complete and organised according to 'natural principles' the Repository should, in brief, be no more and no less than a display of nature itself, as it looked from the natural historian's point of view.

In the event, the Repository failed according to its own standards. Although the Repository certainly was used by zoologists – Richard Bradley, for instance, included a description of some shell fish found in the Repository into his book,[96] Charles Owen described some snakes from there[97] – it never succeeded in making a complete inventory of nature, nor, indeed, in displaying the trivial productions of nature to any significant degree. Depending mainly on gifts, the acquisitions of the Repository remained generally rare, not to say curious: 'Stones taken out of Lord Belcarre's heart in a silver box' and 'a bottle full of stag's tears' were thus among the gifts, the Society received.[98] One suspect that the prestige associated with 'the extraordinary' in the private cabinet also clung to the gifts bestowed on the society.[99] The miscellany of rare objects becomes evident in the catalogue over the Repository's contents that was drawn up by Nehemiah Grew in 1681.[100] Though in the catalogue he did his best to categorise the items according to the taxonomic standards of the day, rare objects clearly outnumbered the trivial in these tables: the foot of a polar bear, the skull of a hippopotamus, a pig-headed armadillo, the skeleton of a crocodile, and a swan's egg containing another egg within it were among the things to be seen at the Repository.[101]

The Royal Society's Repository might have failed, but the idea that was so eagerly advocated of making knowledge, or at least facts, publicly accessible spread during the eighteenth century. At the same time, the idea about how this public should be defined also changed. Linked to a more general, and by no means unambiguous nor all-encompassing,

94 Ibid., p. 251; emph. in org. It is the classification in J. Wilkins, *An Essay* (1668), which Sprat is referring to here. This classification was, in fact, not made by Wilkins himself, but by John Ray.

95 Robert Hooke, *Posthumous Works* (1705), quoted in P. Findlen, *Possessing Nature* (1994), p. 400.

96 R. Bradley, *A philosophical account of the works of nature* (1721), p. 57.

97 C. Owen, *An Essay towards a Natural History of Serpents* (1742), pp. 91, 102.

98 E. Hooper-Greenhill, *Museums* (1992), p. 160.

99 As also Hunter suggests, in 'The Cabinet Institutionalized' (1985), p. 165.

100 On the cataloguing of the collection, see also A. D. C. Simpson, 'Newton's Telescope' (1984); M. Hunter, 'The Cabinet Institutionalized' (1985), pp. 164ff.

101 N. Grew, *Museum Regalis Societas* (1681), pp. 1-3, 14-5, 18-9, 42, 79.

movement to reform and educate the vulgar, it was suggested that even the vulgar might learn something from, or at least be sensibly amused by, natural history collections.[102] Although this, as we will see, was not a straightforward reformation, some museums were, at least in principle, opened up to a more general public than the Royal Society's Repository had been (and as time passed, even the items of the Repository would be exposed to a more general public. After years of complain of neglect, the Repository was removed to the British Museum in 1781 [103]): The scholars once again had to share the space with other people.

The first museum to open its doors to a general public was the Ashmolean Museum at Oxford, opened in 1683. Based on one of the greatest collections in the first half of the seventeenth century, John Tradescant's 'Ark', the collection, once again, consisted of miscellaneous things, although the emphasis was on botany (Tradescant had been a gardener, first to Queen Henrietta Maria at Oatland, and later keeper of the physic garden at Oxford).[104] Upon the death of Tradescant's son, Elias Ashmole inherited the collection and donated it to Oxford University, and from the beginning the plan was to create an institution of natural historical and philosophical learning, In the building specifically made to house it, there was not only made room for the collection, but also for a lavish laboratory, and a 'School of Natural History, where the professor of chymestry [...] reads three times a week'.[105] And used it was by the zoologists. Thomas Pennant, for instance, appears to a have been an eager visitor: No less than 23 of the quadrupeds described in his *Synopsis of Quadrupeds* were taken from the Ashmolean Museum.

However, from the beginning the Ashmolean Museum was also open to the general public. For a sixpence, even 'women [were] allowed up', the German traveller Zacharias Conrad von Uffenbach sourly noted, as he had to give up visiting the museum: 'it was market day and all sort of country-folk, men and women, were up there (for the *leges* that hang upon the door *parum honeste & liberaliter* allow everyone to go in). So we could have seen nothing well for the crowd'.[106]

The scholars and the gentlefolk would have to learn to share the space with the crowd. How this worked out and how the scholars positioned themselves in such a situation, becomes still clearer if we take a look at the next major public museum which opened its doors to the general public: the British Museum.

The British Museum was originally envisioned by Hans Sloane, and founded thanks to the Government's purchase of his huge collection for £ 20,000 upon his death in 1753 – money

102 Porter discusses the various attempts at such reformations, R. Porter, *Enlightenment* (2000) pp. 371ff.

103 Daniel Solander, Diary + Occurrence-Book of the British Museum, June 15, 1781, British Library, Add. 45,874; cf. M. Hunter, *Science and Society* (1981), p. 189.

104 R. F. Ovenell, *The Ashmolean Museum* (1986), pp. 1-2, 7, 56.

105 Ovenell describes its construction and outline in some detail, ibid., pp. 18ff, for the quotation, see p. 23.

106 Uffenbach, *Oxford in 1710*, quoted in P. Findlen, *Possessing Nature* (1994), p. 147.

raised by the government through a lottery (the common people were not, to some extent, only let in, but also contributed to the British Museum's establishment).[107] The money thus raised totalled £ 100,000, and besides being spent on purchasing Sloane's collection, it was also used to buy the Harleian collection of books and manuscripts, and Sir Robert Cotton's collection of antiquities, and to acquire buildings to house these collections.[108] In the Codicils to Sloane's will, he had not only offered his collection to the nation, but also defined the terms of its use. The British Museum should be a public institution with the dual objective of gratifying the curiosity of common people as well as the inquiries of the scholar:

> And I do hereby declare, that it is my desire and intention [...] that the same [the museum] may be rendered as useful as possible, as well towards satisfying the desires of the curious, as for the improvement, knowledge and information of all persons; and it is for this purpose I have hereby reposed a sincere trust and confidence in my right honourable, honourable [sic], and other trustees and visitors hereby appointed.[109]

From the beginning, the collection was beyond comparison the greatest in Britain, and in the following decades, it grew steadily with new acquisitions and gifts. These included gifts from the Earl of Hillsborough who gave 'Natural curiosities' collected at the New Cedeal Island; John Hunter who presented a 'Transvene Section of the Electric Eel'; John Reinhold Forster who donated 'Skins of Quadrupeds from Cap of Good Hope' and a number of stuffed birds from the East Indies after returning from one of Captain Cook's voyages; and a Mr. Braun who offered 'The upper-part of the Cranium of the Æthiopian Hog', just to mention a few of the donations.[110]

As is evident from the lists of donors, a host of different men of the middle and upper echelons contributed to the British Museum's collection. The British Museum had become, at least from the point of view of many of the higher echelons, a matter of national interest. Benjamin Stillingfleet made this explicit in his dedication of his *Miscellaneous Tracts* to George Lord Lyttelton, Baron of Frankley. The Lord had been instrumental in the foundation of the British Museum, and the dedication was written to him in acknowledgement of 'the zeal which You shewed in Parliament for securing to this Country that noble collection of natural curiosities now reposited in the British Museum'. In this matter, 'the reputation and interest of the nation were highly concerned'.[111]

This chain of associations linking the British Museum to 'the nation' and 'pride' gave a new meaning to the idea of 'the public.' No longer defined by just a small number of learned or virtuous citizens, but conceptualised as a 'nation,' towards the end of the eighteenth century,

107 For the history of the foundation of the British Museum, see J. M. Crook, *The British Museum* (1972).

108 R. Altick, *The Shows of London* (1978), p. 25.

109 H. Sloane, Authentic Copies of the Codicils, British Library, Add. 36,269, ff.19-20.

110 Daniel Solander, Reports and Diary of Occurrences in the Natural History Department, Sept. 26, 1766, British Library, Add. 45,874; Daniel Solander, Diary + Occurrence-Book of the British Museum, June 16, 1775, Sept. 8, 1775, March 16, 1781, British Library, Add. 45,874. For a more thorough list of the acquisitions and gifts, see British Museum (Natural History), *Separate Historical Account* (1906).

111 B. Stillingfleet, *Miscellaneous Tracts* (1762), Dedication (unpaged).

the 'general public' came to include all of the inhabitants on the British Isles. The idea of the nation as an 'imagined community' encompassing all of the inhabitants within a geographical area was beginning to take shape.[112]

It is worth dwelling for a moment on this emerging idea of the nation, epitomised in the envisioning of the British Museum, at least to indicate the consequences of this idea for zoology as well.[113] At the same time as the British Museum was established, objects in the domestic natural world also started to attract attention. In at least some collections, domestic and commonplace things would be accorded an unprecedented interest and be advanced to more prominent places in some of the displays.[114] Similarly, within zoology the national faunas would be compiled both within Britain and throughout Europe, including *Fauna Svecica, Fauna Danica,* and in Britain, books such as Pennant's *British Zoology,* or Berkenhout's *Synopsis of the Natural History of Great-Britain and Ireland,* or still more locally, White's *Natural History of Selborne.* Pennant made the lure of the national explicit in the introduction to *British Zoology.* After having noted that Carl von Linné already had made 'an eulogium on *Sweden*',[115] Pennant made his objective clear: 'we shall here attempt a parallel, and point out to the *British* reader, his native riches; many of which were probably unknown to him, or perhaps slightly regarded.'[116] Because, Pennant went on to reason,

> Do the heights of *Torsburg,* or *Swucku* [in Sweden] afford more instruction to the naturalist than the mountains of *Cumberland, or Carnarvonshire*? whose sides are covered with a rich variety of uncommon vegetables, while their bowls are replete with the most useful minerals. [...] *Sweden* can no where produce a parallel to that happy combination of grandeur and beauty in *Keswick*† vale, or *Killarny*‡ lake; nor can *Europe* shew a natural wonder equal to the *Giant's causeway* in the north of *Ireland.*
>
> † In Cumberland.
> ‡ In the County of *Kerry.*[117]

Such a 'neglect' of the national fauna and flora was an outrageous 'shame'.[118]

In the second half of the eighteenth century, the emerging idea of Britain as a nation was, then, echoed within the context of learning, with the subject matter of some zoological books being delimited by the nation, with a new interest in collecting things domestic and common, and, finally, in the establishment of a British Museum which was designed to open it doors for the general public. That the idea of including all people of the British Isles in the

112 B. Anderson, *Imagined Communities* (1983), p. 15; Linda Colley examines the 'forging' of the British nation, 1707-1837, in detail, L. Colley, *Britons* (1996).

113 Within a British context John Gascoigne has traced some of the links between knowledge and the nation, in J. Gascoigne, *Science in the Service of Empire* (1998); for perspectives from abroad see K. Pomian, *Collectors and Curiosities* (1990), pp. 217ff., and L. Koerner, *Linnaeus* (1999).

114 D. E. Allen, *Naturalist in Britain* (1994), pp. 25ff.; cf. K. Pomian, *Collectors and Curiosities* (1990), pp. 271ff.

115 Linné published a *Flora Svecica* in 1745 and a *Fauna Svecica* in 1746.

116 T. Pennant, *British Zoology* (1768-77), p. ii; emph. in org.

117 Ibid., pp. ii-iii; emph. in org.

118 Ibid., pp. v-vi.

'public' was flawed in practice becomes evident if we return to the British Museum and see how the inclusion operated in practice.

Even before the British Museum opened, its trustees had made it clear that the museum's primary objective was the advancement of 'Science and the Arts', and not the gratification of 'the curiosity of [...] multitudes [...] in quest of amusement.'[119] While scholars would be admitted to the museum by means of a recommendation, common people had, to begin with, to 'be decent and orderly in their Appearance and Behaviours' to be admitted in.[120] They had, furthermore, to apply for a ticket, by signing their name, social rank and address in the porter's lodge, and then some days, weeks or even months later when the application had been processed, a prospective visitor could finally pick up his or her ticket and enter the museum. Not surprisingly, given this tedious procedure, the British Museum only had on average sixty ordinary visitors a day during its first years.[121] In practice, as Richard Altick concludes, 'such ordinary Londoners as had some desire for additional knowledge were hardly better off after the British Museum opened than they had been before.'[122] For a while, the learned would also have the British Museum to a large extent to themselves.

However, there was more to these precautions than merely a desire to turn the British Museum into a site of learning, as it was hinted at in the museum's Regulations: 'it might be dangerous, in so populous a Metropolis as London, to admit perfect Strangers [in]'. Hence, the necessity of knowing the name and social standing of the visitors in advance.[123] The basis of this fear of the general admission of the public was made clear by Dr. John Ward, professor of rhetoric and one of the museum's trustees:

> a general liberty to ordinary people of all ranks and denominations, is not to be kept within bounds. Many irregularities will be committed that cannot be prevented by a few librarians who will soon be insulted by such people, if they offer to control or contradict them [...]. If any such people are in liquor and misbehave, they are rarely without their accomplices [...] who out of an Idle vanity in exerting what they will call their liberty will side with them and promote mischiefs that are to be more easily suppressed than [...] prevented. [...] No persons of superior degree will care to come on such days [...]. If public days should be allowed, then it will be necessary for the Trustees to have the presence of a Committee of themselves attending, with at least two Justices of the Peace and the constables of the division of Bloomsbury [...] supported by a guard such a one as usually attends at the Play-House, and even after all this, Accidents must and will happen.[124]

A committee of Trustees, two Justices of Peace, a patrol of constables, and a guard from a Play House posted at the British Museum: the reluctance to allow the general public in *en masse* evidently reflected a fear, voiced more generally among the higher echelons in this period, of

---

119 Quoted in J. M. Crook, *The British Museum* (1972), p. 65.

120 British Museum, Regulations for General Admission into the British Museum, 17??, British Library, Add. 36,269, f.194.

121 R. Altick, *The Shows of London* (1978), p. 26.

122 Ibid., p. 27.

123 British Museum, Directions Respecting the Reading Room of the British Museum, 17??, British Library, Add. 36,269, f.193.

124 Quoted in R. Altick, *The Shows of London* (1978), p. 26.

the general public turning into a 'mob.' The actual or, as in this case, the potential gathering of individual members of the nation's lower echelons in a crowd caused fear because it had become widespread to associate such a crowd with disorder, riots, chaos: 'a great concourse of ordinary people will never be kept in order', as Dr. Ward also stressed.[125] The idea of the nation of which the British Museum reflected, the nation of which the zoologists proudly discoursed in their works on British fauna proved difficult to come to terms with in practice. Even within the confines of the 'nation' there was ample space to distinguish between the gentle, the learned, and the rest.

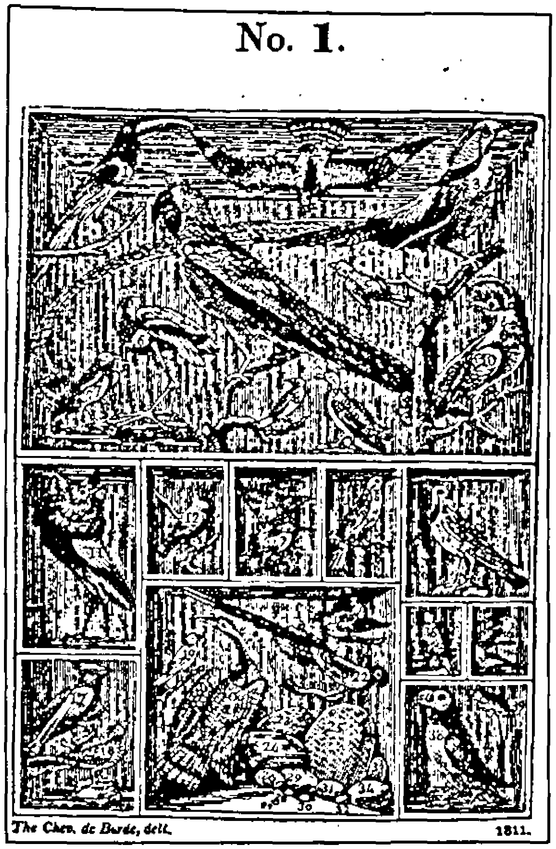
As the trustees guarded the British Museum, at the same time, they also maintained a space of learning in which the zoologists could work relatively undisturbed by the tumults of the vulgar. There were some places, however, in which the zoologist could not so easily escape the vulgar. Among these was the Leverian Museum, which housed an inestimable collection of zoological specimens, among many other things.

From 1760 onwards, Ashton Lever build up what was to become one of the major museums of the late eighteenth century first in Manchester and later from 1773 in London, and ruined himself in the process. As is evident from contemporary descriptions, the museum consisted of all kinds of natural and artificial curiosities – armours and guns, 'dried sea-monster,' a stuffed elephant, apes impersonating humans, minerals and metals, musical instruments and porcelains, some of the precious specimens from Captain Cook's voyages, and according to James Edward Smith, the first president of the Linnean Society of London, also an 'unrivalled' collection of 'birds and quadrupeds' at the time (see Ill. 4.2 and 4.3).[126] With its miscellaneous collection and its emphasis on the rare, the Leverian museum had direct pipelines to the Cabinets of Curiosities. However, it was open to the public on payment of a fee. Run as a commercial though losing enterprise, the collection was carefully arranged to evoke the wonder of the spectator. One visitor described the spectacle:

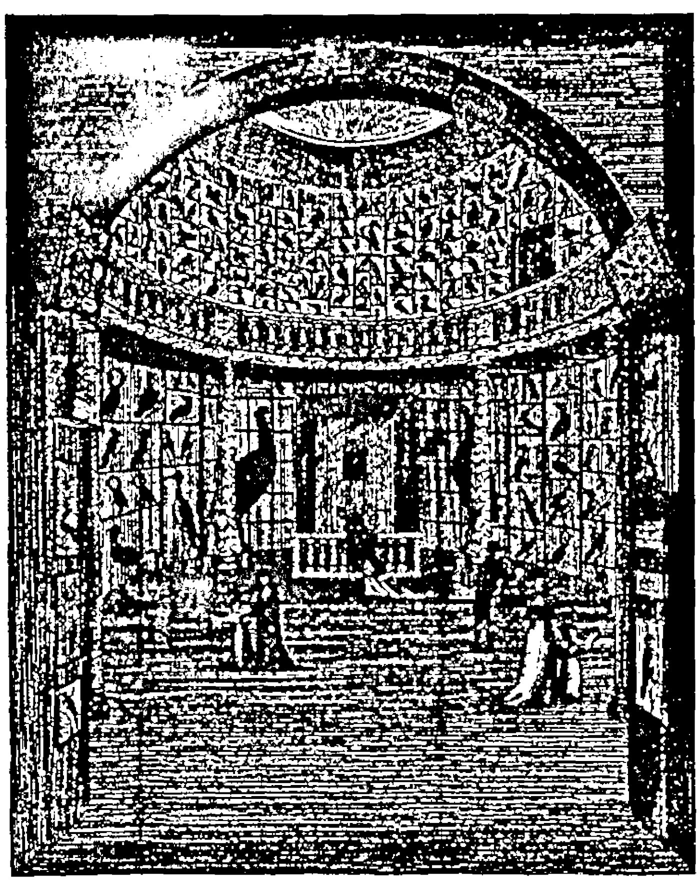
When the big door to the main apartments opened, and we stood in a large marble hall at the foot of a handsome staircase, in the midst of a heap of old armour and guns from every age and corner of the globe, displayed as trophies. This high wall of the well-hole are hung with dried sea-monsters of every description, and at the top of the flight of stairs in front of the first room an excellently stuffed young elephant bids one welcome. On leaving him one enters the room, hung with sea-green damask, curtains of the same, and with sweet little benches by the windows. Lining three walls there are nothing but neat glass cases containing all species of sand, earth, stones, metals, resins and fossils. Meadrepores [sic] come next; after these all kinds of birds from every clime, from the ostrich to the humming-bird, whole families of some of them, old and young, eggs and nests. A room full of fish is equally fine

125 Ibid.; on the crowd and the patricians' fear of it, see E. P. Thompson, *Customs in Common* (1993), esp. chs. 2, 4 and 5; R. Porter, *Enlightenment* (2000), ch. 16.

126 J. E. Smith, 'Introductory Discourse' (1791), p. 52; cf. R. Altick, *The Shows of London* (1978), p. 30. On the Museum in general and on the tragic story of Sir Ashton Lever, in particular, who, after having ruined himself on collecting specimens and been unable to sell his collection lost it in a lottery to a Mr Parkinson, and on 1st February 1788 he committed suicide, see C. E. Jackson, *Sarah Stone* (1998).




Ill. 4.2 CASE WITH STUFFED BIRDS, SPECIMENS FROM THE LEVERIAN MUSEUM.



Ill. 4.3 THE ROTUNDA FROM THE LEVERIAN MUSEUM. In the final decades of the eighteenth century, the Leverian Museum opened its doors to a general public, entering on the payment of a fee. The exquisite collection of natural curiosities was carefully arranged to entertain the spectator, with the rotunda as the centre piece. The case in Ill. 4.2 above is made by Viscount de Barde. According to de Barde, the birds in the upper half of the picture were drawn from specimens in the Leverian Museum, whereas the rest originated from Mr Bullock's museum.

and perfect, another containing curious kinds of snakes and reptiles; all the rare quadrupeds of the known world; all manners of apes and insects.[127]

Though certainly appealing to the wonder of the uneducated, this did not preclude the learned from appreciating its worth. It attracted zoologists such as Thomas Pennant, Gilbert White, George Shaw, and John Latham, who came, in particular, to observe and describe the birds and quadrupeds in the collection. As Pennant, in agreement with Smith, stressed: The Leverian Museum possessed 'the most astonishing collection of the subjects of natural history ever collected in so short a space by one individual.'[128]

That the scholars' shared space with the vulgar in the public museum was something new, indeed unthinkable in the Renaissance museum or the connoisseur's cabinet, and even, as we have seen in the sketch above, as it became thinkable in this period it was often, to say the least, impractical. The vulgar and the learned might be sharing a physical space in public museums such Lever's or, as I shall return to below, at the freak shows and in the coffee houses, but, at least from the point of view of the scholars, they did not share a conceptual nor even an experiential space.

As noted by Richard Kentish in the introduction to this section, what distinguished the common observer from the learned in the museum, was the response of wonder from the former upon viewing the rarities in contrast to the latter's philosophical attitude of inquiry; as we saw Hooke stress in the same vein with regard to the Royal Society's Repository: The things put on display there were not for 'Divertisement and wonder' but for 'the most serious and diligent studies'. The wonder, which had played such an important role in the Renaissance cabinet of curiosities, had become entirely disassociated from learning by the eighteenth century. At the same time, wonder had come to be closely associated with the vulgar.[129] Not uncommonly compared to beasts by zoologists and others,[130] the vulgar was, in the words of Sir Thomas Pope Blount, 'like the Serpent, [who] lye hissing and groveling upon the Earth'. Like the serpent, 'at the best' they would be 'but Des-Cartes's AUTOMATA, moving Frames and Figures of Men, [who] have nothing but their Outsides to justifie their Titles to Rationality.'[131] Ignorant and 'governed', as the vulgar were thus considered to be 'by mere instinct and sensual appetite',[132] the unmediated, strong emotional response of the 'blind amazement' of wonder came to be intimately associated with them.[133] The '*vulgar*' were, as Henry St. John, Viscount Bolingbroke, remarked,

127 S. v. La Roche, *Sophie in London 1786* (1933), pp. 112-3.

128 Pennant, quoted in P. J. P. Whitehead, 'Museums in the History of Zoology' (1970), p. 158.

129 Cf. L. Daston and K. Park, *Wonders and the Order of Nature* (1998), p. 350.

130 Keith Thomas gives a summary of the most common animal metaphors in general use within 'Polite' Society, K. Thomas, *Man and the Natural World* (1983), pp. 45ff.

131 S. T. P. Blount, *A Natural History* (1693), Preface (unpaged); emph. removed, cap. in org.

132 G. Edwards, *Gleanings of Natural History* (1758-64), vol. I, p. ix.

133 Thomson quoted in R. Porter, *Enlightenment* (2000), p. 368.

like *Dutch travellers* in a foreign country. Everything they meet had the grace of novelty: and they are fond alike of every thing that is new. They wander about from one object, to another, of vain curiosity, or inelegant pleasure.[134]

As the Viscount went on to explain, what in comparison to the vulgar the gentle possessed was an ability, edified by experience, to take a more reasonable, distanced, and discerning stance towards the world:

The latter [the gentlemen] come into the world, or at least continue in it after the effects of surprize and inexperience are over, like men who are sent on more important errands. They observe with distinction, they admire with knowledge. They may indulge themselves in pleasure; but as their industry is not employed about trifles, so their amusements are not made the business of their lives.[135]

The resulting difference in the approach to the animals between the vulgar and the learned, as it was described by the learned, was made clear in Borlase's portrayal of the scholars' hardships at the British Museum in a letter to Ellis. Responding to Ellis' decision to offer his papers to the Royal Society instead of to the British Museum, Borlase commented:

I think you will be right in placing the Originals with the R:S: especially, if the present unaccountable preclusion of the Literati equally with the ignorant & sauntering continues at the British Museum. Should there not be medals, or introductory tickets granted to those who want to consult what is now lock'd up, and the access too operose & distressing to the Learned? Surely, those who labour for the publick, and generally represent the fruits of those labours to the Museum merit every kind of indulgence, and ought not to be level'd with those who come only there to stare at millions of things, without carrying off any thing but amazement which expires in half an hour at the next coffee house.[136]

The learned going to museums and the vulgar going to museums involved, then, two entirely different kinds of experiences, according to the learned. Let us explore this difference a bit further, by at first clarifying the conception of the vulgar and of their relation to the animals further.

At a first view this description of the common people's utterly unlearned amazement at the sight of strange animals appears not to fit well with the inclusion of them as providers of information in the collection of specimens, as discussed in Chapter 3. As we saw there, the common people's involvement in this part of the zoological endeavour was predicated on the idea that nature invariably was reflected in the same way on every man's and woman's mirror in the mind. Hence, the possibility that the vulgar might communicate credible information, which, at the zoologists' discretion, could be included into the stock of zoological knowledge. But although, with the idea of the mind's mirror, it was given that the same impressions would be imprinted on everyone's mind, it was by no means given that everyone would make the same out of these impressions. As we also have seen earlier (Chapter 2), there was always the possibility that the impressions would be distorted in the mind, and, furthermore, it was always possible that the impressions would be distorted in representation (cf. Chapter 3). What the learned accentuated when they contrasted the common people's experience at the

134 Henry St. John, Viscount Bolingbroke, *Letters on the Spirit of Patriotism*, reprinted in S. Copley, *Literature* (1984), pp. 47-8; emph. in org.

135 Ibid., p. 48.

136 W. Borlase to J. Ellis, Feb. 22, 1764, Linnean Society, London, Ellis Corr., vol.I.41.

museums with their own, was exactly the cause, and the result, of the possible distortions of impressions as they passed through the human mind and mouth (and thereby they also illustrated why the vulgar were far from always to be trusted on their words, even if they at times could be so). The cause of such distortions was, as we saw above, identified in a lack of experience and, more importantly, in the common people's frequent lack of ability to transcend the brutish faculties in man. The result was a blinding amazement that impeded the vulgar from appreciating animals as matters of facts.

Returning to the zoologists, we might observe that what the contrast of the zoologists' experience in the museums to the common people's most significantly highlighted was the crucial importance of 'detachment' for the zoologists' construction of facts. Highly praised within learned community, detachment signified the very opposite of the common people's amazement. Having made all facts in-principle trivial, having instituted self-government and learning as the prerequisites for non-distorted 'observation,' the zoologist should, in contrast, gaze at the strangest of animals without a feeling. It was basically only in this way, as objects of an impartial gaze, that the natural objects in, as well as outside, the museum would emerge as matters of facts: as a sheer ensemble of perceptible traits.

By thus treating the animals as nothing more, nothing less than zoological facts, the zoologists, in a sense, cancelled out everything that the private cabinets and the public museums attributed to the animals, through their specific modes of display. In case of the private cabinet: their extraordinary qualities in which the connoisseur could take delight. In case of public museums such as Lever's: their ability to awake wonder and amazement in the spectator.

## Animals in Commerce

There were places where animals were put on display without a view to learning at all; there were places where animals would be exhibited first and foremost with the objective of gratifying the wonder of the vulgar, but where the learned came, nevertheless. During the eighteenth century, inns, taverns and coffee-houses shot up especially in London, in which part of the attraction, besides ale or coffee, became curiosities on display. Here, the guests could see a variety of curiosities, such as for instance exotic birds, stuffed sea unicorns, sword-fish and mermaid-fish and a giant's tooth, Queen Elizabeth's strawberry dish, clocks and other artificial curiosities, a fifteen inch long frog, a starved cat, petrified rain, Muscovy gloves, and a learned pig, 'well versed in all Languages, perfect Arethmatician [sic], and Composer of music [and] in his day a far greater object of admiration to the English nation than ever was Sir Isaac Newton', as one contemporary claimed (see Ill. 4.5).[137] With regard to the extraordinary nature of the curiosities, the displays at the coffee-houses and inns did not fall short of the connoisseurs' cabinets. Indeed, as Altick has noted, the cabinet of curiosities had here been displaced into a popular context.[138]

An advertisement for Don Saltero's coffee-house in London, one of the most spectacular of its kind and from 1712 located in Cheyne Walk next to Hans Sloane's Manor House from where Don Saltero allegedly received duplicates, sets the terms of such displays:

> Monsters of all sorts here are seen,
> Strange things in nature as they grew so;
> Some relics of the Sheba Queen,
> And fragments of the famed Bob Crusoe.
> Knick-knacks, too, range round the wall,
> Some in glass-cases, some on shelf;
> But, what's the rarest sight of all,
> Your humble servant shows himself.[139]

Although the animals, and all of the other curiosities, at the coffee-houses and inns were clearly displayed in order to attract a popular audience – not necessarily, as here indicated, solely for their amusement, however, but also for instruction[140] – this did not mean that gentlemen did not attend. Not only did the coffee-house become a cherished place of meeting for (male) members of Polite Society and men of commerce;[141] but, as is evident from references in the zoological literature, zoologists came here as well, if not for anything else then at least to observe exotic animals. Thus, Richard Bradley, for instance, described and provided engravings of a sword-fish, a saw-fish and a mermaid-fish, all taken from 'Mr. *Slater's* Coffee-house at *Chelsea*' (see Ill. 4.4);[142] and in the *Naturalist's Pocket Magazine* a sea unicorn, of which an illustration has already been given (Ill. 3.6), was described after a stuffed specimen in the Mecklenburgh coffee-house at Charing Cross.[143]

Besides at the inns and coffee-houses, animals, and a host of other things, were also displayed at fairs and in the streets. Although the display of live animals was not exactly new

137 Robert Southey, *Letters from England*, quoted in R. Altick, *The Shows of London* (1978), p. 40, cf. p. 18. Also James Boswell mentions this intelligent pig, J. Boswell, *Life of Samuel Johnson* (1791/1999), p. 956.

138 R. Altick, *The Shows of London* (1978), p. 21.

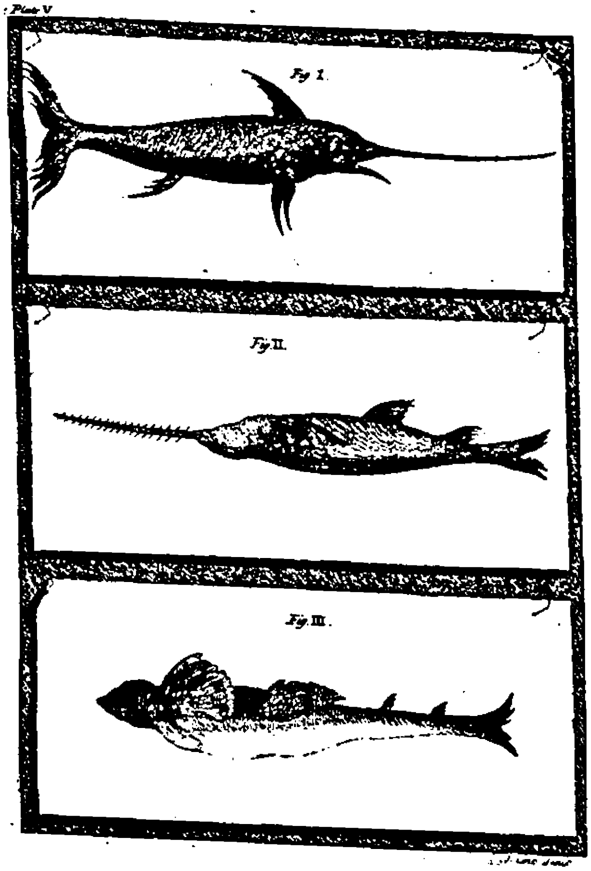
139 *Mist's Weekly Journal* (1723), quoted in ibid., pp. 17-8.

140 During the eighteenth century, the coffee-houses had a reputation as 'the poor man's university'. Not only were exotic animals to be seen there. In addition, public lectures on natural history and philosophical subjects would also be given at times here, and, especially some of the more spectacular experiments of experimental philosophy would be shown. On coffee-houses in general, see L. Klein, 'Coffee-House Civility' (1997), who traces their intricate relation to Polite Society. On coffee-houses as 'poor man's university', see A. Ellis, *The Penny Universities* (1956); on the public display of experiments, see S. Schaffer, 'Natural History and Public Spectacle' (1983); and on public lectures, see L. Stewart, 'Public Lectures and Private Patronage' (1986); J. Money, 'Teaching in the Market-Place' (1993).

141 L. Klein, 'Coffee-House Civility' (1997).

142 R. Bradley, *A philosophical account of the works of nature* (1721), p. 61.

143 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. V, unpaged.



Ill. 4.4 THREE FISHES FROM MR SLATER'S COFFEE-HOUSE (R. Bradley, *A Philosophical Account of the Works of Nature*. 1721)

There was not only coffee on offer at the coffee-houses, but in many places there were also natural curiosities of the more rare and extraordinary kind, such as stuffed fish, like those to the left, and an intelligent pig, below, who allegedly was a very good arithmetician.


Ill. 4.5 THE WONDERFUL PIG (R. Altick, *The Shows of London*, 1978, made 1785)

in the eighteenth century – the Tower of London had housed the Royal menagerie since the sixteenth century – the number of freak shows exploded after the Restoration. The emphasis once again was almost exclusively on the extraordinary and monstrous. In the streets of London, tame bears danced, while apes and wild animals like tigers were put on display. Although probably an exaggeration, the remark of one spectator shows that such animals were not an entirely uncommon sight in early eighteenth-century London: '[tigers were] grown now so common they are scarce worth mentioning.'[144]

Itinerant showmen, furthermore, brought exotic animals around in the country. One of them, apparently, brought an elephant to Dublin in 1681 which, upon its 'accidental death' had to be guarded by the 'Musqueteers' to prevent the common people who came in their multitudes – 'by reason of the great rates put upon the sight of him' – from destroying it before it could be eventually properly cut into pieces in the dissection of the surgeon Allan Mullen.[145] It was itinerant showmen who in 1706 brought yet another elephant to Dundee where, also following an accidental death, it was likewise transformed into an object of knowledge, this time in the hands of Patrick Blair who thereby shot off his carrier within the Republic of Letters.[146]

At the fairs, the learned would intermingle with the ignorant in order to see a variety of strange creatures. The description of Wordsworth (only quoted in part) of the Bartholomew Fair in 1802 gives an idea of its scope:

> The silver-collared Negro with his timbrel,
> Equestrians, tumblers, women, girls and boys,
> Blue-breeched, pink-vested, and with towering plumes. –
> All moveables of wonder, from all parts,
> Are here — Albinos, painted Indians, Dwarfs,
> The House of knowledge and the learned Pig,
> The Stone-eater, the man that swallows fire,
> Giants, Ventriloquists, the Invisible Girl,
> The Bust that speaks and moves its goggling eyes,
> The Wax-work, Clock-work, all the marvellous craft
> Of modern Merlins, Wild Beasts, Puppet-shows,
> All out-o'-the way, far-fetched, perverted things,
> All freaks of nature, all Promethean thoughts
> Of man; his dullness, madness, and their feats
> All jumbles up together to make up
> This Parliament of Monsters.[147]

Quite a few of these 'monsters' made their way into the learned literature. Not only did the *Philosophical Transactions* conscientiously give space to descriptions of a large number of them in their pages through the long eighteenth century.[148] The more 'normal' of the exotic animals

144 Ned Ward in *The London Spy Compleat*, (1700); quoted in R. Altick, *The Shows of London* (1978), p. 35.
145 A. Mullen, *An Anatomical Account* (1682), pp. 4-6.
146 P. Blair, *Osteographia Elephantina* (1713).
147 Wordsworth, *The Preclude* (1805 version), VII, 662-94.
148 R. Altick, *The Shows of London* (1978), p. 37.

at least made their way into the zoological literature as well. Hence, we find descriptions of opossums and elephants, zebras and speaking parrots, enormous vultures and birds of paradise, lions and lionesses, spotted hyenas, and of a variety of apes and among these, finally but not exhaustively, a number of descriptions of that 'Madame Chimpanzee' which was brought from Angola to London in 1738 where it amazed the general audience by its good table manners at the Tea-table and gave quite a few zoologists material for thought on the relationship between man and ape (more on that later).[149] In these accounts, the zoologists remained as philosophically detached as they had been in the private cabinets and public museums. However, one thing had changed. Whereas the animals displayed in the cabinets and museums seem to have been generally accepted as genuine specimens, the zoologist could never be sure if the appearance of a specimen displayed at a show had not been somehow manipulated in order to enhance its value. As animals were turned into commodities, they became inherently untrustworthy.

Zoologists were confronted with the same problem when they went into shops that traded in exotic animals. Judging by the number of advertisements for all kinds of exotic animals in newspapers, there appears to have been a considerable trade in exotic animals in Britain in the eighteenth century. Take for instance this notice in the *Post Boy*:

> There is newly brought over a parcel of choice Canary birds, white, mottled, Ash colour and Grey, also fine talking Parrots and large Pheasants of diverse colours, Poland Hens and Cocks, small India Fowls, fine Geese from the East India, Amedaites [sic], fine small monkeys and Tuttle Doves from Barbary; also a fine Tyger from the East Indies, and several other Rarities are to be sold by Mich. Bland, at the George at Tower-Dock near Great Tower-Hill, London.[150]

The zoologist would visit, buy or simply observe animals at such retailers' shops. Hence, Tyson, for instance, got a male opossum from Arthur Bayle, a merchant in London, and Pennant described the blue goat from a skin he had bought in Amsterdam.[151]

The incorporation of such animals did not always come easy. As the zoologists pointed out frequently, the merchants and the show masters always had an interest in lying about the animals in order to maximise their profits. The more exotic an animal was, the higher a prize could be demanded when selling it or putting it on display. Hence, according to zoologists, merchants had been known to have 'mutilated and bereaved [birds of paradise] of their feet'[152]

149 P. Blair, *Osteographia Elephantina* (1713); T. Pennant, *Synopsis of Quadrupeds* (1771), p. 57; F. Watson, *The Animal World Display'd* (1754), p. 55; E. Bancroft, *An Essay on the Natural History of Guiana* (1769), p. 174; Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), Female zebra (unpaged); G. Edwards, *Gleanings of Natural History* (1758-64), vol. I, pp. 6-8. On Madame Chimpanzee, see also R. Yerkes and A. Yerkes, *The Great Apes* (1929), p. 18; L. Schiebinger, *Nature's Body* (1993), p. 101.

150 *Post Boy*, no. 1,582 (Feb. 16-19, 1705/6); see also, for instance, *Daily Courant* (Feb. 28, 1719; Mar. 5, 1719); *London Gazette*, (Jan. 21-4, 1705/6); P. L. Farber, *The Emergence of Ornitology* (1982) discusses aspects of this sale in relation to birds.

151 E. Tyson, 'Carigueya' (1704), p. 1565; T. Pennant, *Synopsis of Quadrupeds* (1771), p. 25.

152 F. Willughby and J. Ray, *The Ornithology* (1678/1972), p. 2.

in order to make them truly heavenly, moving solely by the power of their wings in the sky;[153] relatively ordinary birds from relatively ordinary places would be claimed to 'be Natives of Places very distant and unknown' whereby they would be made 'more rare';[154] ordinary racoons would be turned into the more rare beavers, and relatively common 'beeve hogs' would be presented under exotic names:

> Those that made a shew of it pretend it was brought from the *East Indies*, and that the true name of it is a Bonasus, than [sic] which nothing can be more unlike. It is the business of those sort of people to impose upon the vulgar, and therefore they seldom give the right name to those animals that are well known; thus one of these people in his bills pretended there were two Beavers among his collection, which were nothing else than Racoons.[155]

Although some zoologists sometimes unmediatedly used the information about the animals provided by a merchant or a keeper,[156] they seem more often to have critically evaluated the information and, in some cases, the animals themselves before incorporating them into their works. Transgressing the border between learning and commerce meant entering a world where animals had a value which was primarily to be counted in gold, where 'private interest' hence, by definition, was always at play: transforming an animal-qua-commodity into an object of knowledge, involved, then, often a critical appropriation of the animal which was directed at cancelling out all those meanings which, at times quite literally, might have been inscribed on them in order to gratify private interests.

## The Zoologist's Space

So, animals of an also zoological interest had a social life in a variety of different social spheres in which they through the different uses that they were put to, and the different displays that they were made to take part in, gained a variety of different meanings: As trivial facts in the Republic of Letters, as prestigious objects of a fetishtic delight in the connoisseurs' cabinets, as objects of both learning and wonder in the public museums, and as objects-qua-commodities of principally wonder and amazement in the coffee-houses, fairs and shops.

The incorporation of this medley of animals into the zoological literature highlights the basic inclusiveness of the zoological enterprise with regard to empirical sources also at this level. At the same time it also points to a basic element of randomness in the compilation of zoological history. Without any institutional setting, which at the time could only be dreamt of,

153 The idea of the birds of paradise without feet was, in fact, prevalent in Europe well into the seventeenth century. See B. Jørgensen, 'Paradisfuglene' (1998), for an outline of the cultural and natural history of birds of paradise from the Renaissance to the present.

154 G. Edwards, *A Natural History of Birds* (1743-51), vol. II, p. 111.

155 R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. 38.

156 E.g. E. Tyson, *Orang-Outang, sive Homo Sylvestris* (1699), p. 14; T. Pennant, *Synopsis of Quadrupeds* (1771), pp. 171-2.

to organise the quest for specimens,[157] the zoologists took what came at hand. Although the zoologist, by sending his servants into the field, inquiring in letters to a wide range of correspondences, going on tour himself, or drawing up guidelines for travellers abroad or the curious at home, might attempt to direct the inquiry, his control over the empirical field remained only partial. Basically, one strongly suspects, due to a lack of funds in the natural history department which were present in other social spheres – like that of the private cabinet, the public museum, and the commercial market – the zoologist would have to turn to the, to some extent, random miscellany of animals circulating in these spheres. As Daniel Carey has pointed out, though focusing on natural philosophy and travel literature, this had the implication that 'Knowledge of nature was not an organized and structured entity but a diverse field [...]. The character of natural philosophy, viewed in this way, is episodic and miscellaneous rather than ordered and predictable, the pattern more of a peregrination rather than a rigorously organized enterprise.'[158]

The use of animals from a variety of spheres meant, furthermore, that the endeavour of zoology, also at this level of gathering of information, came to overlap with a diversity of other social spheres. The zoologist had to master the norms and forms of these social spheres – he had to know how to approach the rich and position himself as a client, he had to move in the inns and coffee-houses and at the fairs – in order to get to those specimens which would enable him to do his zoological work. This also meant that the zoologist would have to share social space with a number of people who did not view animals as trivial specimens, spanning the whole range of British society from the elite's connoisseur to the vulgar at the lower end of the social scale. Also in this sense zoology was, indeed, intermingled with society at large.

But the way the zoologist positioned himself vis-à-vis these 'others' in the various different spheres he moved in in quest of specimens indicates something of the exclusiveness of the zoological enterprise at the level of approach. George Edwards might have stood next to the Duke of Richmond in his museum, Thomas Pennant have stood next to a Mr Jones at the Leverian Museum, and Richard Bradley have sat next to a Mr Smith at the Slater's coffee-house, but, at least from the zoologists' point of view, that did not mean that when viewing the animals on display there they were experiencing the same thing, as we have seen the zoologists insisting on. In a sense, the difference lay in the eyes of the beholder: where the vulgar saw a monster, and the connoisseur a fetish, the zoologist would see a simple specimen. But, more basically, from the point of view of the learned, that difference in gaze stemmed from a

157 Most notably, the founders of the Royal Society hoped that some day they might turn the Society into an institution organising research into all domains of nature, cf. D. Carey, 'Compiling Nature's History' (1997), pp. 271ff. Before them, almost a century earlier, Bacon had hoped that an entire natural history could be compiled according to his standards under the auspices of the King, F. Bacon, *Preparative* (1620/1962), p. 251.

158 D. Carey, 'Compiling Nature's History' (1997), p. 276.

difference in discipline. Where the connoisseur would indulge in idle delight at the sight of his extraordinary stuffed animals, and where the vulgar like a beast or a child would respond with wonder and amazement at the new and strange, the zoologist had learned to overcome such deceptive passions through his self-government and to take a more reasonable stance towards the animals. Thanks to the virtues of philosophical detachment, he could gaze upon them without passion as if he saw them from beyond. He saw what everybody in principle would see, if they only had the discipline and knowledge to transcend their bodily urges and assume a perspective from nowhere. What this contrast of the learned to the vulgar and the connoisseur, in brief, elucidates is the ideal transparency of philosophical detachment: the zoologist's perspective from beyond was not too unlike the pure perspective of the angels.

Maintaining an attitude of 'philosophical detachment' towards the animals not only allowed the zoologist to transform extraordinary birds of paradise or wondrous sea unicorns into trivial facts. By virtue of this very appropriation of the animals, the zoologist also, in a sense, created a space of his own throughout all the social spheres which he moved in: a space for the registration of zoological facts. Although the zoological endeavour was inclusive at the empirical level, the zoologists positioned themselves and hence, also their field as exclusive at an experiential and conceptual level. There might not have been a single location for the production of zoological knowledge, but throughout all the social spheres the zoologists moved in they, nevertheless, managed to create a unified space for the natural history study of animals.

The ability of the scholar to observe rarities without being aroused by the feeling of wonder or delight might be one way of making a distinction between him, the connoisseur and the vulgar. Even more pertinent was his ability to transcend the matter of the empirical world and place the animal within an abstract order, once a specimen had been impartially grasped in all its detached, meaning-less materiality and been recreated as a zoological working object, a fact. It is to an analysis of this act of making order I shall turn to in Part II.

Part II

# THE SPIRIT OF ORDER

Chapter 5

# Transcending the Empirical Maze

'[T]he things which will be set forth in this history are not collected on their own account', Francis Bacon stated by way of explaining why not only the common and the most trivial, but also the most extraordinary ought to be recorded by the natural historian. '[A]nd therefore', he continued, 'neither is their importance to be measured by what they are worth in themselves, but according to their indirect bearing upon other things, and the influence they may have upon philosophy.'[1] The gathering of specimens of all kinds, in a range of different places and in a number of different ways which has been traced in Part I was only a prelude to natural history proper. In a sense, knowledge about such material, individual specimens was not knowledge at all. As Lord Monboddo stated hundred and fifty years after Bacon's death, in order to obtain 'knowledge' about 'a single or monadic thing', such as an individual animal or plant for example, it had to be compared to the 'general ideas [...] already formed' in the mind about other such things:[2] 'we have no knowledge', Monboddo concluded, 'but of the relations which things have to one another.'[3] It was only when the zoologists began to compare specimens to one another, determined similarities and differences between them and thereby were enabled to class them together in abstract categories, transcending both space and time, that knowledge, at least of a superior kind, could be attained about the animal kingdom.

Within zoology, as in related disciplines, the way to draw relations between animals would be through classification. It was, as Richard Kentish in his speech to the *Societas Naturæ Studiosorum* at Edinburgh stated 'by the aid' of classification that 'the study of nature is facilitated, the various appearances of bodies, which at first sight seem innumerable, are

1 F. Bacon, *Preparative* (1620/1962), p. 259/aphr. vi.
2 L. Monboddo, *Of the Origin* (1774), vol. I, p. 57, note*; cf. pp. 57ff.
3 Ibid., vol. I, p. 69, note*.

brought under our review'.[4] It was classification that allowed the zoologist to transcend the material level of infinite and fugitive specimens and commence approaching nature's singular order:

> When we take a view of the number of animals which exist in every part of our earth, we shall be ready to acknowledge, that it must be a matter of real difficulty to attain a tolerable acquaintance with them. The appearances of nature are not immutable. Many of her external forms are fugitive, and it is only by serious attention, and minute investigation, that we can fix upon points which she has characterised as indelible.
>
> When such characteristic marks are once discovered, we may proceed to system, and attempt the classification even of infinitude. Multiplicity will no longer constitute difficulty. It is by method that we facilitate study[.][5]

Within eighteenth-century British zoology, classification was equated with taxonomy. It was within the bounds of a taxonomic order that even 'infinitude' could be classified, and that proper knowledge about animals could be obtained.

In general terms, a taxonomy may be defined as that particular mode of categorisation in which categories or taxa (as I shall call this particular type of categories) are created so that they on a horizontal level are mutually exclusive; where taxa on one horizontal level are included into more general taxa on a higher level; and where each horizontal series of taxa is located on a specific level of generality. Taxonomic classification, then, orders phenomena in a pyramidal structure.

As obvious as this conception of classification might appear to be, it was, in fact, relatively new in the eighteenth century. Even though hierarchic classifications, resembling those of taxonomies, can be extrapolated from folk-biologies of innumerable societies across the world and through the ages[6] (where, moreover, other kinds of classifications structuring phenomena according to other principles also existed[7]), the eighteenth-century conception of taxonomy was still peculiar in the sense that no extrapolation here was needed, so to say. The eighteenth-century natural historians not only equated classification with taxonomy, they also gave taxonomic classification an explicit theoretical foundation, and – as we will see, in the works of some natural historians more than others and with respect to some concepts more than others – they made the generic concepts of the taxonomy explicit. This was something new, which allowed for an entirely new way of making sense of the natural world.

---

4 R. Kentish, *An Essay on the Method* (1787), p. 12.

5 Ibid., pp. 71-2.

6 The classic studies of folk biology includes Bret Berlin and partners' investigations among the Tzeltal Maya of southern Mexico, and the Aguaruna Jivaro of north and central Peru, B. Berlin, D. Breedlove, and P. H. Raven, 'Covert Categories' (1968); B. Berlin, 'Ethnobiological classification' (1978); Ralph Bulmer and M. J. Tyler's studies from Papua New Guinea, R. Bulmer, 'Why is the Cassowary Not a Bird?' (1967); R. Bulmer and M. Tyler, 'Karam Classification' (1968); and E. Hunn's studies also from Mexico, E. Hunn, *Tzeltal Folk Zoology* (1977). For a critique of these studies, see R. Ellen, 'Introductory Essay' (1979), esp. pp. 5ff; for a critical reassessment and review of folk biological classifications, see S. Atran, *Cognitive Foundations of Natural History* (1990), chs. 2 and 3.

7 R. Ellen, 'Introductory Essay' (1979), pp. 12ff., reviews some of these.

We have already seen in the previous chapters, and especially in Chapter 3, how certain kinds of taxonomic classifications were foreshadowed in the fashioning of facts. In the present and following two chapters, we shall look into how these facts were put in order, so to say, in the taxonomic schemes, by examining the construction of taxonomies in theory, as well as in practice. In this chapter, in order to encircle the peculiarities of the eighteenth-century conception of taxonomy as well as to elucidate its historical preconditions I shall commence with a brief outline of the history of taxonomic classification in European thought through a closer reading of three of its main protagonists – Aristotle, Andrea Cesalpino, and Carl von Linné – and by discussing the use and conceptions of taxa in Renaissance thought prior to Cesalpino more generally. The focus here will be not exclusively on zoology but also on botany. Especially during the Renaissance, botany was studied as part of medicine and received much wider attention than zoology, and it did to a significant extent, in particular, at the level of classification, as Émile Guyénot has observed, provide 'de modèle aux zoologistes et les guider dans leurs efforts.'[8] In the remainder of the present chapter, I zoom in on classification in eighteenth-century British zoology. I shall discuss the epistemological framework of taxonomic classification in broad outline and, for reasons which hopefully will become fully apparent as I go along, here give a more detailed analysis of the exegesis of species – the beyond comparison most important category in the British zoologists' taxonomies. In the following chapter, I turn to the practices of species formation, which were not always executed in perfect accordance with the theoretical formulation and which, furthermore, brought a whole cosmology into play which was not detailed in the definition of the species concept. In Chapter 7 I, finally, turn to the ways in which the entire taxonomic systems were established in practice.

## Classification in History

When the British zoologists were to tell the history of zoology, it was virtually always Aristotle who was honoured with being the 'father.' At the inaugural meeting of the Linnean Society in London, James Edward Smith, for instance, praised Aristotle for

> rising so superior to the darkness in which he lived, darting his penetrating glance through all natural, and establishing principles which a long course of ages of enquiry have but confirmed. With Aristotle begins the real history of science; and how much so ever he may have erred on particular points, the greatness of his conceptions and the justness of his ideas on the whole, entitle him to our high veneration, and we should correct his mistakes with awe. His labours in the investigation of the animal kingdom have laid the foundation of the knowledge we now possess[.][9]

8 É. Guyénot, *Les Sciences de la Vie* (1941), p. 7.

9 J. E. Smith, 'Introductory Discourse' (1791), p. 5.

Not only revered as a founding father, Aristotle's zoological works were still uses by the eighteenth-century zoologists. On an equal footing with contemporary descriptions, his descriptions of animals were incorporated into that stock of empirical knowledge, which the zoologists drew from. What was, furthermore, read as Aristotle's general classification of animals 'laid a foundation', as Kentish said, 'upon which the classification of the first methodological naturalists, as Gesner, Aldrovandi, Johnston, Charleton, Ray &c, have been founded.'[10] Moreover, it was Aristotle who most often received the honour of having introduced the concepts of species and genus, *eidos* and *genos* with his Greek concepts, into natural history and thereby had made it possible to reduce the multitudes of natural objects into a taxonomic order. Now, as I shall argue, following Pierre Pellegrin, a translation of Aristotle's eidos and genos into the taxonomic concepts of species and genus does not appears to be completely in accordance with the meaning Aristotle gave to his concepts: Reading implied interpretation. However, it still seems appropriate to begin this outline of the history of classification in European thought with Aristotle. Considered as a 'father' by both Renaissance and eighteenth-century descendants, Aristotle's classification signifies one beginning. Considered on its own, his classification would also seem to offer us an opportunity to become acquainted with a radically different way of making sense of the animal kingdom which, as a contrast to the eighteenth-century taxonomies, will allow us to specify the nature of taxonomic classification with more precision.[11]

## Classical Classification

In the following, I shall concentrate, in particular, on two aspects of classical classification, which will be of importance to us as we move on to discuss Renaissance and early modern classification. Firstly, I shall discuss Aristotle and Plato's notion of classification through the

10 R. Kentish, *An Essay on the Method* (1787), p. 72.

11 My reading of Aristotle, obviously, also implies an interpretation which, moreover, is not even my own. Aristotle's zoological works have received considerable attention in the history of ideas during the last hundred years, and the interpretations of his work, and not least of his concepts of eidos and genos, differ radically, at some points. In the following I shall draw heavily from Pierre Pellegrin's interpretation, and my reason for doing so is that Pellegrin, as far as I can determine, offers the most coherent analysis of Aristotle's work. Where other historians and philologists have had to postulate the existence of rather rudimentary inconsistencies in Aristotle's work – most notably that he employs eidos and genos in an incoherent fashion – Pellegrin manages to show in his reading that Aristotle's use of these terms are actually coherent within the framework of Aristotle's work, if we accept Aristotle's definition of these terms on their own, rather than translate them into contemporary notions of 'species' and 'genus'. P. Pellegrin, *Aristotle's Classification* (1986); for alternative readings, see D. Hull, 'The Effect of Essentialism on Taxonomy ' (1965); D. M. Balme, 'Aristotle and the Beginnings of Zoology' (1970); G. E. R. Lloyd, 'The Development of Aristotle's theory' (1961); A. L. Peck, 'Introduction' (1965), and to some extent S. Atran, *Cognitive Foundations of Natural History* (1990), pp. 86, 102, 104 and *passim*. Usually, 'eidos' and 'genos' are rendered as 'species' and 'genus' in translations of Aristotle's work, which is also the reason why these words, rather than the Greek terms, will appear in my quotations below.

method of logical division, developed within logic, and the definition of eidos and genos which this method gave rise to. Next I turn to an examination of Aristotle's classification of animals. Although in this case, Aristotle maintained the concepts of eidos and genos, he also criticised the method of logical division, and advocated another method of classification.

Classification in logic first: In the *Metaphysics*, Aristotle, following the rules laid down by Plato in the *Sophist* and *Statesman*, defined a 'method of division,' *diairesis*, and, in relation to that, eidos and genos as concepts of logic:

We must first inquire about definitions reached by the method of divisions. There is nothing in the definition except the first-named genus and the differentiæ. The other genera are the first genus and along with this the differentiæ that are taken with it. [...] And in general it makes no difference whether it [the definition] includes few terms or simply two; and of the two the one is differentia and the other genus; e.g. in 'two-footed animal' 'animal' is genus, and the other is differentia.[12]

The genos, then, signified a whole, which by means of logical division could be divided into two opposed eide. The divisions produced by this 'dialectical art', as Plato had it, would be made on the basis of only one criteria of differentiation in which 'the manifold diversities which are seen in a multitude of things' would dialectically be reduced to 'the bounds of one similarity [which] embraced them [i.e. the eide] within the reality of a single kind [i.e. genos].'[13] In this way, logical division defined its eide monothetically.[14] Applied to the animal kingdom, the animals could thus by means of logical division, according to Plato, be broken down into bipeds (two-footed) and quadrupeds (four-footed) on the basis of the number of the feet. The bipeds, including both birds and men, could be again divided into those with feathers and those without, etc.[15]

As it becomes evident here, by help of the method of logical division, a whole series of divisions could be made where a genos (e.g. animal kingdom) at one level of generality would be subdivided into two eide (e.g. bipeds and quadrupeds), one of these eide would in turn come to act the part of a genos (e.g. bipeds), which would be again subdivided into another two eide (man and birds), and so on. In each case, an eidos would be defined by its genos – what it had in common with the eidos it was opposed to – and by a differentia – that one feature by which it was distinguished from the other eidos in the genos. Performing this series of logical divisions until an eidos allowed for no further subdivisions, made it possible to define the essence of a thing by way of a definition within logic:

But we have a definition not where we have a word and a formula identical in meaning (for in that case all formulae or sets of words would be definitions; for there will be some name for any set of words whatever, so that even the *Iliad* will be a definition), but where there is a formula of something primary; and primary things are those that do

12 Aristotle, *Metaphysics* (1968-69), p. 516/VII.12.1037b.

13 Plato, 'The Statesman' (1961), p. 595/285.

14 My usage of 'monothetic definition' of taxa – the definition of a taxon by only one trait – here, and, later, of 'polythetic definition' – the definition of a taxon by more traits – are drawn from R. Needham, 'Polythetic Classification' (1975).

15 Plato, 'The Statesman' (1961), p. 585/266.

not imply the predication of one element in them of another element. Nothing, then, which is not a species of a genus will have an *essence* – only species will have it, for these are thought to imply not merely that the subject participates in the attribute and has it as an affection, or has it by accident[.][16]

It was this way of dialectically defining the essence of eide through a series of divisions proceeding downwards from the most general to the most specific, which later became known in its Latinised version as defining a species *per genus et differentiam*, by genus and difference. Through Andrea Cesalpino's and Carl von Linné's reinterpretations, a variant of this method of logical division would greatly influence the concept of species in early modern natural history, as we will later see. In contrast to their concepts, however, the Platonian-Aristotelian genos and eidos did not imply a specification of a level of generality on which the categories existed, as Pellegrin emphasises:

the concept of *genos* is classificatory but not taxonomic: as the term does not designate a fixed level of classification, to say of a collection of objects that it makes up a *genos* is not, from a classificatory point of view, to say anything more than that it is subdivided into *eide*. Similarly, to say of a being that it is an *eidos* is to say nothing more than that it had been carved out of a *genos* by slicing according to a specific difference, and says nothing at all about its absolute degree of similarity.[17]

Genos and eidos, then, were not anchored at a specific level of generality. They could move up and down, so to say, so that the category which had formed an eidos in one case, would form a genos in the next act of logical division which could then be divided into two other eide, and so on. The 'pair eidos/genos' only worked, as Pellegrin concludes, as 'a diairectical tool functioning at any level of generality at all',[18] and employed with a view to establishing a definition of the essence of the things concerned.

Although in the *Metaphysics*, Aristotle exemplified the method of logical division with zoological examples, in contrast to Plato, he did not find such monothetic divisions adequate for defining the essence of animals. Employing logical division within the zoological world resulted not only in the splitting up of 'natural groups,' Aristotle argued, but would also produce divisions by 'accident,' and furthermore brought about repetitions.[19] Instead, Aristotle argued, on one hand, one should rely on a 'common sense' experience of animals, and this, on the other hand, implied taking a greater number of 'axes of divisions'[20] into consideration in the definition of the zoological eide and gene:

The proper course is to endeavour to take the animals according to their groups, following the lead of the bulk of mankind, who have marked off the group of Birds and the group of Fishes. Each of these groups is marked off by *many differentiæ*, not by means of dichotomy. By dichotomy [...] either these groups cannot be arrived at at all (because the same group falls under several divisions and contrary groups under the same division) or else there will be one *differentia* only, and this either singly or in combination will constitute the ultimate species.[21]

16 Aristotle, *Metaphysics* (1968-69), p. 552/VII.4.1030a; emph. in org.
17 P. Pellegrin, *Aristotle's Classification* (1986), p. 69; emph. in org.
18 Ibid., p. 69; cf. E. Mayr, *The Growth of Biological Thought* (1982), p. 255.
19 Aristotle, *Parts of Animals* (1968), pp. 79-89/I.1.642b.5-3.643b.
20 P. Pellegrin, *Aristotle's Classification* (1986), p. 28, cf. p. 29.
21 Aristotle, *Parts of Animals* (1968), p. 89/I.3.643b; emph. in org.

The objective of zoological divisions, like in logic, was still to identify the essence of animals by dividing them into gene and eide. But in contrast to logic, according to Aristotle such division had, then, to be based on a number of differentiæ, including the 'parts of animals,' such as hooves, bones, feathers, blood, flesh, heart, organs of reproduction, colour and shape, their 'manner of life, their activities, and their dispositions',[22] as well as their *krāsis*, i.e. their 'blend' in the physical composition of heat, cold, fluidity and solidity.[23] Some of these differentiæ were, however, more essential than others. The heart, blood and respiratory organs as well as the reproductive organs were considered to be the material loci of the animal soul, and therefore they more readily provided access to the definition of an eidos' essence than the other parts of an animal.

In order to understand what Aristotle meant by 'essence' – another concept which through reinterpretations were to be taken up in Renaissance studies, as we already have seen indications of earlier (Chapter 2) – we need to take a closer look at his more general conceptualisation of nature. In simple terms, this conceptualisation relied on a doctrine of hylomorphism, in which every substance existing in the universe was taken to be a 'composite of immaterial form and a material substrate.'[24] 'Matter' was 'neither a particular thing nor a certain quantity': it was nothing in itself except that upon which the form would work in order to bring forth beings.[25] The 'form,' in contrast, was immutable, incorporeal and eternal, and it was this form which determined how the material particulars would combine and hence, be organised into complex structures, like that of an animal. The form defined the 'principles of change and becoming.'[26] It was this form, which was captured in the definition of a category of animals by genos and eidos, as the genos defined the 'transmissible type,' and the eidos what was 'actually transmitted in generation.'[27]

In sum, in logic, Aristotle, like Plato, employed a method of logical division, whereby a given category, a genos, would be divided into two, and only two, opposing eide. The essence of these eide could be then defined in terms of what they had in common, that is by their genos, in conjunction with the one differentia, which differentiated the two eide from each other. This monothetic definition of an eidos was what became known as defining *per genus et differentiam* in the Renaissance. Pointing out that logical divisions in the animal kingdom would not lead the student to natural groups, although employing the concepts of eidos and genos, in his zoological works, Aristotle classified animals polythetically, defining each eidos

22 Aristotle, *History of Animals* (1965-91), p. 7/I.1.487a.10ff.
23 A. L. Peck, 'Introduction' (1965), p. xv.
24 P. R. Sloan, 'John Locke, John Ray' (1972), p. 15.
25 Aristotle, *Metaphysics* (1968-69), p. 551/VI.3.1029b.
26 S. Atran, *Cognitive Foundations of Natural History* (1990), p. 94, cf. ibid., p. 98; D. M. Balme, 'Aristotle and the Beginnings of Zoology' (1970), p. 277.
27 P. Pellegrin, *Aristotle's Classification* (1986), p. 110.

along a number of axes. This classification, in turn, provided Aristotle with a means of constructing a definition of the essence of an eidos, according to their genos and the eidos differentiæ. It was such definitions rather than any all-embracing classificatory, and much less taxonomic concerns, which, as Pellegrin convincingly argues, appear to have been the objective of Aristotle's zoological work.

That was, however, not how it would be read by descendants in the Renaissance and in the early modern period. As already indicated in the quotations from Smith and Kentish above, Aristotle's zoological books could easily be interpreted as a taxonomic classification *in spe;* his relative concepts of eidos and genos could be translated into the taxonomically fixed concepts of species and genus; and as we shall see in the works of Cesalpino and Linné, the method of logical division could, just as easily, be transformed into a ruling taxonomic method. Before we turn to these reinterpretations of the classical authors it will, however, be useful to consider what went before that in the Renaissance.

## Renaissance Implications

Although Aristotle, of course, got a renaissance in the fifteenth and sixteenth centuries, and although what would be read as his grand division of the animal kingdom into five classes was appropriated by some Renaissance zoologists, it is noteworthy that it was only towards the very end of the sixteenth century with the botanical work of Andrea Cesalpino that any systematic attempts were made to apply Aristotle's, or indeed any explicitly defined concepts of classification within studies of nature.[28] Renaissance students of nature were certainly engaged in classifying natural objects also well before the time of Cesalpino, but for most of the Renaissance they did not concern themselves with discussions of methods of classification, nor did they offer any explicit definitions of the taxa of their classificatory systems.

Although, in many cases, classification itself was not necessarily the objective of Renaissance scholars' natural philosophy, but merely a means to satisfying other end, for the purpose of the present study it is still necessary to take a closer look at how plants and animals were classified during the Renaissance. At times, the classification of animals or plants would be entirely 'arbitrary,' as the eighteenth-century zoologists would later call it, as the plants and animals would simply be alphabetically listed in books, as Conrad Gesner did, for instance, in

28 Aristotle's zoological corpus became available to European scholars during the first decades of the thirteenth century, through the translation of Arab versions by Michael Scot and, later again in the same century, by William of Moerbeke. A. L. Peck, 'Introduction' (1965), pp xl-xlii. In the fifteenth and sixteenth centuries, Theodore Gaza's translation of *Historiae animalium* (minus book 10), *De partibus animalium*, and *De generatione animalium* became the principle Latin version of Aristotle's works. On this and on Gaza's often very liberal translations, see J. Monfasani, 'The Pseudo-Aristotelian *Problemata*' (1995).

each volume of (his own Latin version of) *Historiae animalium* (1551-87), or as Leonhart Fuchs did in his work on German plants. Often, however, groups of plants or animals would be organised along less 'arbitrary' lines. On one hand, the scholars would use traits of the plants or animals themselves, such as form, size, odour and/or colour in order to divide them into categories; on the other hand, the relation between an animal or a plant and something exterior to that would be utilised in the categorisation, as for instance its place of growing or living, its resemblance in form to other extra-botanical or extra-zoological objects, its use in medicine or as human food, etc. In most cases, a scholar would employ different axes of division when dealing with different groups of animals or plants and thereby far transcend the narrow limits of the monothetic logical division. Hence, Jerome Bock, minister and medicus in Hornbach, in his study of German plants, for instance, grouped them in such categories as plants with purple flowers, odorous herbs, those with medical roots, plants belonging in the vegetable garden, and cattle feed.[29] Likewise Giambastista della Porta in *Phytognamina* (1588), divided plants – and I am here paraphrasing Guyénot's description – into those which resembled the lung, those resembling the teeth, the heart, veins, fingers; those which looked like the horse, those with roots like a scorpion, those with flowers like a fly, and those with fruits like horns; others were classified according to their similarity with different human illnesses: some having fruit like dandruff, others like warts, some with roots like varicose veins. Other plants were classified according to their qualities, hence some beautiful plants would be grouped together because they all possessed the ability to make man beautiful, others were joined in a category because they being fertile made men fertile, etc. Finally, there was a group of plants with a special rapport with different planets.[30]

Referring to the classifications of della Porta, Bock and other contemporary herbalists, Guyénot concludes that, 'Les classes ne résultaient pas d'une analyse méthodique des caractères et ne reposaient sur aucune définition précise.'[31] And that, I will argue, was neither their purpose. Given the kind of knowledge that the Renaissance scholars were concerned with, this arrangement of plants should not come as a surprise. On one hand, botany was closely allied with medicine during this period and quite a number of botanists were physicians or apothecaries first, and herbalists next. The classification of plants according to etiological criteria served its purposes. On the other hand, and more generally, these classifications also became meaningful in relation to that interpretive mode, discussed in Chapter 2, of making sense of objects by inscribing them in a web of signification, of reading natural productions as analogies to, or signatures and resemblances of other things within as well as far beyond any narrowly defined domain of 'natural objects.' Within that scheme, the

29 É. Guyénot, *Les Sciences de la Vie* (1941), p. 11.
30 Ibid., p. 11.
31 Ibid., p. 16.

categories, their definition and boundaries, were not important in themselves – their relations, by way of resemblance or use, to other things were.

Building upon an unprecedented wide survey of some 6,000 forms of plants, in *Pinax theatri botanici*, published in 1623, Caspar Bauhin introduced a categorisation of plants based on a more exclusive examination of the plants themselves. With the help of the textual division of the book into sections, subsection and sub-subsections, the plants were grouped in hierarchic classes resembling those that would later be called 'families,' 'genera,' and 'species,' although in Bauhin's work, these categories did not have a name. In many cases, the contents of the classes, as well as their place in the hierarchy also appeared to foreshadow the taxonomic classifications of Ray, Tournefort and Linné in the late seventeenth and eighteenth century. However, as Scott Atran has argued, Bauhin's division of plants differed in crucial ways from those of later taxonomists. Hence, Bauhin did not offer any familial designations, specify any generic definitions, and nor attempt to distinguish the species by any characteristic marks as the taxonomists would do.[32] Furthermore, many taxa were not even named.[33] Atran concludes: 'To the modern eye, family-level and generic-level chains of species can be discerned in Bauhin – the most accomplished of the herbalists – [but] for him there is yet no clear distinction, nor conception of, species, genus or family.'[34] Here, as in the work of his Renaissance predecessors, taxa remained covert categories.[35]

If we turn to Renaissance zoological studies, the same pattern, albeit with variations, repeats itself. Less prone to make use of many of the relations entirely external to the field of animals in the classification (though as we saw in Chapter 2, not in the descriptions), the animals were still classed without any attempt at making the terms of the classes, or of the method of classification, explicit. Usually, it would be the figure, size, place of living and/or foraging that would form the basis for the divisions. Fish, for instance, would usually be defined as 'simplement animal vivant dans l'eau', hence, the category included not only what we would as fish, but also muscles, crayfish, worms, etc.[36] In Pierre Belon's *Histoire naturelle des Oisseaux* (1555), which was frequently cited by eighteenth-century zoologists for its empirical descriptions, we are given a clear example of the mode of division. In this book, birds were divided into six classes mainly with reference to feet, habitat and mode or place of foraging: 1) Birds 'qui vivent de rapine', 2) birds 'acquatiques à pied plat', 3) 'ceux qui hantent les rivages de lacs, marais, étand, rivières, qui n'ont le pied plat et qui ne nagent sur l'eau', 4) birds 'de

32 S. Atran, *Cognitive Foundations of Natural History* (1990), pp. 135-6.
33 É. Guyénot, *Les Sciences de la Vie* (1941), p. 14.
34 S. Atran, *Cognitive Foundations of Natural History* (1990), p. 137.
35 The notion of 'covert categories' in connection with classification is drawn from B. Berlin, D. Breedlove, and P. H. Raven, 'Covert Categories' (1968), and R. Bulmer and M. Tyler, 'Karam Classification' (1968), pp. 335, 379-80, and *passim*.
36 É. Guyénot, *Les Sciences de la Vie* (1941), p. 42.

campagne qui font leur nid sur terre', 5) birds 'qui habitent indifféremment en tous les lieux et se paissent de toutes sortes de viandes', and, finally, 6) 'oysillons qui hantent les hayes, buschettes et buissons'.[37] Though Belon did not make use of such relations of resemblances as for instance della Porta did in his botanical classification, Belon's classification of birds, as was also more generally the case in contemporary classifications of animals, was still not only based upon polythetic divisions, but also upon a recognition of the animal's relation to an exterior world. Most importantly, finally, the Renaissance scholars' zoological classification, like the botanical, was not made an object of theoretical contemplation and neither was their method of division addressed in explicit terms. 'Nulle part,' Guyénot observes with the hindsight of those who look through an evolutionary optic, 'on ne voit se dessiner le principe d'une méthode.'[38] The generic categories of classification remained tacit; the method of dividing was only revealed at the level of practice.

In a sense, the taxonomic concepts of 'species,' 'genus,' and 'families' – or whatever the taxa at different levels would be later called – did not exist for the better part of the Renaissance. It is true that the Renaissance scholars certainly took the existence of a basic level as well as one or two higher-level taxa for granted. But though taxa on different levels of generalisation were at work in the classification, as undefined, unspecified and unnamed categories they made their presence felt only by functioning covertly. That, however, was to change with the work of Andrea Cesalpino.

## Andrea Cesalpino's Explications

Towards the end of the Renaissance, Andrea Cesalpino, professor of medicine and botany at the Universities of Pisa and Rome and an erudite scholar well-versed in Aristotle, picked up the thread from Aristotle as he himself declared, and explicitly addressed the concepts of species and genus in relation to the study of nature in *De plantis, libri XVI* (1583). In the eighteenth-century, Cesalpino was with this work to be singled out as 'the first in line of systematists', in the words of Carl von Linné.[39]

Aristotle's Latinised concepts of species and genus did not come unmediated to Cesalpino, however. Though the concepts as yet had not been developed to assist in the taxonomic classifications of natural phenomena, they had been important concepts in logic through the Medieval Ages and Renaissance, as we might get a clear indication of in the work

37 Ibid., pp. 45-6.
38 Ibid., p. 62.
39 Linné, *Philosophia Botanica* (1751), § 54; quoted in A. Cain, 'Logic and Memory' (1958), p. 151.

of the mid-sixteenth-century Parisien scholar, Pierre de la Ramée or Petrus Ramus.[40] Like Plato, Ramus identified dialectics, or the method of logical division, as the most important method of logic, and hence, of philosophy. By dialectically organising the world's phenomena in a series of dichotomous categories, according to Ramus, the essence of each category could be demonstrated and hence defined, whereby man was provided with a window to God's ideas, i.e. to the defining ontic locus of the world. In this scheme, 'genus' was employed in reference to the general category that provided the starting point for the dialectic distribution, while 'species' referred to the parts that would be derived from the genus by the logical division. Ramus explained:

> [The genus is] the whole essential to its parts, as the species is the part of a genus; thus genus occurs for animals and for men, because it is a whole essential to parts; thus animal is the genus of singular animals, man is the genus of singular men, because it is a whole essential to parts; thus man is a species of animal, and Socrates a species of man.[41]

As it becomes evident here, the concepts of genus and species were in Renaissance logic, just like in the Classical, relative concepts which could be applied at different levels of generality, and which were generated in a dialectic process through which genus and species, and, in turn, genus and species, etc. would be distributed into an often tabulated scheme, thus:

Animals { Beasts; Men { Socrates; All other men } }

In principle, this dialectic distribution of things could be pursued in many different directions, and since every species could always come to act the part of a genus in a new series of divisions, the table of things did not have any centre, or any boundaries. It rather established itself as a dialectic continuum, as Ramus stressed: 'its centre every place and its circumference nowhere.'[42] As Walter J. Ong concludes in his analysis of Ramism, such decentred and in principle, unlimited tables established 'an ethereal contact among all items in a pulverised world.'[43]

Although Andrea Cesalpino clearly drew on this scholastic-Platonic dialectic method, in *De plantis* he also gave a new meaning to 'genus' and 'species' which made it possible for him to fix the categories and put clear boundaries to his distribution of plants into categories.

The purpose of *De plantis* was, as Cesalpino noted in the dedication of the book to Francisco dei Medici, to establish 'the collection of similar [plants], and the distinction of dissimilar, and the distribution of these into genera and species like armies, according to the

40 The following sketch draws on W. J. Ong, *Ramus* (1983).
41 P. Ramus, quoted in ibid., p. 207.
42 P. Ramus, quoted in ibid., p. 207.
43 Ibid.

differences indicated in the nature of things'.[44] Through the help of 'classes,' 'genera' and 'species' nature would be ordered into a hierarchic regime. To facilitate this classification Cesalpino from the outset, and in accordance with the ancient rules of logical division, set out to determine one criterion for the division. In the case of the most general taxa, the classes, drawing on a prevalent Renaissance analogy between animals and plants,[45] Cesalpino made use of what he considered to be the 'heart' (*cor*) of plants: the pith where the root and stem meet. With regard to the genera and species, the reproductive organs of the plants – the number, location, shape and structure of the parts of fructification – were settled upon as the *fundamentum divisionis*.[46] In both cases, the choice of fundamentum was legitimised by, in a neo-Aristotelian vein, referring to the essence of plants. Hence, the heart of the plants, on one hand, was regarded the locus of the 'vegetable soul'.[47] On the other hand, the reproductive organs were seen as cardinal for the transmission of that soul and hence also essential. As Cesalpino himself hinted and Scott Atran has highlighted,[48] though there might have been also more practical reasons for choosing the reproductive organs as the fundamentum for classification, Cesalpino's mode of justifying this choice still places him securely within a neo-Aristotelian scholastic tradition.

The singling out of a fundamentum for the division, provided Cesalpino with a basis for weighing the characters of plants, distinguishing unimportant or as they were called, 'accidental' differences from essential ones. By employing a – in some measure rather relaxed – method of logical division, on the basis of these essential characters Cesalpino was enabled to draw out his plants in a hierarchical order. At first, strictly following the precepts of logical division, the entire kingdom was divided into two classes, those with a hard cor, *Arbores*, and those with a soft one, *Herbæ*.[49] Relaxing the rules of logical division somewhat, Cesalpino then broke the classes down into genera and species, not by a simple dichotomous division, but by making multiple divisions of each class into numerous genera, and of each genus into numerous species. In accordance with the rules of logical division Cesalpino, however, proceeded from the most general level towards the most specific through the help of divisions, and thereby, was enabled to define the species *per genus et differentiam*, according to genus and species difference. Unlike in the series of logical divisions as laid out by Plato and Aristotle where class (as a *genus summus*), gene and eide would be purely relative concepts, in

44 A. Cesalpino, *De plantis* (1583), Dedicatory Epistle (unpaged).
45 Cf. P. R. Sloan, 'John Locke, John Ray' (1972), p. 12, n. 31.
46 A. Cesalpino, *De plantis* (1583), p. 29.
47 Ibid., p. 25.
48 Cf. Ibid., p. 28; S. Atran, *Cognitive Foundations of Natural History* (1990), p. 156. See also C. E. B. Bremekamp, 'A re-examination of Cesalpino' (1953), who has attempted to reconstruct the procedure of Cesalpino's classification.
49 A. Cesalpino, *De plantis* (1583), p. 25.

Cesalpino's reinterpretation class, genera and species had, like soldiers in the army, been transformed into fixed categories at specific levels of generalisation in a hierarchical system.

Though Cesalpino only sporadically contemplated on species, genera and classes as generic concepts, nevertheless in Cesalpino's work they were thus turned into explicit categories of thought. As Phillip Sloan has observed, such an explication only became possible as the study of plants was separated from 'the utilitarian concern of the herbalist and apothecaries',[50] and disassociated, I would add, from the Renaissance interpretive mode of making sense of natural objects by inscribing them in a web of signification. It was only as nature was made autonomous and natural objects disassociated from the rich context of resemblances and usage that it became meaningful to consider plants *an sich* and classify them solely on the basis of characters inherent to the plants themselves. What characterised Cesalpino's departure from common Renaissance practice was not only that the hitherto mainly implied, the covert taxa, had been made explicit. The very process of explication had involved a rethinking of the categories, their terms of definition and the relations between them as well. The explication had involved a transformation. In a word, what had been achieved were the establishment of a taxonomic system and the introduction of classes, genera and species as taxonomic concepts, though still in an embryonic form.[51]

## Linné's Orders

Cesalpino did not win many adherents in his own time.[52] But as we have already seen indicated above, he was later to be courted by eighteenth-century natural historians. Among these, the most notable continuities can be discerned in the work of Carl von Linné.

In the introduction to *Systema Naturæ*, Linné dogmatically laid down the rules for natural history classification thus:

> Methodical order, which is the soul of science, denotes every natural body at the first sight, so that it may be known by its own name; and this name indicates whatever the industry of the age has discovered with regard to the group to which it belongs: accordingly, despite the greatest apparent confusion of things, the order of Nature retains exactness to the highest degree. This systematic arrangement is most appropriately divided into branches, subordinate to each other, which have been given different appellations:

| | | | | |
|---|---|---|---|---|
| Class | Order | Genus | Species | Variety |
| Highest genus | Intermediate genus | Proximate genus | Species | Individual |
| Province | District | Parish | Ward | Hamlet |
| Legion | Battalion | Company | Mess | Soldier. |

Linné ended this description of the methods of classification with a quote from Cesalpino, which we have already encountered in part above:

50 P. R. Sloan, 'John Locke, John Ray' (1972), p. 13.

51 Cf. S. Atran, *Cognitive Foundations of Natural History* (1990), p. 157.

52 Ibid., p. 158.

'For, unless the collection of similar plants are made, and the distinction of dissimilar, and the distribution of these into genera and species like armies, according to the differences indicated in the nature of things, every thing that is known concerning them must remain in confusion and uncertainty'.*

*Caesalpinus.[53]

Method must reign! Taking the thread up from Cesalpino as well as from Renaissance scholasticism,[54] Linné declared that method, understood as a (relaxed) kind of logical division, had to take precedence in the study of nature in order to establish a *Scientia Naturæ*, a *certain* knowledge about nature's productions.[55] Linné's most explicit formulation of his method and of his taxonomic concepts was made in his tracts on botany, and I shall therefore start with these before turning to his zoological classification.

Species and genera, Linné stressed in *Genera Plantarum*, were God's creation made by fiat at the beginning of time:

1. In the beginning the thrice exalted CREATOR covered the medullary substance of the plant with the principles of which the various kinds of cortex consist, and in this way as many individuals were formed as there are now Natural Orders.

2. The vegetable prototypes of §1 were mixed with each other by the Almighty, and there are now so many Genera in the Orders as in this way new plants were formed.

3. The generic prototypes of §2 were mixed with each other by Nature, and in this way in every Genus so many Species were formed as at present exist.[56]

In the beginning, then, God had made the various forms of the medulla and the cortex, and mixing these, he had formed the various genera, and out of these, by another mixture, God created the species. For most of his life, Linné maintained that the species and the genera had been created once and for all and hence, were immutable: 'There are as many species as the infinite being created diverse forms in the beginning.'[57] Genera and species, then, were granted an ontological existence.

Like Cesalpino, Linné gave primacy to fructification in his classification of plants. He also maintained that the organs of reproduction contained the essence of a plant: 'fructification is the only true foundation'.[58] Therefore, also Linné reasoned that the fructification organs (in

53 C. Linné, *Systema Naturæ* (1766-68), vol. I, p. 13.

54 Lindroth goes as far as to conclude that Linné 'was a natural historian in the old-fashioned sense of the word, an inheritor and a consummator. [...] With Linnaeus an era in the history of botany reaches its culmination and conclusion: it is the end of scholastic botany. He gave science a new face – but no new soul. As a scientist Linnaeus somehow seems a stranger to his own times, antiquated and primitive'. S. Lindroth, 'Two Faces' (1994), p. 37; cf. A. Cain, 'Taxonomic Concepts' (1959), p. 305; C. E. B. Bremekamp, 'Linné's Views on the Hierarchy' (1953), p. 244. As we will see, however, Linné's scholasticism, like Cesalpino's, implied a reinterpretation, which set him apart from the Renaissance tradition at the same time as it placed him within it.

55 C. Linné, *Systema Naturæ* (1766-68), vol. I, p. 13.

56 C. Linné, *Genera Plantarum* (6th ed., 1764); quoted in C. E. B. Bremekamp, 'Linné's Views on the Hierarchy' (1953), p. 243; cap. in org.

57 Linné, *Philosophica Botanica* (1751), § 157; quoted in E. Mayr, *The Growth of Biological Thought* (1982), p. 258. Following some apparently credible reports on hybrid vegetable species and after having made a number of experiments himself, Linné towards the end of his life, however, suggested that mutations, which produced new and stable species, might be possible, and that it was only the genera that God had created in the beginning. The species would then be viewed as hybrid forms of these. Ibid., p. 259.

58 C. Linné, *Philosophica Botanica* (1751), § 26; quoted in S. Atran, *Cognitive Foundations of Natural History* (1990), p. 173.

the flower: calyx, corolla, stamen, pistil; in the fruit: pericarp, seed, receptacle) should be made the *fundamentum divisionis* in the classification of plants.[59] Based on the number, shape, proportion and situation of these sexual organs, plants were systematically divided into classes, orders, genera and species by means, again, of a relaxed mode of logical division, allowing more than two divisions to be made in each case and most often allowing for more than one trait of the essential sexual organs as defining differentiæ.[60] By means of this classificatory method, Linné was not only able to classify the plants he actually knew from experience, but, in principle, also to foretell which plants would be discovered and in advance, single out their position in the taxonomy (as more and more plants were discovered, Linné's hypotheses actually turned out to be correct in quite a few cases).[61]

Within the animal kingdom, the definition of the *fundamentum divisionis* was more complicated. Maybe from 'motives of propriety' as Arthur Cain suggests,[62] or maybe because they turned out to be unhelpful in the empirical analysis, Linné did not make use of the organs of reproduction in his classification of animals. In some ways like Aristotle, Linné based the definition of the higher taxa on the heart and blood, and for the same reason: they were defined as the locus of life.[63] Employing, once again, a method of logical division, the animals could be divided into six classes on the basis of heart and blood:

| | | |
|---|---|---|
| *HEART*: Two ventricles and auricles<br>*Blood*: Warm and red | Viviparous.<br>Oviparous. | *Mammalia*<br>*Avibus* [Birds] |
| *HEART*: One ventricle and auricle<br>*Blood*: Cold and red | Respiration voluntary.<br>Breathing by gills. | *Amphibiis* [Amphibia]<br>*Piscibus* [Fish] |
| *HEART*: One ventricle without auricle<br>*Blood*: Cold and colourless | Antennated.<br>Tentaculated. | *Insectis* [Insects]<br>*Vermibus* [Worms].[64] |

In subdividing these classes into orders, and the orders into genera and species, Linné primarily made use of the nutritive organs. Varying from class to class, though the principle remained the same, the specific organs differed: in mammals, primarily, teeth and feet; feet and beak in birds, feet in amphibia, fins in fish, wings in insects, and shells in worms.

In principle, by employing a relaxed mode of logical division, the classificatory system could be laid down from the top downwards. Although, especially in the animal kingdom, it proved impossible to pull through such a classification in practice, in particular, at the levels of genera and species, the very grid of the classificatory system, i.e. the determination of the

59 A. Cain, 'Logic and Memory ' (1958), p. 161; C. E. B. Bremekamp, 'Linné's Views on the Hierarchy' (1953), pp. 246, 249.

60 J. L. Larson, 'Linnæus and the Natural Method' (1967), gives a careful analysis of Linné's method of logical division, and traces in addition the changes of classification which occurred through Linné's classificatory career.

61 Cf. S. Lindroth, 'Two Faces' (1994), p. 28.

62 A. Cain, 'Taxonomic Concepts' (1959), p. 305.

63 C. E. B. Bremekamp, 'Linné's Views on the Hierarchy' (1953), p. 250.

64 C. Linné, *Systema Naturæ* (1766-68), vol. I, p. 19; emph. and cap. in org.

number of levels and the vertical order of those levels, was still fixed from the outset. In this scheme, Linné granted that the classes and orders were 'constructed [*struentis est*]' by man, but maintained, inversely, that through the analysis of the sexual organs of the plant or the heart and blood and nutritive organs of animals man would be able to discover the species and genera of 'Nature's work': 'all true knowledge about Species, and likewise about Genera [is] real.'[65] Proceeding by defining species *per genus et differentiam (sive differentias)* nature's own species and genera could be brought within the regime of the taxonomic system.

Linné, of course, was not only a theoretical systematiser. He also studied plants and animals in practice and even did so, not least thanks to his wide ranging network of gatherers all around the world, to an extent which few, if any of his contemporary natural historians did. In practice, Linné observed in *Systema Naturæ*, a natural historian had to start by investigating the particulars 'from which he ascends to more universal propositions,' in order to discover how each individual specimen should be classified.[66] However, the principles of that classification, as well as the parts of the animal or plant that should be taken into consideration, were, as we have seen, determined theoretically from the outset.[67] In practice, moreover, it turned out that plants and especially animals could not always be classified in perfect concordance with the rules laid down for the classification. Though the order of *Feræ*, for instance, was defined by six teeth, sharp fore teeth in the upper jaw, and one canine tooth in each side, the genus 'Didelphis' was still included within this order, though all of the species of the genus were in possession of seventeen teeth, so also was the 'Sorex' with nineteen teeth, and the 'Eninaceous' with twenty.[68] As a number of historians have noted, in Linné's work there was an underlying tension between experience and the demands of logical method; in the end it was, usually, logic that won:[69]

> The Science of Nature is founded on an understanding of Natural Method and a systematic nomenclature; this, like the clew of Ariadne, is the only reliable way to penetrate Nature's meanderings[.][70]

Method became the *sine qua non* of Linnean taxonomy.

In Linné's hands, the classes, orders, genera and species not only became thoroughly explicit categories of thought, but also became explicated as a function of his downward method of logical division. In principle, entirely logically built up (if not always so in practice), as a hierarchy of fixed categories, the taxonomic system blossomed in Linné's work: the concepts of species, genera, orders and classes had come only to make sense in relation to the

65 Ibid., vol. I, pp. 13-4.
66 Ibid., vol. I, p. 14; also cf. C. Linné, 'De curiositate naturali' (1748/1962), p. 20.
67 Also cf. A. Cain, 'Logic and Memory' (1958), p. 149.
68 As R. Kentish pointed out in *An Essay on the Method* (1787), p. 77.
69 Cf. A. Cain, 'Logic and Memory' (1958), p. 149; S. Lindroth, 'Two Faces' (1994), p. 241; W. T. Stearn, 'The Background' (1959), p. 18.
70 C. Linné, *Systema Naturæ* (1766-68), vol. I, pp. 13-4.

system, though an empirical analysis was still needed to discover the actual species and genera.

## Empiricist Classification

Method could only be made a *sine qua non* in classification upon the presupposition of there being an essence that could be discovered by a human observer and hence, be made to act as fundamentum divisionis in the methodological arrangement. Within an eighteenth-century British context an, in the words of Phillip Sloan,[71] it became an 'epistemological impossibility' to discover such a fundamentum divisionis because, as we saw in Chapter 2, man here was conceived as being incapable of discovering the essence of things. Indeed, the most commonly voiced contemporary critique of Linné's work in Britain appears exactly to reflect an uneasiness with and a lack of acceptance of Linné's claim that his method should in some measure be 'natural' and his system, even if only at the lower levels, should reveal the essence of nature and hence, reflect nature's species and genera. Within the eighteenth-century British context, the method of logical division, however relaxed it might have become, was generally not accepted to lead to such revelations. Hence, R. Brookes characterised Linné's system as 'speculative', and 'in contradiction to nature and experience,' and Brookes consequently rejected it as a guide for the zoological study because his own 'design', inversely, was 'not to amuse the speculative, but to direct the industrious'.[72] Richard Kentish, though citing Linné's zoological classification at length, judged it 'arbitrary and unnatural'.[73] William Smellie declared that Linné's attempts at 'defining vegetables and animals' had been 'abortive'.[74] Even Linné's first British biographer, Richard Pulteney, otherwise an ardent disciple of Linné, observed that a '*natural* method' was 'so far unknown' and, hence, that Linné's system was but an '*artificial* arrangement'.[75] Although Linné's works – both in some cases his arrangement and in more cases his descriptions of animals and very often his names –were certainly made use of in eighteenth-century British zoology, as well as in botany, his order of animals was not acknowledged by the majority of British zoologists to reflect the order of nature, and his 'natural' method of division, based on only one or a few essential characters, was not adopted. To explore what the British zoologists did instead, it will be necessary to firstly take a closer look at the impact that the idea of man as incapable of perceiving essences had upon the status and understanding of zoological taxa.

71 P. R. Sloan, 'John Locke, John Ray' (1972), p. 364.
72 R. Brookes, *A New and Accurate System* (1763-72), vol. VI, pp. v, vi.
73 R. Kentish, *An Essay on the Method* (1787), p. 75.
74 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, pp. 4-5.
75 R. Pulteney, *A General View* (1781), p. iv; emph. in org.

In the *Essay* Locke, himself a consumer of natural history literature[76] and often employing examples from the natural world as illustrations of his philosophical argumentation, brought out the implications of man's lacking ability to perceive essences for the conception of species and genera (and it should here be remembered that the *Essay* was published 29 years prior to the first edition of *Systema Naturæ* in 1735 and hence, was not targeted against the Linnean system but against the scholastic tradition on which Linné was to draw). As man could not perceive essences, Locke argued, it became 'evident' that what was called 'the *essences of* the *sorts, or* (if the Latin word pleases better) *species* of things, are nothing else but these abstract ideas' made in the mind of man:[77] Man's idea of the essence of things was but 'nominal',[78] and hence the definition of species would also be relative to man:

> [The] boundaries of species, are as men, and not as nature makes them, if at least there are in nature any such prefixed bounds. 'Tis true, that many particular substances are so made by nature, that they have agreement and likeness one with another, and so afford a foundation of being ranked into sorts. But the sorting of things by us, or the making of determinate species, being in order to naming and comprehending them under general terms, I cannot see how it can be properly said, that nature sets the boundaries of the species of things: or if it be so, our boundaries of species, are not exactly conformable to those in nature.[79]

The case was not necessarily that there did not exist species in nature, nor that they were not defined by essences (Locke is not entirely clear on this point); the case was principally that man could not with any kind of certainty discover that essence and hence the species:

> I would here not be thought to forget, much less to deny, that nature in the production of things, makes several of them alike: there is nothing more obvious, especially in the races of animals, and all things propagated by the seed. But yet, I think, we may say, the *sorting* of them under names, *is the workmanship* [of man...]. For two species may be one, as rationally, as two different essences be the essence of one species: and I demand, what are the alterations may, or may not be in a *horse*, or *lead*, without making either of them to be of another species? In determining the species of things by our abstract ideas, this is easy to resolve: but if anyone will relegate himself herein, by supposed real essences, he will, I suppose, be at loss: and he will never be able to know when anything precisely ceases to be of the species of a *horse* or *lead*.[80]

For the classification of animals, this rejection of man's ability to perceive essences meant that also the scholastic method of division had to be rejected, as man had no longer an essential fundamentum divisionis to take his point of departure from: 'But though defining by *genus* and *differentia* [...] be the shortest way; yet, I think, it may be doubted, whether it be the best'.[81] Instead, Locke declared, 'we are to take a quite contrary course': 'the want of ideas of their real essences, send us from our own thoughts, to the things themselves, as they exist. *Experience here must teach me,* what reason cannot'.[82]

76 P. R. Sloan, 'John Locke, John Ray' (1972), pp. 21-2.

77 J. Locke, *Essay* (1706/1997), p. 372/III,iii,12; emph. in org.

78 Ibid., p. 395/III,vi,6.

79 Ibid., p. 409/III,vi, 30.

80 Ibid., pp. 372-3/III,iii,13; emph. in org.

81 Ibid., p. 370/III,iii,10; emph. in org.

82 Ibid., p. 569/IV,xii,9; emph. in org.

No knowledge of essences, no certain definition of species, no possibility of employing a method of logical division in downwardly constructing a taxonomic system, no *scientia* of nature, Locke concluded: experience was all man could build his only probable knowledge of nature on.[83] So far, Locke was in perfect harmony with the more general tenets of British natural history and with the British zoologists. John Ray, often celebrated as 'the founder of systematic Zoology'[84] by his eighteenth-century descendants, and in any case, the first natural historian to thoroughly conceptualise species in non-essentialistic terms, had even before Locke, in the *Essay*, drew out all the philosophical implications of the human predicament of knowledge for classification made an analogous argument for what I, with a concept introduced in Chapter 2, shall call an 'empiricistic' approach to taxonomic classification.

Although Ray both acknowledged his debt to Cesalpino and to some extent followed his mode of classification of plants,[85] and though Ray in some of his works, made use of divisions which would seem to resemble those brought about by a relaxed method of logical division,[86] from the beginning he undermined its philosophical foundation, and proposed an alternative conception of classification. In *De variis planetarum* from 1696, after having stated the impossibility of perceiving essences and instituted sensation as the basis for any knowledge of nature,[87] Ray pointed to the consequences for the classification of plants (and this held good for the classification of animals as well[88]):

Therefore, since the essences of things are unknown to us, certainly the essential generic characters could not be known to us. However, it is probable that those plants which agree in several attributes, conform in their nature. Therefore, it cannot be properly said that the flower or fruit in plants are essential parts.[89]

Without perceptible essences, then, it was not, as Cesalpino had earlier done and Linné was later to do, possible *a priori* to distinguish between 'accidental' characters, which could be entirely discarded with in classification, and 'essential' characters which could be used as the fundamentum divisionis in classification:

According to the rules of logic, genera should be derived and species constituted by essential difference. But since the essence of things are unknown to us, certain characteristic accidents [...] should be taken for those differences or essential characters. When such characters are not given, nor even known to us, the collection of as many accidents, common to all species of a genus, should be taken for differentiæ, as are not all together in some genus.[90]

83 Ibid., p. 570/IV;xii,10.
84 T. Pennant, *British Zoology* (1768-77), vol. I, p. xiii.
85 Cf. P. R. Sloan, 'John Locke, John Ray' (1972), p. 29.
86 Most clearly visible in his classification in J. Wilkins, *An Essay* (1668), and in his joint work on ornithology with Francis Willughby, *The Ornithology* (1678/1972).
87 J. Ray, *De variis planetarum methodis dissertation brevis* (1696), p. 5; quoted in P. R. Sloan, 'John Locke, John Ray' (1972), pp. 43-4.
88 Cf. J. Ray, *Historia Planetarum* (1686), p. 40; quoted in S. Atran, *Cognitive Foundations of Natural History* (1990), p. 162.
89 J. Ray, *De variis plantarum methodis dissertation brevis* (1696), p. 5; quoted in P. R. Sloan, 'John Locke, John Ray' (1972), pp. 43-4.
90 J. Ray, *De variis plantarum methodis dissertation brevis* (1696), p. 23; quoted P. R. Sloan, 'John Locke, John Ray' (1972), p. 45.

As the theoretical weighing of characters had become an epistemological impossibility, the natural historian also by Ray was propelled from the reign of reason and logic to the observation of nature itself where all features of living beings would in principle be equally important for classification.

When Ray had first set out his rules for an empiricist approach to classification in botany and zoology (the first seeds of this formulation is to be found in his classification of animals and plants in Wilkins' *Real Character* from 1668[91]), he was severely attacked by adherents to the scholastic-essentialistic approach for his neglect of the method of logical division, and for making use of a variety of different characters when defining botanical and zoological species. Said Dr Robert Morison, physician to Charles II and professor of botany at Oxford University and in addition leader in the campaign against Ray in the 1660s, about Ray's classification in Wilkins' book: 'I saw there only a chaotic muddle of plants: I learnt nothing: I will show you the faults and confusion some other time. We must not waste time on them now.'[92]

By the turn of the century, however, virtually all of the British zoologists had acknowledged the human predicament of knowledge and had given up the attempt to theoretically determine any essential characters in advance and employ a method of logical division in constructing taxonomic orders. Hence, Thomas Pennant in his *Synopsis of Quadrupeds,* for instance, concluded after having observed how 'ignorant' man was, that,

> We ought, therefore, to drop all thoughts of forming a system of quadrupeds from the character of a single part: but if we take combined characters of parts, manners and food, we bid much fairer for producing an intelligible system, which ought to be the sum of our aim.[93]

In the same manner, an anonymous reviewer in the influential *Monthly Review* observed that 'Enquiries into the works of nature' ought to be carried out, 'not in the method of hypothesis and vain conjuncture, but in the only just and satisfactory method of experiment and observation, and with a view to illustrating the wisdom and goodness of the great parent of the universe'. Only thus could they become 'extremely useful'.[94]

In line with the exegesis of natural history requirements voiced more generally during this period, in theory, also the zoologist had to start with what could be observed in nature – the innumerable, fleeting specimens – if he wanted any knowledge about its order, and even that of a more uncertain kind.

---

91 J. Wilkins, *An Essay* (1668). In this work, Ray made use of various characters in plants and animals which were defined as 'accidents' and hence, unimportant for classification within scholastic natural history. It was only later that Ray thoroughly developed the theoretical justification outlined above for this kind of classification. On the developments in Ray's thought, see P. R. Sloan, 'John Locke, John Ray' (1972), pp. 27ff.

92 Morison, *Præludia Botanica* (1669), p. 476, quoted in C. E. Raven, *John Ray* (1986), p. 184. See ibid., pp. 183-6, for a fuller treatment of the controversy.

93 T. Pennant, *Synopsis of Quadrupeds* (1771), p. ix.

94 *Monthly Review*, vol. 6 (May, 1752), p. 367.

This repositioning of the zoologist vis-à-vis nature, as in one sense, a tabula rasa – a man without prior knowledge about essences or suitable methods – involved a redefinition of the taxa and, in tandem, a reformulation of the act of classification. It is to the consequences of this epistemological repositioning of man, and to the reformulation of the act of classification I now shall turn.

As we saw above, in scholastic-essentialistic classification, such as that of Cesalpino or Linné, it was possible and even required to start classification at the most general level, and construct the taxonomic scheme from the top downwards. A taxon would thereby be defined partly, in terms of its membership in a higher level taxon, and partly, in terms of what distinguished it from the other taxa of the same level: per genus et differentiam. As we have also already seen indicated above, in principle, the empiricist zoologist, inversely, had to start from the bottom, at the level of perceptible matter, and work his way up in order to build up the more general taxa of the taxonomic system. Consequently, the category of species gained an unprecedented prominence as the basic level taxa, as the first building blocks so to say, in the structure of the taxonomic system. Therefore, it was also the species that received the prime and most explicit attention in the theoretical discussions of the taxonomic system.

In practice, the zoologists did not approach to the specimens as tabulae rasae, and I shall later return to some of the more important presupposed ideas implicated in the construction of taxonomy. But it is worth first taking a closer look at how it was imagined that the taxa ought to be formed inductively as if by an empty mind. In the discussion of this point below the main focus will, following the zoologists, be on the formation of species, and I shall in this chapter only more sporadically touch upon the higher level taxa. In the following chapter I shall look into the factors that, together with the exegesis of species, conditioned the formation of species in practice by zoologists, who had always already a knowledge about nature and the universe, and who, in practice, could never act as tabulae rasae. In Chapter 7 I shall, finally, turn to the formation of the entire taxonomic system.

## The Exegesis of Species

### *The Cognitive-Philosophical Space of Species Formation*

In principle, the movement from the level of specimens to that of species was quite straightforward. Starting with the simple ideas which the specimens had made upon the mind and which reflected their secondary qualities, the zoologist would turn inward and within the space of his mind, compare those ideas to each other and through that comparison be enabled to generalise. 'By comparing things together,' Lord Monboddo observed, 'we discover their differences as well as their likeness.'[95] By doing so,

it appears, that by the mind's abstracting from any individual one or more sensible qualities, and perceiving these to exist in other individuals, the *idea* is formed, and the *one* is made out of the *many*. And what makes this one, is *that one thing* which is *common* to the *many*; for *that* gives them an union, and, as it were, a band or tie, which bundles them up together.[96]

Through this act of comparison the mind would by identifying the one in the many in effect transcend the material level of matter:

When the idea is perfectly formed, the several *subjects* in which this one common thing exists, are entirely laid out of the view of the mind, and the *one common thing* is only considered; that is to say, in other words, *the likeness*, or, to speak more accurately, *that in which they are like*, is only considered, not the *things* that *are* like; the *commonness*, if I may so speak, that is, *the things which is in common*, not the *things* which *have* it in common.[97]

Comparing ideas, determining similarities and differences between them and thereby discovering the abstract one in the material many, was the basic method of classification. Leaving the world of matter behind, through such a classification, as James Harris said after having detailed the same process in identical terms, the mind would 'come[...] to behold a kind of *superior* Objects; a new Race of Perceptions, more comprehensive than those of Sense'.[98] A 'superior object' like, for example, a species.

Making such an abstract idea relied upon a prior distinction between material object and mental image. Not everyone was considered to be able to make such a distinction, however. As David Hume observed 'all the unthinking and unphilosophical part of mankind, (that is, all of us, at one time or other)' would 'suppose their perceptions to be their only objects and never think of a double existence internal and external, representing and represented.'[99] From a learned point of view, the matter looked entirely different. As already Descartes[100] and later Locke[101] had stressed, the objects of the world and their representation in the mind were two entirely different things. In the words of Hume:

But this universal and primary opinion of all men is soon destroyed by the slightest philosophy, which teaches us, that nothing can ever be present to the mind but an image or perception, and that the senses are only the inlets, through which these images are conveyed, without being able to produce any immediate intercourse between the mind and the object.[102]

It was alleged that the unphilosophic part of mankind, in other words, the vulgar was incapable of appreciating the distinction between matter and mental representation, and thereby was of forming abstract ideas. Lord Monboddo explained:

95 L. Monboddo, *Of the Origin* (1774), vol. I, p. 68, note*.
96 Ibid., vol. I, p. 62; emph. in org., note excluded.
97 Ibid., vol. I, p. 68, note*; emph. in org.
98 J. Harris, *Hermes* (1751), pp. 362-4 [sic]; cap. and emph. in org.; note excluded.
99 D. Hume, *A Treatise of Human Nature* (1739-40/1978), p. 205.
100 Cf. C. Taylor, *Sources of the Self* (1989), p. 143ff., and J. Cottingham, *Descartes* (1988).
101 Cf. J. Locke, *Essay* (1706/1997), p. 136/II,viii,15, and *passim*, esp. Book II.
102 D. Hume, *An Enquiry* (1748/1988), p. 137.

[T]he idea of the man of science, or philosopher [...] is very different from that of the vulgar. For, in the *first* place, it is entirely separated and abstracted from every thing material, all the several particular objects from which it is collected being laid out of the view of the mind, and *that* only which they have *in common* being considered; whereas the vulgar never perfectly make this separation, but still continue to see the *one* only in the *many*: So that among them, *man, e.g.* is no more than one name given to *Peter, James*, and *John*, and other individuals of the species; and when they want to explain their idea of any thing, they cannot do it without an *example*; that is, without shewing to the person with whom they converse, the material image of the thing in their own minds.[103]

By introducing a distinction between a common-sensual way of experiencing ideas as material things and a philosophical appreciation of an ontological distinction between the two, the philosophers at this level separated common experience from philosophical cognition, and hence, drew a fundamental line of distinction between the common people and the philosopher, as Charles Taylor points out.[104] The vulgar might have been able to assist with information about individual specimens, as we saw in Chapter 3, to be observed at a material spatio-temporal level because such information, for the scholar and vulgar alike, could be obtained by universal common-sensual perception (even if, as we saw in Chapter 4, the vulgar frequently tended to be all too amazed by what they saw). But they were from the outset excluded from participating in the formation of abstract ideas, like that of species. This task was left for those who knew how to transcend mere matter by generalising through comparison.

### *The Common and Particular, and the Essence of Species, Nevertheless*

Even for the learned that were deemed capable of distinguishing between idea and object, making such a generalisation was not an easy task, however. For the empiricist, the problem arose that between any two things, or between any two ideas as it correctly were, there were always innumerable differences: 'the differences of things are innumerable;' Lord Monboddo observed, 'because every thing is different from that which it is not.'[105] Locke exemplified the predicament:

[T]here is *no one thing*, whether simple idea, substance, mode, or relation, or name of either of them, *which is not capable of almost an infinite number of* considerations, in reference to other things; and therefore this makes no small part of men's thoughts and words. *V.g.* one single man may be at once concerned in, and sustain all these following *relations*, and many more, *viz.* father, brother, son, grandfather, grandson, father-in-law, son-in-law, husband, friend, enemy, subject, general, judge, patron, client, professor, European, Englishman, islander, servant, master, possessor, captain, superior, inferior, bigger, less, older, younger, contemporary, like, unlike, *etc.* to and almost infinite number[.][106]

More specifically, the zoologist William Smellie made the case with regard to animals:

103 L. Monboddo, *Of the Origin* (1774), vol. I, pp. 96-7; emph. in org.

104 C. Taylor, *Sources of the Self* (1989), p. 146. Taylor's observation is made in relation to Descartes' philosophy.

105 L. Monboddo, *Of the Origin* (1774), vol. I, pp. 68-9, note*.

106 J. Locke, *Essay* (1706/1997), p. 290/II,xxv,7; emph. in org.

> [W]hen the productions of nature are [...] scrutinised by the eye of philosophy, the number of their relations and differences is discovered to be almost infinite; and their shades of discrimination are often so delicate, that no sense can perceive them.[107]

The consequence of the empiricist's lack of means to weigh characters, which Ray pointed to above, becomes evident here: Without a notion of a somehow accessible essence which could guide the choice of differentiæ, the empiricist zoologist was, in principle, left with all the differences in the world to contemplate on. This was, of course, an impossible position, and the British zoologists were not, in fact, left entirely at loss in the meanderings of nature. Even though they could not claim any prior knowledge about essential characters, they still entertained ideas about the nature of specific differences which, in most cases, made it possible to reduce the number of useful differentiæ drastically – it was not every difference which made a difference in the formation of species. As we will see, to begin with, it was only common and peculiar traits that were of significance in the formation of species.

First of all, as Lord Monboddo made clear in general terms, in singling out traits in specimens appropriate as differentiæ of a 'perfect idea,' like a species, one should distinguish between 'accidental' qualities and those which were '*characteritical of the species*', that is to say those which were '*common* to the species'. In defining the species of man, for instance, it would not do to highlight 'colour or size, or any other property belonging to the individuals' as these would not be the same in all men. Secondly, the qualities should be '*peculiar*' to the species. It would hence not work to 'make my idea of man to be that of a creature walking on two legs, or a horse, that of a creature with four legs', since birds also had two legs, and virtually all quadrupeds had four. Finally, referring to Plato, Monboddo stressed that the qualities singled out needed to reflect on the '*nature* and *essence*' of the species and thus define 'the principles of things', like in man his capability of 'intellect and science'. However, in contrast to Plato, in the empiricist's scheme this essence could only be posited *posterior*, after the analysis of the common and peculiar perceptible traits and as a summation of these:[108]

> If it be asked, from whence we get this knowledge of likeness and difference, which, I say, is all we know of the nature of things? I answer, from the source of all our knowledge in our present state of existence, I mean the senses: And, particularly with respect to material objects, we have that knowledge of them directly and immediately from the senses. For we know nothing of their likeness or difference, except from their operations upon our organs of sense. Those which operate upon our organs in the same way, we say, are of the same kind; those which operate in a different way, of a different kind.[109]

The knowledge of essences, on this account, was based on a knowledge of similarities and differences between perceptible qualities.

Not everybody agreed with Lord Monboddo on this point. Most notably Locke, as we have already seen indications of above, argued that it was impossible for man to ascertain the limits of the essence of things by an analysis of such 'sensible qualities':

107 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, p. 2.
108 L. Monboddo, *Of the Origin* (1774), vol. I, pp. 98-101; emph. in org.
109 Ibid., vol. I, pp. 70-1 (wrongly paginated as p. 17), note*.

This then, in short is the case: *nature makes many particular things, which do agree,* one with another, in many sensible qualities, and probable too, in their internal frame and constitution: but 'tis not this real essence that distinguishes them into species; 'tis *men,* who, taking occasion from the qualities they find in them, and wherein, they observe often several individuals to agree, *range them into sorts, in order to their naming* [...]: and in this, I think, consists the whole business of *genus* and *species.*[110]

It was a similar idea of species and genera as nothing else but products of the understanding which the French naturalist, Count de Buffon would later bring into play within zoology, arguing as he did in his first essays that 'puisqu'il n'existe réellement dans la Nature que des individus, & que les genres, les ordres & les classes n'existent que dans notre imagination.'[111] In Locke as in the early Buffon the species had lost their ontological status.

All the British zoologists, that I know of, did, however, follow suit with Lord Monboddo rather than with Locke, hence assuming that they in fact did approach the species of nature through their analysis of similarities and differences of multiple characters and identification of the common and peculiar traits. When that could be assumed it was due to the fact that the secondary qualities of things not were produced fortuitously, but were systematically produced alike in all specimens of the same species by the species' defining essence. Ray explained:

[T]he essences of things are unknown to us, and therefore the essential Differences of them also. However, since from the same essences flow the same qualities, operations and other things which are accidents, there can be no surer mark of essential, and so of generic, agreement than to have many common attributes, that is, many parts and accidents similar, or to have the whole facies, habit, and structure the same.[112]

Although the formation of species could only be made on the basis of perceptible information supplied by the secondary qualities, those secondary qualities still somehow conveyed knowledge about the essence of species, even if it was only of an indirect kind,. So, though the predefined essential-accidental distinction of Cesalpino and Linné within the empiricist context had been translated into a common and peculiar, or as these in conjunction most often would be called within zoology, a 'characteristic'-'accidental' distinction, multiple characteristics would still for most empiricist zoologists (if not for all philosophers) indicate an essence. Even though the method had been fundamentally altered and the mode of approaching essences redefined, the very idea of an essence generating the visible qualities remained unaltered. And that, in turn, allowed the empiricist zoologist to assume that the species he formed through induction, at least in principle, corresponded to species in nature.

---

110 J. Locke, *Essay* (1706/1997), pp. 412-3/III,vi,36; emph. in org., editor's note excluded.

111 G.-L. L. Buffon, 'Premier Discours' (1749/1954), p. 19. For an analysis of the philosophical underpinnings of Buffon's position and his critique of taxonomic categories, see P. R. Sloan, 'The Buffon-Linnæus Controversy' (1976).

112 J. Ray, *De methodo plantarum in genere* (1703); quoted in A. Cain, 'Logic and Memory' (1958), p. 156.

### *The Immutability of Species*

In principle, traits singled out as 'characteristic' should also be 'indelible.' We saw already Richard Kentish point to the importance of this in the introduction to this chapter in his speech to the learned society at Edinburgh: The purpose of the minute examination of animals was to determine those characters which nature 'has characterised as indelible.' Similarly, Smellie stressed that,

> On every animal Nature has imprinted a certain *character*, which is indelibly fixed, and distinguishes the species. This character we discover by the actions, the air, the countenance, the movements, and the whole external appearance.[113]

In order to account for the indelibility of the species characters, the zoologists had recourse to a creationistic frame of explanation. On one hand, it was assumed that all species had been created by God once and for all at the beginning of time: 'the number of species in nature is certain and determined,' as Ray observed, '*God rested on the sixth day, interrupting his great work* – that is, the creation of new species.'[114] Since then, no changes had been made, and hence, the characteristic marks in the species remained to the present time as like they had been in the time of Pliny and Aristotle, as Richard Brookes pointed out.[115]

To account for why no changes had occurred in species, it was, on the other hand, also argued that species would always reproduce themselves and hence also their characteristic marks. Said Ray, echoing Cesalpino's assertion of 'like everywhere engenders like':[116] 'every kind has its seed.'[117] Although some philosophers such as, again, Locke claimed that nature sometimes made 'monstrous productions' by pairing for instance a rat and a cat and that species consequently could 'not be distinguished by generation',[118] all of the empiricist British zoologists, and incidentally also Buffon in his later writings,[119] maintained in line with Ray and Cesalpino that although hybrids might be produced, they were not capable of procreating. Thus, a species could be defined as a self-reproducing community of specimens, and the species' lack of change since Creation could be explained.

I shall return to the notion of hybrids within, or rather outside eighteenth-century British zoology in Chapter 6; for now it suffices to observe that by affirming the sterility of hybrids and, inversely, the invariable reproduction of like by like, the zoologists added

113 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 335; emph. in org.

114 J. Ray, *Historia Planetarum* (1686), p. 40; quoted in S. Atran, *Cognitive Foundations of Natural History* (1990), p. 162; emph. in org.

115 R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. xlii.

116 A. Cesalpino, *De plantis* (1583), p. 26.

117 J. Ray, *The Wisdom of God* (1691), p. 181.

118 J. Locke, *Essay* (1706/1997), p. 403/III,vi,23; emph. removed.

119 G.-L. L. Buffon, *Histoire naturelle* (1777-89), vol. I, pp. 213ff. For an analysis of the developments in Buffon's concept of species, see P. L. Farber, 'Buffon and the Concept of Species' (1972); P. L. Farber, 'Buffon and Daubenton' (1975); J. Roger, *Buffon* (1997), ch. XIX.

evidence to the claim of the Bible, quoted by Ray, that all species had been made by God once and for all in the beginning, regardless of whether man could perceive their essences directly or not. The definition of such self-reproducing species, then, would, and indeed in principle should, hold good for all time – the characteristic marks distinguishing them were indelible in the sense of being immutable. By this qualification, the species were not only lifted out of the material maze of matter and into the abstract realm of the mind, but they were also placed beyond the sway of time.

There were, however, some types of changes in animals, which the empiricist zoologists acknowledged and described, which must be taken into consideration. It was accepted that breeding as well as the removal of an animal from one climate to another could change its stature in some measure. Hence, Edwards made the case for the changes in animals and plants, which resulted from breeding:

> I found the agreement between different Generations of Animal and Plant, which always continues to bear the Form and Likeness of those in which they were first inclosed [sic]. Indeed some domestic Animals and Plants differ in some sort from their first Parents, which were savage. I take these Differences not to be very material, and to proceed from the unnatural Food, Habitation, and other Circumstances that may alter the Plant or Animal in Magnitude or Colour; which is not material, seeing these Things so made domestick, if turned again to their native Habitations in a Generation or two cast off those Accidents attain'd by unnatural Situations, and recover their first Forms and Colours stamped on them in the first Creation of the whole Species.[120]

Analogously, Brookes described such changes, which would occur upon the transfer of animals between climates:

> We have observed, that among animals of the same kind, there is little variety, except what is produced by the art of man; but we would have this observation extend only to animals of the same climate. As in the human species many alterations arise from the heat or cold, and other peculiarities of the region they inhabit, so among brute animals the climate marks them with its influence, and in a few successions they entirely conform to the nature of their situation.[121]

As becomes clear in both these explanations of changes in species, such changes were regarded as only minor, and in addition, not even permanent: let the tame, bred animal out into the wild, and in a couple of generations it would regain its original form; move an animal back to its place of origin and it would likewise recuperate.

Now, at the same time as Edwards and Brookes made these assertions, in *Histoire Naturelle*, a book to be referred to by most of the contemporary British zoologists, Buffon vigorously argued that the species of America were degenerated from those of the Old World, and that through time they had established themselves as *new* species under the influence of American climate and consequently had to be studied as separate species.[122] Some British

120 G. Edwards, *A Natural History of Birds* (1743-51), vol. I, p. vii; emph. removed.

121 R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. xxxiv.

122 G.-L. L. Buffon, concluded after a detailed comparison of animals of the Old and New World, in his *Histoire naturelle* (1777-89), vol. III, p. 224: 'Cette loi qui réduit à les juger autant par le climat & par le naturel, que par la figure & la conformaté, se trouvera très-rarement en défaut, & nous sera prévenir ou reconnoître beaucoup d'erreurs.'

zoologists accepted this thesis of American animals being descendants of animals from the Old World.[123] But none of the British zoologists, to my knowledge, accepted Buffon's assertion that the characters of the American animals had been changed permanently and to such an extent that they had become new and different species. In British zoology, though note would occasionally be taken of differences arising from breeding and translocation, these differences would generally be interpreted to be relatively insignificant and pertaining only to the level of 'varieties': subspecies which shared in the immutable characteristic marks of the species, but between which 'minor' or 'accidental' differences, as for instance in colour or size, could be observed.

By making the differences produced by breeding accidental, the unchangeability of species over time was once again underscored; by making the differences produced by place minor and accidental, place was generally written off as a difference that could make a difference to the nature of the species. The 'Bengal goat' could, consequently, be classified together with the English ditto, the Indian elephant with the African, and likewise, contrary to what Buffon thought, the 'harelipped monkey' of Africa and India ought to be incorporated into the same species:

> *Le Malbrouck* of *M. de Buffon*, xiv. 224 *tab.* xxix. so much resembles this species [the harelipped monkey of Africa], that I place it it [sic] here as a variety. That able Zoologist suspected the same; but separates them, on account of some trifling distinctions, and the difference of country: this being a native of *India*, the other of *Africa*: but since those very distinctions may arise from the last cause, it seems better to unite them, than to multiply the species already so numerous.[124]

The species were severed from any spatio-temporal relations, and would hence emerge as a transcendental category, which were valid for all places and to all times. What was essential to a species was what characterised it despite time and place.

The idea of the immutable characteristics of species was even reflected in and re-inforced by the language employed in describing them. In contrast to descriptions of specimens, as we saw in Chapter 3, which were many times tied to a specific historically situated experience, and which in any case always concerned a particular specimen, and thus mostly was given in past tense, the descriptions of species were virtually always given in third person, present tense, indicative: 'The Lion is...', 'the Cat is...', 'the Pelican is ...'. As James Harris observed in a more general discussion of the relationship between language and philosophy, in contrast to objects of sensations, by definition *'indefinite'*, *'fleeting'* and *'transient'*,[125] and hence best described in the past tense,[126] the *'Immutable*, as in *Objects of*

123 E.g. R. Brookes, *A New and Accurate System* (1763-72), vol. I, pp. xxxvi-xxxvii; G. Edwards, *A Natural History of Birds* (1743-51), vol. II, p. 117.

124 T. Pennant, *Synopsis of Quadrupeds* (1771), p. 111; emph. in org.

125 J. Harris, *Hermes* (1751), p. 353; emph. in org.

126 Ibid., pp. 90-2.

*Intellection or Science*' could only be properly designated with the verb 'to be' in its indicative mode:

This therefore (the INDICATIVE I mean) is the Mode, which as in all Grammars 'tis the first in order, so is it truly first both in Dignity and Use. 'Tis this, which publishes our sublimest Perceptions; which exhibits the Soul in her purest Energies, superior to the Imperfection of Desire and Wants [...]; but above all in its *Present* Tense ['to be'] serves Philosophy and the Sciences, by just Demonstrations to establish *necessary Truth*; THAT TRUTH, which from its nature *only exists in the Present*; which knows no distinction whether of Past or of Future, but is every where and always invariable one.[127]

Knowledge of species, then, was essentially of a different kind from knowledge of specimens: in referring to qualities which existed ontologically in a transcendent space, a species in principle signified what, as Ephraim Chambers had it in a similar statement, was 'absolute' and 'permanent'. In contrast to such knowledge, knowledge of specimens was of a 'merely transient, or historical'[128] kind, since it only referred to the fleeting existence of matter.

## The Exclusivity of Species

In exegetical theory, the empiricists' species could and, indeed, should, to recapitulate, reflect on permanent and unchanging aspects of nature, just as Linné and Cesalpino had claimed theirs to do, but they did so for somewhat different reasons. Linné and Cesalpino had based their claim to truth on a theoretical identification of essential characters, and on a method of downward divisions which resulted in a definition of the species *per genus et differentiam*. This, in turn, had allowed Linné, to stay only within the realm of the contemporaries, to define genera and species almost monothetically. Without an essence to rely on which allowed for a weighing of characters prior to empirical analysis, the empiricists had to base their species definition on a minute examination of the specimens in their entirety (or, at least that entirety which was constructed in the fashioning of specimens as facts – more on that in Chapter 6). This examination aimed at an identification of a number of characteristic marks, which would in conjunction define the species. The resulting methodological difference between the two modes of classification, and consequently in species definition, was made clear time and again as British zoologists reclassified Linnean species by relying on a more general comprehension of the specimens' characteristics. Hence, with regard to the 'brown mole,' Pennant noted:

*Linnæus* places this and our radiated mole in his class of SOREX, or SHREW, on account of the difference of the teeth; but as these animals possess the stronger characters of the MOLE, such as form of nose and body, shape of feet, and even the manners, we think them better adapted to this genus than to the preceding.[129]

Or, George Shaw reclassifed the 'vesperilio' (the bat) in a book dedicated to illustrating Linnean zoology:

---

127 Ibid., pp. 159-60, note excluded; emph. and cap. in org.
128 E. Chambers, *Cyclopædia* (1741), vol. I, p. ix.
129 T. Pennant, *Synopsis of Quadrupeds* (1771), pp. 134-5: emph. and cap. in org.

According to the established rule of the Linnæan arrangement of quadrupeds, by which those animals are principally classed from the structure and situation of the teeth, it is necessary that the genus Vespertilio should rank under the first order, or Primates: but as the general appearance of Vespertilio is so widely different from that of the rest of this order, Linnæus has been in this, as well as in some other instances, thought to pay too little regard to the evident and obvious characters of animals, and too much to those of the teeth.[130]

Teeth alone would not do: Even though the differences which made a difference to the empiricist zoologist were not innumerable, because as they were circumscribed by the notions of the common, the peculiar and the indelible, the empiricists' species still had to be defined *in extenso* by multiply morphological and at times also anatomical traits and characteristic manners and dispositions. Only by proceeding in this way could the empiricist start to approach, if ever so indirectly, the essence of nature's species.

From the empiricists' point of view, the downward classificatory movement, so central to Linnean taxonomy, was in fact, as Lord Monboddo observed (without, however, explicitly targeting Linné) reserved for the angels: '[W]e collect our ideas from objects of sense that we set together and compare. Intelligences of a higher order have, no doubt, a manner of conception very different':[131]

From this point of view let us try if we can discern the difference betwixt us and higher intelligences. *We* begin with *matter* and *material objects*, and through *particulars* and *individuals* investigate *generals*. *They* (so far as we can conceive of their operations) proceed in a method directly opposite to this: For, beginning with *generals*, they through them recognise *particulars*. In this way we too proceed, after we have attained to intellect and science; but with this difference, that those more perfect minds see the particulars in the generals *intuitively*; whereas we, for the greater part, are obliged to *investigate* them, and find them out by *circuit* and *collection*. If it were otherwise, and that in the *universals* we could see at once the several *subordinate species*, and their several properties, connections, and dependencies, we should then indeed be *divine* intelligences, and be ranked with beings of superior order.[132]

Given the predicament of man, the upward movement became the only legitimate route for him to take in the formation of species. Within the realm of humans it was, moreover, not a route open to everybody, but only to the educated that had learned how to discriminate between idea and object, as we saw.

With this nominal species concept, the British zoologists had decisively moved away from scholastic-essentialist classification. With their conception of man as devoid of innate ideas, and with the introduction of an inductive method in classification, suitable for such a man, the British zoologists provided a new foundation for conceptualising species, and, indeed, as we shall see in Chapter 7, for taxonomic classification in general.

The concept of species, which emerged in the empiricist context, although hence, differing on essential points from that of Aristotle and the scholastic-essentialist species, was still, however, conditioned by the history of taxonomic classification in European thought. When Cesalpino set out to explicate the taxa of botanical classification in the late Renaissance, he drew on Aristotle's eidos and genos, and by coupling them with the scholastic

130 G. Shaw, *Speculum Linnæanum* (1790), 'Genus Vesperilo' (unpaged).
131 L. Monboddo, *Of the Origin* (1774), vol. I, p. 84.
132 Ibid., vol. I, pp. 183-4; emph. in org.

reinterpretation of the Platonic-Aristotelian method of logical division reified them as taxonomic categories of thought, which designated a specific level of generality. Although the British zoologists rejected the philosophical underpinnings of scholastic-essentialist taxonomy and thereby severed it both from the (relaxed) method of logical division, and consequently in theory also untied the species definition from the definition of genera, they still adopted the idea of species as a taxonomic concept anchored in a specific level of generality. What they, by instituting 'observation' instead of the 'vain conjuncture of speculation' as the point of departure for the formation of species did was, in principle, to make the species autonomous of the higher taxa of the taxonomic system, and most importantly of the genus, in relation to which the concept initially had been explicated and defined. The species were now primarily to be made sense of and defined in relation to 'observable nature' as a concept for what the fleeting specimens permanently had in common.

That the empiricist species were empirically based did not mean, however, that they were not framed by a series of preconceptions as well. In fact, as we have seen, the zoologists took a number of things for granted which made it possible to conceptualise species in this way; things which even on their own account they could not have any knowledge about. They presupposed, on one hand, that there, indeed, existed an essence, even if it was imperceptible, which consistently produced similarities and differences in the secondary qualities of things; they presupposed that the species were formed once and for all at the beginning of time and remained as in the Garden of Eden until the end; they presupposed that like always engender like, hence they presupposed fixed species boundaries. In brief, they presupposed, on one hand, the immutability of species. On the other hand, they also preconditioned an anthropology, and even a sociology: by making man devoid of innate ideas, they had made inductive method the only possible means of acquiring knowledge about species; by making the vulgar incapable of distinguishing between image and idea, and, in effect, of employing the inductive method, they also delimited an exclusive socio-cognitive space required for the definition of species. The empiricist zoologists could only pull through their classification of specimens into species, not by observing nature alone, but also by reckoning with this whole cosmology of species, and by positioning themselves as men who were epistemologically capable of pulling through such a classification.

What the zoologists had accomplished by moving from the level of specimens to that of species – by distinguishing between thing and image, and analysing the images of specimens with a view to determining similarities and differences and on the basis of these relations classing specimens in species – was, in sum, to move out of the spatio-temporal world of matter and into a transcendental realm where the transcendent qualities, the essential, immutable traits of animals, exclusively, could be defined. It is, I will suggest, in the context of this idea of species that we have to understand the importance of Bacon's assertion for zoology, which we met in the introduction to this chapter, that it was only relations that mattered in natural history. As we also saw in the introduction, Lord Monboddo stressed in the same vein, that 'knowledge' could only be attained about a 'single or monadic thing,' such as a specimen, if it was compared to 'general ideas,' such as species. The reason for this was that 'knowledge,' basically, was concerned with what was immutable:

In these [the general ideas] we perceive the objects of SCIENCE and REAL KNOWLEDGE, which can by no means be, but *of that which is general, and definite, and fixed*. Here too even *Individuals*, however of themselves unknownable, become objects of Knowlege [sic], as far as their nature will permit. For then only may *any Particular* be said to be known, when by asserting it to be *a Man*, or *an Animal*, or the like, we refer it to some such *comprehensive*, or *general Idea*.[133]

Within zoology, the descriptions of specimens were only a prelude to zoology proper, then, because it was not specimens, but only the general ideas about species which could communicate something, if ever so indirectly, about the immutable essence of things. As we saw, only the learned was considered capable of making such general ideas. Only they could make knowledge. To form a species, then, was an exclusive and excluding task: Doing so, the zoologist had to enter a transcendental cognitive space, thereby leaving both the vulgar and the fugitive matter of their world behind.

133 J. Harris, *Hermes* (1751), pp. 368-72 [sic]; emph. in org.

Chapter 6

# Specifying Nature

Outlining an empiricist species concept in theory and settling procedures for defining a species comparatively by identifying characteristic traits was one thing. When defining species in practice, the zoologists, however, encountered problems and developed practices that were not taken account of in the exegesis of species. In the exegesis of species it was, firstly, preconditioned that all the required knowledge for making such a comparison that would lead to a species definition was at hand. That there, on one hand, was enough specimens of what would prove to be animals of the same species available to determine the indelible characteristics and, on the other hand, that the individual zoologist who would make the species definition possessed an adequate stock of knowledge to be able to define a species. However, this was far from always the case. In practice, both lack of knowledge and lack of adequate specimens impeded the formation of species, leading the zoologists both to engage other zoologists in the act of defining species, and as more information came to hand over the years, to redefine already defined species. In practice, comparison was conditioned by the available traits of the specimens at hand, and consequently, defining a species became both a process – at times a prolonged process, lasting for years or even decades – and not seldom a collective endeavour as well. The first section of this chapter will be devoted to an analysis of the procedural and communal aspects of species definition.

Secondly, in the exegesis of species it was presupposed that there actually existed some common, peculiar, and indelible traits, shared by all 'like' specimens, however difficult they might be to discover, which would allow for a unification of them in a species and, thereby, for a definition of that species. In the face of the mutability of animals living in the world in which, as we will see, even some of the marks identified as characteristic would change over time, it took more than simply a notion of characteristic marks to form a species, however. In practice, the zoologists had to further qualify the idea of the common, peculiar, and indelible in order to single out the characteristic marks, in order to form a species. In doing so the zoologists would consistently foreground the features of some particular specimens in the species definition: some specimens proved to be better representatives of the immutable qualities of species than others. In making this qualification, the zoologists brought a whole cosmology of nature's way of working and its purpose with the species into play. The second part of this chapter will be concerned with how the notion of the characteristic marks was interpreted in practice, and with a discussion of that cosmology which facilitated this interpretation.

Finally, there was a whole group of animals, commonly labelled 'monsters,' which, given the exegesis of the species concept and the practices of species formation, it became impossible to classify. Consistently excluded from the classificatory schemes, and even from the field of zoology itself, they would, to use Mary Douglas' phrase, be treated as 'matter out of place.' Turning to the handling of these monsters in the conclusion to this chapter, I shall use the ideas surrounding them to examine the boundaries instituted in the actual classification between the 'normal' and the 'abnormal,' between nature and its exterior, and thereby, finally, attempt to specify the conceptual borders of the eighteenth-century British idea of species.

## Terms of Comparison

### Communal Definition of Species

When Gilbert White finally received a package of Iberian curiosities – birds, fish, insects – from that young friend at Gibraltar whom he had urged to take up the study of nature a little, the first thing White appears to have done was to compare them to other specimens that he was already familiar with. White could thereby readily identify some of the specimens as belonging to already known species. White listed the names of the more curious of these in English and Latin in a letter to Pennant.[1] We might note here, that the whole question of identification was not an issue taken account of in the exegesis of species, but which became important for the formation of species in practice. In order to avoid forming a species that had already been made, a zoologist had to firstly ascertain that those specimens, which came into his hands had not already been described as a species by another zoologist.

Some of the specimens which White could not identify himself were sent to Pennant for identification, and some to his brother in London who was also interested in natural history.[2]

1 G. White to T. Pennant, Jul. 12, 1770, British Library, Add. 35,138, f.37.
2 G. White to T. Pennant, Aug. 1, 1770, British Library, Add. 35,138, f.39, G. White to T. Pennant, Oct. 29, 1770, British Library, Add. 35,138, f.43.

Turning to correspondents in the Republic of Letters when a zoologist's own stock of knowledge did not suffice to make an identification of a specimen or to define a species was far from uncommon. Hence, also Thomas Browne, for instance, made an enquiry to Christian Merrett about some specimens of birds that Merrett attempted to determine the species of;[3] and, likewise, Lord Lyttleton sent Pennant a 'schelly' which Pennant identified as 'the Ferra of the lake of Geneva.'[4]

Sometimes, a zoologist would ask correspondents to lend him relevant books in which he might be able to find information on the topic he was presently working on and in that way he could increase his own stock of comparative knowledge. Here, parenthetically, it is worth remembering both how difficult it often was to acquire a book, especially if one lived far away from the major cities, and especially from London where the book trade was concentrated.[5] David Skene, resident of Aberdeen, lamented: 'Our Publick Libraries afford very little new, & except a little Assistance from My Lord Finlater's Library whenever I want to look into a book I must commission to London.'[6] In addition, the comparatively high prices of books in the eighteenth century meant that, in many cases, even a zoologist of some standing in the middle echelons could not afford to buy all the books that would be essential for his study.[7] In both cases, the zoologist was forced to borrow books in order to proceed with his work. Thus, James Douglas repeatedly asked Hans Sloane to lend him books on the various topics that he was working on.[8] Emanuel da Costa asked Dr Fothergill, who patronised his work, to lend him no less than nineteen books:

> As I am hard at My Studies I beg thee Dear friend if thee hast any of the ~~following~~ in the Inclosed list Books (w$^{ch}$ I have not) to lend Me (one at a time) to Make the Necessary extracts from them for they will be of very great service to Me & I assure thee I will take great Care of them, & return you them very faithfully Again as soon as perused.[9]

The terms of exchange of books as well as of the information given in letters necessary for the identification and definition of species followed the same ethos of reciprocity as that of the exchange of specimens within the Republic of Letters, discussed in Chapter 4, and I shall go no further into the practices of exchange here. What I would like to stress here is the communal

---

3 C. Merrett to T. Browne, May 8, 1669, British Library, Sloane 1,830.

4 T. Pennant to Lord Lyttleton, Oct. 7, 1768, British Library, Egerton 2,001, f.270.

5 T. Belanger, 'Publishers and Writers' (1982), pp. 11-3.

6 D. Skene to J. Ellis, Dec. 5, 1765, Linnean Society, London, Ellis Corr., vol.II.97.

7 Cf. T. Belanger, 'Publishers and Writers' (1982), esp. pp. 12ff. In *The Nature of the Book* (1998), esp. ch. 2, A. Johns discussed some of the problems a man of learning might encounter in attempting to acquire a book. Although drawn from a Swedish context, the case of Claus Bjerkander illustrates well the precarious position of quite a few of the zoologists well. Being a minister in a small parish at the Swedish countryside, Bjerkander struggled all his life to be able to in most cases not to buy, but just to get a look at those natural history books, which were essential for his pioneering work in entomology. He had to go to such extremes as naming an insect after the local Lord in order to get access to his library and hence, to the required books. H. Sandblad, 'Linneask pastoral' (1974).

8 J. Douglas to H. Sloane, n.d., British Library, Sloane 4,058, ff.260-262.

9 E. da Costa to J. Fothergill, Jan. 30, 1754, British Library, Add. 28,537; deletion in org.

dimension of the definition of species, facilitated by this practice of exchange – the space that allowed for the making of those comparisons on which the species definition rested was not only a conceptual space, but also a social one. To the extent that a zoologist when faced with new specimens did not possess the necessary information about comparable animals himself, he was likely to turn to correspondents in the Republic of Letters in order to acquire that information, or even, as we have seen, engage them actively in the act of identification and definition. In this sense, the definition of species became, in many cases, a collective endeavour.

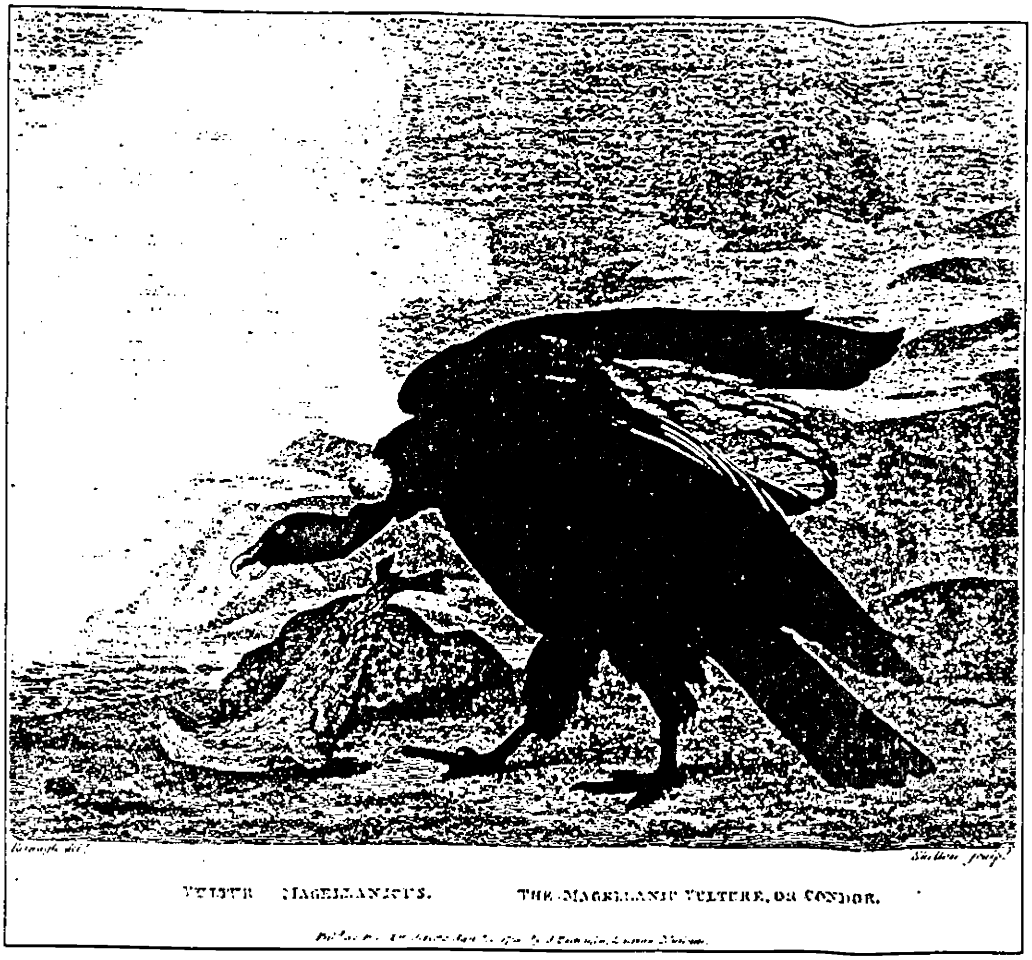
## Differences, which Could Make a Difference

Among the Iberian curiosities that White received, White's brother found a quail without a back toe that appeared to be 'a non-descript and a new species'. That single quail was, however, not enough to ascertain the fact of the matter: 'I think it merits further enquiry: and I shall accordingly desire my Brother to procure more specimens, & to satisfy himself thoro'ly that the back toe is always wanting; and also to get an old bird of each sex.'[10] It was not only lack of knowledge on the individual zoologist's part that became an obstacle to the formation of species. No matter how many enquiries were made to correspondents in the Republic of Letters, sometimes the features necessary for making a species definition could simply not be brought to light. In a thoroughly material sense, the formation of species was also circumscribed by the often random assortment of specimens which the zoologist had at his disposal.

As we saw in Chapter 3, the description of specimens to some extent foreshadowed and put limits on the classification: Ideally, there was a correspondence between the features described in representations of specimens – in the circumstantial description: principally the morphology, and secondarily also the manners and habits, anatomy and usage of an animal; in the concise description: a more limited number of mainly morphological traits – and the marks necessary for classifying them into acceptable species. In practice, however, not every description proved to be as complete as one would have wished, and not every drawing or stuffed animal appeared to reveal that particular piece of information which, when comparing a specimen to already known species or specimens, turned out to be essential to have information about.

Moreover, the presence of only one or a few specimens made it hard to determine whether a trait, like the missing toe in the quail, was in fact accidental or characteristic. Like

10 G. White to T. Pennant, Oct. 29, 1770, British Library, Add. 35,138, f.43.



Ill. 6.1 THE MAGELLANTIC VULTURE, OR CONDOR (G. Shaw, *Museum Leveriani explicato*, 1792). Though George Shaw only had a few feathers and some rumours to rely on, he both described and depicted the magellantic vulture of North America. A bird of prey so enormous that it allegedly could take a young boy, as it appears from the text, and a seal, as seen in the picture, as prey.

White's brother, Pennant was also left at a loss at how to characterise and classify a 'grey deer,' because he had only an account of a single specimen to build his definition of the species on:

An obscure species, doubtful whether a Deer, a Musk, or female Antilope; for the horns were wanting in the animal described by *Linnæus*.

Size of a cat; of a grey colour: between the ears a line of black: a large black spot above the eyes: on each side the throat a line of the same colour pointing downwards: the middle of the breast black: the fore legs and sides of the belly, as far as the hams, marked with black: ears rather long: under side of the tail black.[11]

Similarly, Edward Tyson was not sure whether to classify an opossum that he had dissected as of the 'dog-kind' or the 'vermin-kind,' because he had only a female specimen to examine.[12] George Shaw was left in uncertainty as to whether there, in fact, existed a species of the 'magellanic vulture' somewhat like the 'vulture gryphus' of Linné but so much bigger that allegedly it could take a ten year old boy as prey, because Shaw had only some rumours and a few feathers to identify the species on the basis of. Although Shaw for this reason declared that 'we must be content that its history and description should still remain in some degree involved in obscurity', nevertheless, it was described and depicted (see Ill. 6.1), and christened as well in his *Museum Leveriani*: 'Not chusing [...] to create confusion in natural history by making it absolutely the same with the Vultur Gryphus of Linnæus, I have rather chosen to give it a new name, and to place the supposed Linnæan synonym in a doubtful manner.'[13]

It was not solely the presence of insufficient descriptions or of just a single specimen that left the zoologists uncertain as to the determination of their species. In the process of preservation or transportation, animals, moreover, could easily loose limbs that would be vital for the definition. Hence, Peter Brown made a description of the 'Surinam Daw' from a specimen in the cabinet of Marmaduke Tunstall which had lost its tail;[14] Shaw described a 'lion-tailed monkey' in which, as the name indicates, the tail was considered to be a characteristic mark, from a specimen with a mutilated tail;[15] Robert Kerr encountered an illustration of a 'two-toed ant-eater' with such strange feet that he had to assume it was either of another species or 'might be taken from a mutilated dry skin';[16] and Thomas Yeats lamented that the feet of butterflies often would be mangled or entirely destroyed before they reached the zoologist from all over the world.[17]

Such mutilations had implications for the possible formation of species. Hence, Yeats had to give up classifying butterflies according to their feet even though Scopoli in *Entomologia Carniolica* (1763) and Geoffrey in *Histoire Abregeé des Insectes* (1764) had suggested that these might be the best characteristic marks; Kerr had to refrain from deciding whether there existed

11 T. Pennant, *Synopsis of Quadrupeds* (1771), p. 55; emph. in org.
12 E. Tyson, *Carigueya* (1698), pp. 3-4.
13 G. Shaw, *Museum Leveriani explicatio* (1792), vol. I, pp. 5-6.
14 P. Brown, *New Illustrations of Zoology* (1776), p. 20.
15 G. Shaw, *Museum Leveriani explicatio* (1792), vol. II, p. 72.
16 Kerr's addition in Linné, *The Animal Kingdom* (1792), p. 105.
17 T. P. Yeats, *Institutions of entomology* (1773), p. 134.

a one-toed ant-eater as well as a two-toed; and Smith, finally, highlighted the implications of such 'accidental mutilations' for the formation of species in general, and for the definition of ape species in particular:

> These accidental mutilations, which occasionally occur in several exotic animals, are productive of considerable errors in the descriptions of authors, and no small confusion has resulted from this cause in the arrangement and enumeration of the different species of Simiæ, which with every assistance of figures and descriptions is yet involved in considerable obscurity.[18]

Even in cases where stuffed animals did reach a zoologist in their original form, this did not necessarily guarantee certainty. As little as a drawing would allow for an anatomical examination would a stuffed specimen; and information about morphology alone did not always reveal everything that had to be known in order to define a species. The example of two stuffed 'skinc-formed [sic] lizards', sent to Thomas Wilson from New Holland by John White, indicates the limits to the use of such information. One of these specimens had an excrescence on the upper part of its tail, 'almost like a supernumerary or forked tail', while the other did not have any. Wilson was not sure whether this might be a characteristic trait of only one of the sexes, and in that case probably the male and hence a defining character of the species, or whether it was merely a 'monster' – an accidental abnormality. The sex of the lizards could, however, not be determined without a dissection of the animal, and the matter, and consequently, the definition of the species, 'remains still to be proved'.[19]

These examples highlight that the classification of specimens into species was circumscribed not only by the exegesis of species, the fashioning of specimens as zoological facts, and by the collective stock of information at hand in the Republic of Letters, but also, in material terms, by the actual traits available in the animals under consideration: Only these could in practice be made to make a difference, and they often left the zoologists at a loss. By the end of the description of a species, it was, thus, not uncommon to see a note expressing uncertainty with regard to the species definition in terms like those we have also seen above: '[It] must be left to future Enquiry...',[20] or 'We confess ourselves unable to decide, with certainty...'.[21]

However, as time passed, more perfect specimens would be conveyed to the zoologists, which made it possible to define the species with more certainty. During the eighteenth century, a steady flow of new specimens to the zoologists in Europe from all over the world, made possible not least by the steady colonial expansion, entailed a continuous redefinition of species within the realm of zoology. Hence, that 'grey deer' which had caused Pennant problems in 1771 could by 1792 be defined with more certainty, as male specimens had been

---

18 G. Shaw, *Museum Leveriani explicatio* (1792), vol. I, p. 72.

19 T. Wilson, 'Appendix' (1790), p. 242.

20 M. Catesby, *The Natural History of Carolina* (1731-43), plate 42 (unpaged), on the possibility of there being more than one species of rattle-snake.

21 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. IV, 'Female Zebra' (unpaged); on the possibility that the quagga might be a female zebra or maybe a variety of the zebra.

discovered by then to have characteristic antlers in contrast to the female of which Pennant had only had information: 'The characters of the animal are now better known, and it is found to belong [...] to the genus Antilope', Shaw concluded with reference to Pennant's description. At the same time, it was renamed as 'musk deer.'[22] Likewise Tyson himself, only six years after his initial examination of the female opossum got a chance to examine a male specimen and, by then, could define the species with somewhat more exactness: 'Now having upon the dissection [of the male] observed the *Penis* to be fleshy, and to have no *Bone* in it; I find it cannot be referred to the *Dog* or *Weasel* kind, as some', among these, remember, Tyson himself, 'have thought.'[23] However, Tyson was still not sure how to categorise it:

> I must confess we cannot be at a certainty in this matter, unless we had a more perfect Enumeration and Description of the several sorts of Animals that are in the World; and by a strict Enquiry into their *inwards* as well as *outwards* Parts, observed, how gradually they differ from one another; by easie and gentle steps, the intermediate *Species* linking the whole together. However till this can be attained, every little help will contribute somewhat.[24]

In practice, as this example clearly indicates, it was not enough only to have knowledge about specimens of one species. In order to determine not only a species' common traits, but also the peculiar ones, a species would have to be defined in comparison to other species and most particularly, in comparison to those it resembled the most. At the time that Tyson wrote this in 1704, and for the better part of the eighteenth century, much of South America, where opossums in the beginning of the eighteenth century were thought only to reside, was still left unexplored, due, as it often went, to 'the jealous *Spaniards*', who tenaciously guarded their colonial possessions.[25] By the end of the eighteenth century, not only had more South American specimens had been described, but New Holland had also been discovered and a number of new specimens of opossums had reached Europe. Shaw outlined the implications of these discoveries for the definition of opossums:

> The preserving efforts of navigators accompanied by naturalists have at length discovered as it were another new world, and other animals, not less surprising than the Opossum; and which seem in many particulars to agree in structure with those animals [discovered in South America]; being like them furnished with an abdominal pouch for the temporal residence of their young.[26]

As a result of these discoveries, the opossums would now be determined to constitute a new 'genus,' characterised by 'An Abdominal *Pouch*, or *Follicle*, in which the mammæ [breasts] are situated, and which serves as a temporary residence for the young.'[27] The various species of

22 G. Shaw, *Museum Leverianí explicatio* (1792), vol. I, p. 20.

23 E. Tyson, 'Carigueya' (1704), p. 1566; emph. in org.

24 Ibid., p. 1566; emph. in org.

25 T. Pennant, *Synopsis of Quadrupeds* (1771), p. 172; written in relation to want of knowledge of panthers. The implications, however, were the same. For a discussion of the problems of getting access to the Spanish dominions in South America during the eighteenth century, see M. L. Pratt, *Imperial Eyes* (1992), p. 16. D. A. Baugh discusses in his 'Seapower and Science' (1990), the politico-strategic background to the Spanish guarding of their possessions in South America from scientific exploration.

26 G. Shaw, *Museum Leveriani explicatio* (1792), vol. I, p. 25.

27 G. Shaw, *Zoology of New Holland* (1794), p. 5; emph. in org.

opossums could then be defined and characterised in relation to that 'genus,' and thereby to each other.

Many similar examples of such redefinitions of species could be cited, but these suffice to make the point that the definition of species in practice changed over time. In order fully to appreciate this processual character of the species formation and its implications for zoology, it will be useful to step outside of the realm of species formation for a moment, and inquire into the influence of the steady influx of new specimens on zoology, and on the conceptualisation of knowledge, more generally.

The steady influx of animals becomes especially evident in the prefaces and appendices to books, commonly written after or at the time of the printing of the main body of the book. Here, authors would often give additional information that had come in hand only after the main body of the book had been completed. Thus, Brookes added descriptions of the glutton, the shoe-goose and no less than thirteen different species of monkeys in his preface, because, as he explained,

> There has been of late many new discoveries in natural history, which lying scattered in different essays required also to be reduced into system, each of these I have taken care to range under their proper classes in the body of the work; but that this is a science that continually improves, new matter arises even during the short time between printing and publication. As I would have nothing omitted, therefore it may be proper to insert here such animals as have newly come to my notice.[28]

Similarly, Pennant added a number of clarifying descriptions in an appendix, in this case of species already described in his book, which had been received too late to go into the book itself.[29] George Edwards found it necessary to attach a systematic index to the last volume of his *Natural History of Birds*, and by way of making an apology for this index he also brought out the, at times, fortuitous dimension of making zoology:

> As there has been no Design at the Beginning of this Work to have carried it on to the Length it is now come, the Matter contained in it could not be arranged in a Classical Order; for as Things of a mixed Nature continually offered themselves to me, I was obliged to proceed just as I could procure Subjects to go upon: Therefore, if we survey this whole Work (which is now brought to a Conclusion) we shall find many Subjects that ought to have been placed together, are scattered throughout the four Parts thereof; and as their being so creates some Difficulty and Confusion, I have judged it convenient to bring all the Subjects contained in the Books, into a *Generical Catalogue*.[30]

At a more general level, it was often stressed that due to the nature of the study, it was necessary to print books even though all of the descriptions and definitions might not be perfect. In the preface to his more general work on nature, John Ray thus noted in apology for his '*huddling up, and tumbling out*' in the book: 'I know well, that the longer a Book lies by me, the perfecter it becomes. Something occurs every Day in Reading or Thinking, either to add, or to correct and alter for the better. But should I defer the *Edition* till the Work were absolutely

28 R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. xvi.

29 T. Pennant, *British Zoology* (1768-77), vol. III, pp. 321-44.

30 G. Edwards, *A Natural History of Birds* (1743-51), vol. IV, p. 235; emph. in org.

perfect, I might wait all my Life-time, and leave it to be published by my Executors.'[31] In a similar manner, Gilbert White noted in a letter to Pennant, after having pointed out in a previous letter some mistakes Pennant had made in the description of some species of the 'grallæ order' in his *British Zoology*, received good-humouredly by Pennant: 'If a man was never to write on natural knowledge 'til he knew every thing, he would never write at all: & therefore a readiness to acknowledge mistakes on due conviction is the only certain path of perfection.'[32]

Indeed, every piece of information on animals, every shadow of a specimen, and every definition of a species regardless of how uncertain it might be, was usually welcomed eagerly within eighteenth-century zoology, if better could not be had. The author of the *Naturalist's Pocket Magazine* stressed this, as he invited his readers to forward him information in connection with a description of the Australian 'porcupine caterpillar' of which he had never seen a grown insect (as we will see below, ideally, it was only on the basis of the grown insect that a species definition could be made):

We are thankful, however, for such information as we can get, for the present, respecting any non-descript articles and patiently wait the farther development of time: a doctrine which we most cordially recommend to our readers; as some information is certainly better than none, and every little commonly gives rise to a little more.[33]

Some information was better than no information because it could be improved over time as also Edwards stressed:

It is the Work of some only to hint to us what there is in Nature, barely by Names; and of others, to search a little farther, and give some tolerable Account of them, which may enable others, who come after, to attain a more perfect Knowledge of Things, who perhaps would never have busied themselves about them, had they not received their first Hints from Authors far more dark than themselves.[34]

As also becomes evident in this quotation, zoology, as indeed (human) knowledge more generally, was conceptualised as *a process* towards perfection in which the individual author in the grand perspective, only mattered as one step towards achieving this perfection. White, in yet another letter to Pennant, made this clear as he criticised Scopoli's new work on entomology, but at the same time found that it might serve some useful purpose, nevertheless:

Monographers have a fair pretence to challenge some regard and approbation from the lovers of Nat: History: for as no man alone can investigate all the works of nature; those partial writers may, each in their different departments, be more accurate in their discoveries, and freer from errors than those that undertake in a more general way; & so by degrees may pave the road to a correct universal Nat: history.[35]

In more general terms, Ephraim Chambers went as far as to annihilate the rights of property within learning for the sake of such perfection:

'Tis vain to pretend any thing of property in things of this nature. To offer our thoughts to the public, and yet pretend a right reserved therein to one's self, if it be not absurd, yet is sordid. The words we speak, nay, the breath

31 J. Ray, *Three Physico-Theological Discourses* (1732), p. xv; emph. in org.
32 G. White to T. Pennant, Jan. 2, 1769, British Library, Add. 35,138, f.24.
33 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. I, 'Porcupine Caterpillar' (unpaged).
34 G. Edwards, *A Natural History of Birds* (1743-51), vol. II, p. 111.
35 G. White to T. Pennant, Sept. 14, 1770, British Library, Add. 35,138, ff. 41-2.

> we emit, is not more vague and common than our thoughts, when divulged in print. You may as well prohibit people to use the light that shines in their eyes, because it comes from your candle [...].
>
> We see the same thought, which was first started by one author under a word of crudity, borrowed by another, become farther improved, and ripened; and at length, being transmitted to a third, yield fruit in abundance. All plants will not thrive in all soils that will produce them; some languish in their mother beds: whence the gardener is under a frequent necessity of replanting them, &c.[36]

Although every zoologist would certainly not have agreed that there was not some kind of legitimate right to the words one had produced – allegations of dishonest citations, or 'plagiarism' as it was called, were recurrent in the books[37] – Chamber's idea of knowledge as something which was perfected over time through a communal effort certainly resonated within the zoological community. This idea, as well as the actual practice within zoology, of course, squared well with the notion already launched by Bacon in the early seventeenth century of natural history being a communal endeavour.

Acknowledged as a premise of knowledge in general in a world where new animals continuously arrived, and where one man could never get to know everything and much less effect and perfect all of the descriptions and definitions by himself, the communal path to perfection was also celebrated in the formation of species. Here, as we have seen, it entailed numerous redefinitions of species in introductions and appendices, and in books by other authors as new information came at hand throughout the century. In nature, and hence also ideally within zoology, a species might once and for all be eternally defined, but the zoologists' 'discovery' of this definition was pervaded by mutilated specimens, insufficient descriptions, non-discovered continents and a lack of books: in practice, the species, ironically, became a category in flux.

## Specifying Perfection

Let us leave this dimension of change out of the picture for now (I shall return to it in conclusion of this section), and focus on the other crucial aspect of the practical formation of species, namely the specific modes of singling out those characteristic traits of species which allowed for the species definition: the interpretation of what was, in fact, common, peculiar and indelible. This mode of interpretation remained constant throughout the period, although it would be applied to different specimens as new ones came at hand.

Before starting, it is necessary to clarify an issue of terminology. In the following, I shall make use of a distinction between the 'definition' and the 'description' of a species. This

36 E. Chambers, *Cyclopædia* (1741), vol. I, p. xxiv.

37 See for instance J. Ray, 'The Preface' (1728) (unpaged). For a more general discussion of plagiarism, piracy and copyright in eighteenth-century Britain, see T. Belanger, 'Publishers and Writers' (1982), pp. 13-6, 20-2; A. Johns, 'Miscellaneous methods' (2000), pp. 163-4.

distinction would usually not be as clear-cut in British zoology as it was, for instance, in Linné's *Systema Naturæ* where the difference was highlighted typographically. There was, however, still a difference in empiricist zoology even if the definition was elaborate and commonly not distinguished typographically from the description in the text. Usually, a zoologist would sum up all of a species' defining characteristics in the first paragraph of a section devoted to a species, before he moved on to give a more general description of the species concerned in the next paragraph. The distinction instituted thereby became evident not least in cases of comparison of species. In referring to a species, the reference would generally be to those features, which had been singled out in the first paragraph. Though for heuristic reasons, reifying the distinction between 'definition' and 'description' here, the distinction is made on the basis of a tacit, but not absolutely clear-cut distinction in the British zoologists' representation of species.

To begin this discussion of the definition of characteristic marks, we might identify an apparent problem in the identification of them (although the zoologists themselves never put the matter in these terms, for good reasons, as we will see): When having to determine what were actually to be deemed immutable, indelible characteristics in practice the zoologist would seem to be left with a problem in face of the continuous alterations in the live animals. As we might observe, nature is not only fugitive with regard to 'accidental' marks but also, more seriously, with regard to some of the marks defined as 'immutable and indelible.' Hence, a horse, for instance, does not get all of those teeth by which– in conjunction with other traits – it be distinguished by most zoologists would until its fourth year; a butterfly is first a larva, then a caterpillar, before it finally emerges as an insect with such distinctive marks on its wings as would normally enter into the species definition; numerous birds and quadrupeds change colour from season to season; and males and females of abundant species differ significantly in appearance, far from always, as we will see below, sharing the same characteristic marks; and so on and so forth. In the face of such variations between specimens and alterations in individual specimens, how did the zoologists manage to fix the characteristic marks in practice? How did the zoologists concretely manage to transgress the gap between the mutability of specimens situated in a spatio-temporal world of matter and the transcendent realm of nature's immutable species?

It might at first be argued that the choice of what was deemed essential in an animal had already been made in the zoologists' fashioning of specimens as zoological facts, characterised as these were by a relatively limited series of attributes, as we saw in Chapter 3. And, as I have argued earlier, demarcations of the space of classification were decisively made in the selection of traits through this mode of transforming raw nature into facts. However, at least as regards the specimens described in the circumstantial mode, the particular kind of taxonomic classification, and the specific definition of a species' 'immutable' characteristics were far from determined by it. The zoologists would still be left with a large variety of fashioned specimens to work on: old and young, males and females, birds in summer dress and birds in winter dress, etc. etc., which were all described by a range of morphological and, less frequently, extra-morphological traits. Even though the fashioning of specimens circumscribed classification by drastically reducing the possible number of traits the zoologists could work on, the zoologists were still confronted with the question of which particular traits should be considered as immutable and characteristic and hence, definitive of a species.

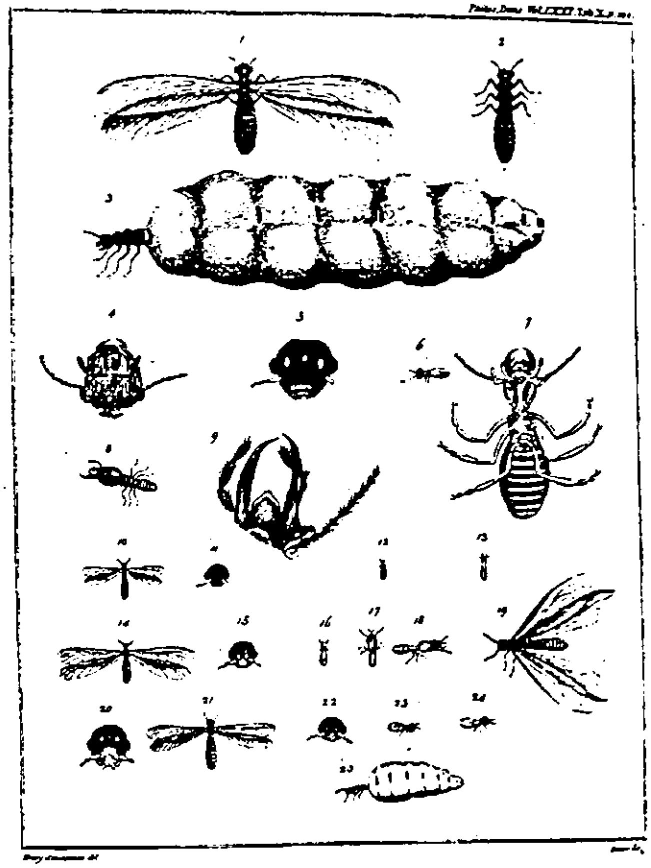
In seeking an answer to this question in the following, I shall start by considering which traits were generally singled out as characteristic of a species, and, more specifically, in which animals and in which state of the life of those animals, the zoologists usually found indelible marks.

## Specific Prototypes

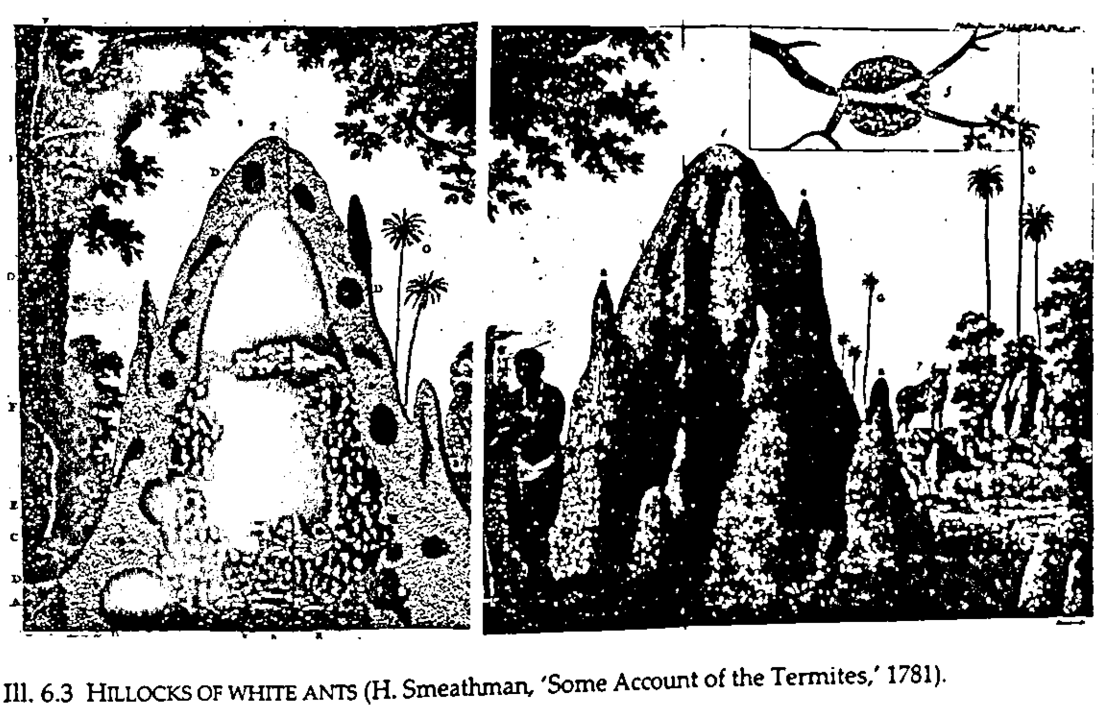
Metamorphosing as they did from larva to caterpillar and to insect and, furthermore, not always terminating in the production of only male and female specimens but, as with bees and some types of ants, also in a variety of different kinds of grown insects, insects became one of the most tricky groups of animals to deal with, and I shall start the enquiry into how the characteristic marks were captured with these.

Henry Smeathman's description of the 'termes bellicosus' or 'white ants' will serve as a case in point. In African Guinea, Smeathman had met these 'wonders of creation' which constructed whole 'commonwealths' by working together in building hillocks with halls, chambers, corridors and galleries, raising as much as twelve feet above the ground (see Ill. 6.3).[38] Now, these insects were divided into three different sorts, which were labelled with inspiration from contemporary social classification. Firstly, there were the '*labourers*' who did all the work; then there were the '*soldiers*, which do no kind of work' except fighting; and, finally, there was the '*nobility* or *gentry*': the '*perfect insects*, which are male and female, and capable of propagation.'[39] The white ants not only varied according to their functions in the commonwealth but, more importantly for classification, also in their appearance (see Ill 6.2). Hence, the labourers were very small and without wings and with the mouth 'evidently formed for gnawing or holding bodies'; for their part, the soldiers had 'undergone a change of form, and approached nearer in degree to the perfect state': They were much larger, half an inch in length and hence equal to fifteen labourers in size, and had, furthermore, 'jaws [...]

38 H. Smeathman, 'Some Account of the Termites' (1781), pp. 139, 144, 148-9.
39 Ibid., p. 154; emph. in org.

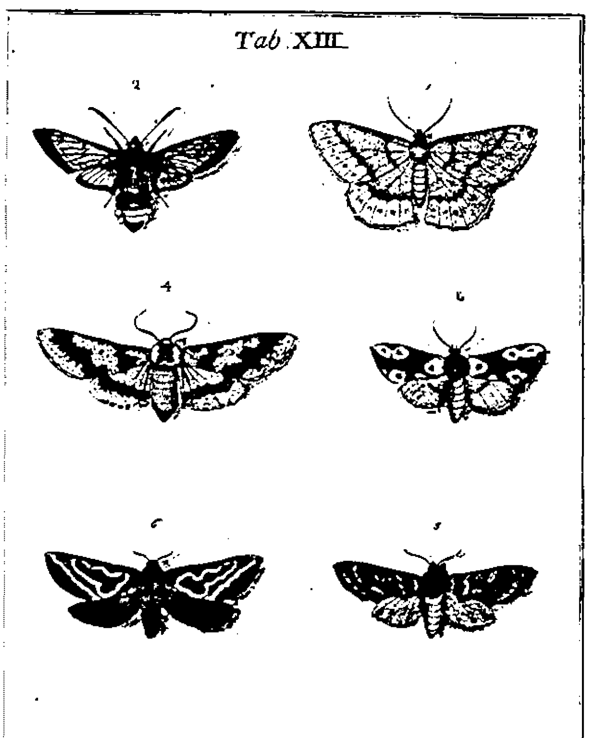


Ill. 6.2 DIFFERENT KINDS OF WHITE ANTS (H. Smeathman, 'Some Account of the Termites,' 1781). In Africa, H. Smeathman had met the 'sagacious' white ants, which both built commonwealths in enormous ant-made hillocks, as depicted below, and which were divided into three different ranks, comparable to those of contemporary society. In the illustration to the left, Fig. 2 and 3 represent the 'King' and 'Queen,' respectively, or the white ants in their 'perfect stage.' Fig. 8 shows the 'soldier,' with 'his' forceps made for fighting (magnified in fig. 9). Finally, the lowest rank, and most imperfect kind of the white ant, the 'labourer,' is depicted in fig. 8. Figs. 10-25 show other termites in their different stages of perfection.



Ill. 6.3 HILLOCKS OF WHITE ANTS (H. Smeathman, 'Some Account of the Termites,' 1781).


Ill. 6.4 A VARIETY OF BUTTERFLIES (M. Harris, *The Aurelian*, 1766)




Ill. 6.5 SIX PERFECT BUTTERFLIES (M. Harris, *An Exposition of English In-sects*, 1782)

Although at times, eggs, larvæ and caterpillars would be described and depicted as above, it was always only the fully-grown, perfect insect that would figure in the representations of species of insects, as below.

shaped like two sharp awls a little jagged, [...] destined solely for piercing or wounding'.[40] Finally, 'The third order, or the insect in its perfect state, varies its form still more than ever':

> The head, thorax, and abdomen, differ almost entirely from the same parts in the labourers and soldiers; and, besides this, the animal is now furnished with four fine large brownish, transparent, wings [...]. In short, it differs so much from its [sic] form and appearance in the other two states, that it has never been supposed to be the same animal, but by those who have seen it in the same nest; and some of these have distrusted the evidence of their senses.[41]

By digging into the hillocks of the white ants, Smeathman, however, was enabled to ascertain the fact of the matter that the different insects were indeed of the same kind. On the basis of this observation, the species was reclassified according to its proper characteristics:

> The great LINNÆUS, having seen or heard of but two of these orders, has classed the genus erroneously; for he had placed it among the *Aptera*, or insects without wings; whereas the chief order, that is to say, the insect in its perfect state, having four wings without any sting, it belongs to the *Neuroptera*; in which class it will constitute a new genus of many species.[42]

Labourers, soldiers and nobility were all included into one species, but it was the insects identified as 'perfect' which, as a matter of course, were made the representatives for the entire species in the species definition.

The mode of making what was considered to be the most perfect animal the representative of the species as such can be observed more generally in definitions of insect species, and other metamorphosing animals such as frogs. It was not, as is also evident in Smeathman's case, that the 'less perfect' specimens were not mentioned at all. Quite often they were taken note of in the more general descriptions of the species, as Moses Harris' treatment of English insects also clearly illustrates. In *The Aurelian*, Harris, merely describing and illustrating different species without attempting to classify them, took pains in every single instance to depict and describe not only the fully-grown flies, but also the eggs and caterpillars in their different states (see Ill. 6.4). In *An Exposition of English Insects*, published ten years later where Harris attempted to make a classification, however, it was only the features of the fully-grown insect that were used in that classification (and depicted in the illustrations, see Ill. 6.5).[43] The point was, then, here as in other entomological studies[44] (the frogs I shall return to below), that although the species certainly included the eggs, larvæ and caterpillars, soldiers and labourers as well as the perfect insect, it was the fully-grown insect and its features alone which featured in the definition of the species.

The same mode of subsuming the heterogeneity of specimens under what was conceived to be the perfect specimen in the species definition can be discerned in zoology generally: Hence, it would be the number of teeth in the fully-grown horse which, together

40 Ibid., pp. 163-4.
41 Ibid., pp. 164-5; note excluded.
42 Ibid., p. 144; note excluded; emph. and cap. in org.
43 M. Harris, *The Aurelian* (1766); M. Harris, *An Exposition of English Insects* (1782).
44 See, for instance, E. Albin, *A Natural History of English Insects* (1720); T. P. Yeats, *Institutions of entomology* (1773).

with other traits, would figure in species definitions of the horse;[45] it would be the plume of the fully-grown, male birds in their summer dress which would feature in ornithological classifications.[46] In similar fashion, a young elephant without tusks had, by the hand of Edwards, to have those added in the depiction in order to make the elephant 'complete' and hence, stand as a representation of the species (see Ill. 6.6): 'This [the elephant depicted] being a young one, it had no tusks, which therefore I have added to compleat the figure'.[47] And, to give a final example, in the same vein, when evaluating the descriptions of the 'Cape Cat' by two different zoologists, John Reinhold Forster's and Thomas Pennant's respectively, the author of the *Naturalist's Pocket Magazine* deemed Forster's description of a live specimen[48] 'incongruous' because it was taken from a young specimen. Inversely, Pennant's description, taken from a 'distended skin' but of a fully-grown specimen was accepted as the basis for defining the species.[49]

We can, in other words, observe a clear preference for the features of the fully-grown male as those to be singled out as characteristic. We might say, that the 'perfect' animals and their characteristic traits were in effect made the prototype of the species as they were judged to be the best examples of the entire category.

Following Ellen Rosch, prototypes can be defined as 'the clearest cases of category membership defined operationally by people's judgement of goodness of membership in the category'.[50] In the case of eighteenth-century species, the prototypical effect worked by a metonymic replacement of the entire species with a part of it in the species definition – the perfect exemplar. As George Lakoff has pointed out, following Rosch, such a metonymic replacement results in a hiding of the heterogeneity between members in a category: the prototype is nothing but a 'mere shadow' of what the category contains.[51] The 'irregularities of experience' are thereby 'flattened out' by the unit categories, as Edwin Ardener says, as the heterogeneity of category members is replaced by a single prototype in representation.[52] Such a 'flattening-out' was exactly the result of eighteenth-century species definitions: by making only

45 T. Pennant, *Synopsis of Quadrupeds* (1771), p. 1.

46 See for instance, G. Edwards, *A Natural History of Birds* (1743-51); idem., *Gleanings of Natural History* (1758-64); M. Catesby, British Library, Sloane 4047, ff. 90, 147, 212, 290, 307; F. Willughby and J. Ray, *The Ornithology* (1678/1972); G. Edwards to T. Birch, Feb. 3, 1752, Royal Society, London, L & P.II.260.

47 G. Edwards, *Gleanings of Natural History* (1758-64), vol. I, pp. 22-3.

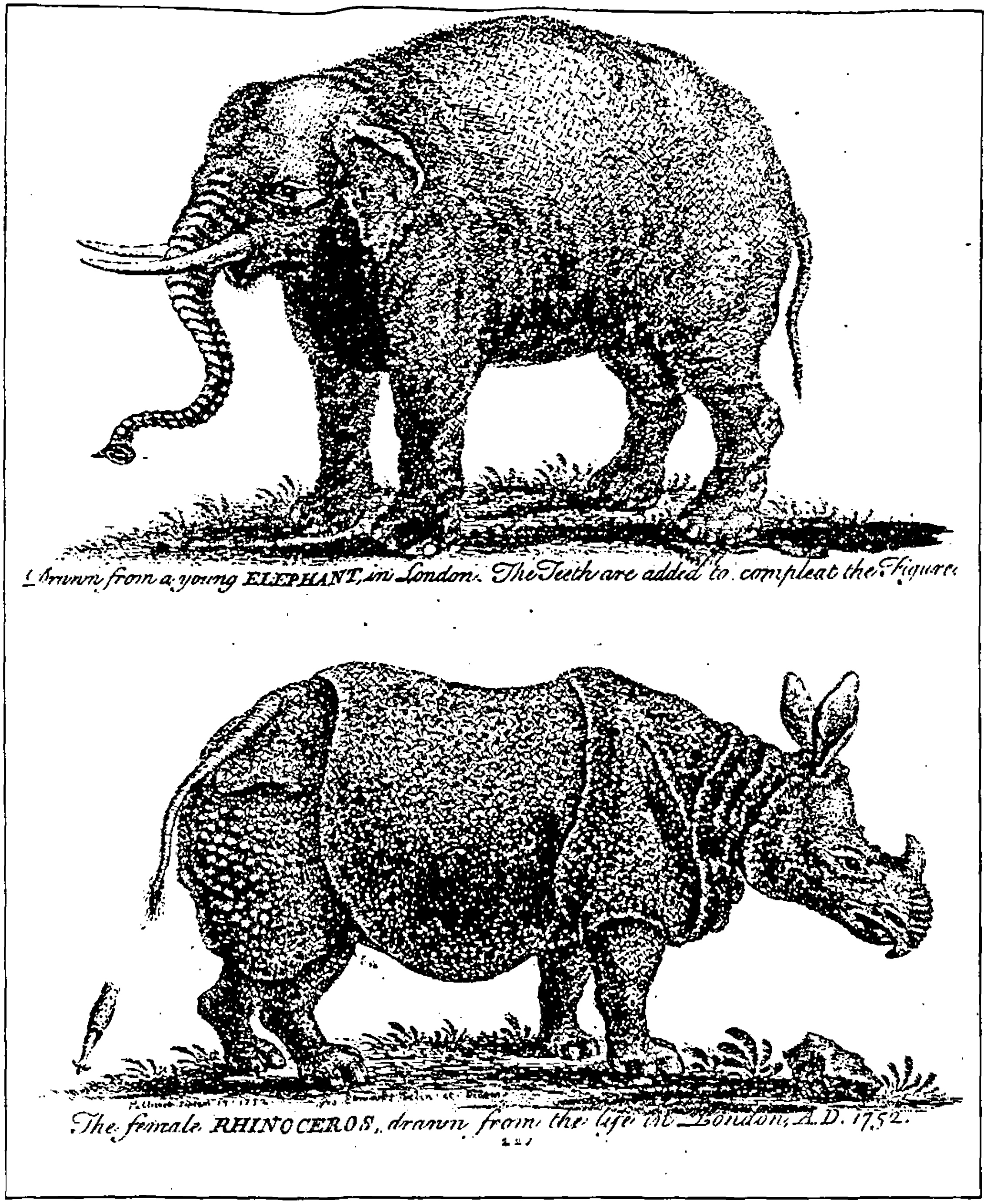
48 Given in J. R. Forster, 'Natural History and Description of the Tyger-cat' (1781).

49 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. VI, 'Cape Cat' (unpaged).

50 E. Rosch, 'Principles of Categorisation' (1978), p. 36.

51 G. Lakoff, *Women, Fire and Dangerous Things* (1987), p. 82.

52 E. Ardener, *The Voice of Prophecy* (1989), p. 169. Ardener develops his theory of category representiveness in relation to a concept of 'semantic density,' and not in relation to prototype theory. These two approaches can, however, be seen as parallel traditions developed within two different disciplines, Ardener's within anthropology and the prototype theory within cognitive science, cf. K. Hastrup, *A Passage to Anthropology* (1995), p. 30.




Ill. 6.6 YOUNG ELEPHANT WITH TUSKS ADDED, AND A RHINOCEROUS (G. Edwards, *Gleanings of Natural History*, vol. I, 1758-64). Any one specimen could not represent a species equally well: in order to make the elephant above – an animal too young to have grown tusks yet – a representative of the species, G. Edwards added tusks – a feature which was invariably singled out as one of the elephant's characteristic traits, but which was, of course, only present in grown specimens.

the perfect males' characteristic traits figure in the species definition, the less perfect animals and their traits were relegated to the background.

In relation to the problem outlined at the beginning of this section – that of the variability and alterations of animals in the world of matter compared to the stasis and immutability of species – this mode of foregrounding the perfect and fully-grown male and making his traits the basis of the species definition, had the consequence that such variations and alterations could be overcome in the creation of species. The authors managed to arrest the flux of observable nature by making the perfect, grown male stand for what was common, peculiar, and indelible. By means of the metonymic replacement, the zoologists managed, in practice, to create their species as immutable, just like they ought to be in theory.

We might, however, ask how such a metonymic replacement became meaningful. How was it that the perfect male could, consistently and without questioning, act the part of prototype throughout eighteenth-century zoology? As Rosch has argued, prototypes can be seen as 'theories of context':[53] It becomes meaningful to make some members, rather than others, representatives of a category only in relation to something else – in itself a category cannot provide the reason for the pattern of metonymic replacement. Rosch mainly focuses on contexts of use in her explanation of prototypes. However, following Kirsten Hastrup, who also draw on Rosch's theory, we might add that the judgement of prototypicallity also, and maybe even more fundamentally, is mediated by the cultural context:[54] What makes it meaningful to install some category members as representatives, rather than others, is predicated upon a theory of the relationship between the category and the wider world. In the case of the eighteenth-century definition of zoological species, I will suggest that we might find the best clue to this context of the judgement of prototypicallity in the cluster of ideas relating to the 'perfect': What did the authors mean by perfection? and why did it make sense to centre the species definition on the perfect?

To explore this point, we have in the following at times to move far away from the formation of species, and also, at times, outside the domain of zoology in order to encircle the meaning of 'perfection,' and, hence, the context within which it became meaningful to posit the perfect male as the prototype of the species. My point of departure will, however, be the ideas of perfection entertained within zoology.

The idea of perfection worked at three different levels in the zoological literature, and starting with that of the individual, I shall move on to consider its place at the level of species and, finally, at the grand level of nature herself. For the present, I shall leave the relationship

53 E. Rosch, 'Principles of Categorisation' (1978), p. 43.
54 K. Hastrup, *A Passage to Anthropology* (1995), pp. 30-1.

between males and females out of consideration as in some respects it presents us with a special case, but only to return to it after the analysis of perfection has been carried out.

*Perfection of Individuals*

As Bradley highlighted in a description of the transformations of insects and frogs, nature always worked to perfect its creatures in the development of an animal from its youth to adulthood, as illustrated here by the perfection of the frog (see Ill. 6.7):

An infinite Number of Parts, which were folded up [in the tadpole], explain and open themselves at the End of a certain time; some become absolutely useless, dry up, and fall off; and others are alter'd beyond our Knowledge. Nothing can be more admirable than the Tracing of all these Changes. A *Frog* is a *Fish* in its Beginning, named *Tadpole*; it has a great Head, the Mouth of a *Fish*, the Finns and Tail like *Fishes*; it respires by the *Gills*, which are *Lungs* peculiar to *Fishes;* some time afterward its *Tail* and *Finns* drop off, and its *Feet* appear, which are as well adapted to Walking as Swimming; the Fore-part of its *Head*, or rather its *Mask*, falls off, with its *Gills*; in the mean while, the *Lungs*, which resemble those of terrestrial *Animals*, unfold and dilate themselves, and become expanded and very visible, from almost invisible Parts that they were before. May not he look upon this as an extraordinary Perfection, and even more than Man himself can boast of, that Gift of Power in tasting Life successively in different States and in dfferent [sic] Elements?[55]

The result of this process of unfolding was, Bradley concluded, turning to the analogous case of insects, the production of the perfect animal:

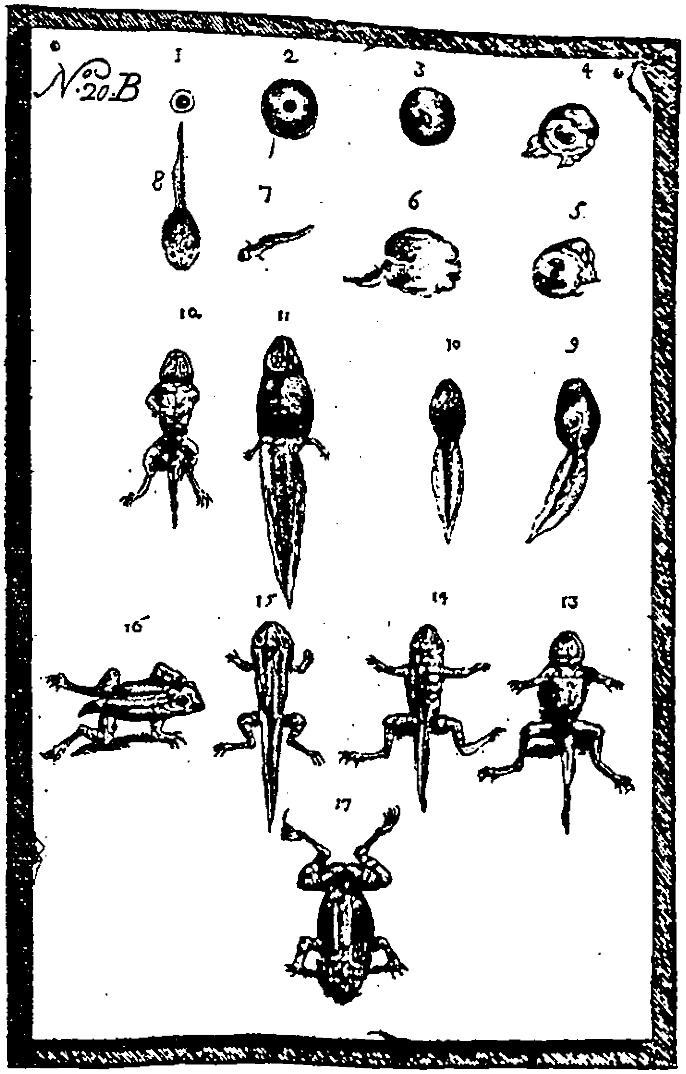
These considerations may undeceive those who are prejudiced in their Opinions, that a Creature in the Rank of *Insects* cannot become a *perfect Animal*, especially if they reflect that for the most part the State of *Worms* or *Caterpillars* is only a State of Passage to bring them to another Form.[56]

So, the forms preceding the adult cum perfect animal were only imperfect stages of passage, which made the formation of the perfect animal possible. Edwards also highlighted this in a discussion of the frog, but this time of the extraordinary Surinam frog, which allegedly metamorphosed from a fish to a tadpole to a frog and then back again to a fish and which, as we have already seen examples of, caused some debate within eighteenth-century British zoology:

I think however that our assent to such an opinion [as advanced by Seba and Merian about the metamorphosis of the frog] may reasonably be suspended til [sic] we are confirmed in it by further Observations of the real fact, for it seems strange that a tadpole should first be changed into a Frog, and that the Self same frog by a reversed process of Nature should change again into a Very large tadpole [... I]t seems very strange that another tail should grow from the frog that hath lately lost one and that he should gradually loose his leggs [sic] and become a Perfect Fish. Nature in her ordinary course is not accustomed to act in such a Manner backwards and forwards, to seem to perfect a work and then to reverse it by a process directly Opposite.[57]

'[N]ature', Thomas Hutchinson similarly stated after he also had refuted Merian's and Seba's theories regarding the frog-fish, 'seldom deviating from her general laws,' and neither had she done so in 'producing this Animal'.[58] Nature always worked forward. 'Every animal, and every plant, rises, by gentle gradations, from an embryo, or gelatinous state,' Smellie likewise

55 R. Bradley, *A philosophical account of the works of nature* (1721), p. 105; emph. in org.
56 Ibid.; emph. in org.
57 G. Edwards, Letter to Royal Society, Mar 27, 1760, Royal Society, London, L&P.IV.3.
58 T. Hutchinson, 'The Natural History of the Frog Fish' (1796), p. 7.



Ill. 6.7 TRANSFORMATION OF THE FROG (R. Bradley, *A Philosophical Account of the Works of Nature*, 1721). Nature was considered to always work forward in its creation of beings, bringing an animal to perfection in its development from an egg to a grown individual. The metamorphosis of the frog was a favourite example when nature's sense of direction was to be illustrated.

concluded in a more general statement on nature's way of producing animals, 'to a certain degree of perfection exactly proportioned to their several orders.'[59] Nature, it would seem, had a clear sense of direction and an equally clearly defined sense of purpose with its work: to bring out the most perfect animal possible.

This forward process towards perfection was, however, not always impeccably achieved, as John Hunter here underscores:

> The propagation of continuance of animals in their distinct classes, is an established law of nature; and, in a general way, is preserved with a tolerable degree of uniformity: but in the individuals of each species, varieties are every day produced in colour, shape, size, and disposition.[60]

So, the forward movement towards perfection was one of nature's laws, though far from always perfectly enacted. By implication, the occasional slips in nature became, in a sense, unnatural. Samuel Johnson clearly brought out this point in a recapitulation of nature's general end and design:

> Thus we see plainly, at one View, as in a Glass, that all Nature acts, or is acted upon, in all its various Species and Beings, separately and jointly to its own Perfection, and to the End and Design of the first Fiat, or of Matter being put into Motion, dependent on its first Cause, and effected by a continual Change, Fluctuation and Rotation, and that different Communications of Motions produce the innumerable Variety of Figures and Effects in the material World.
>
> That this World was formed in Time, and that Time is a Part in Eternity, and Matter a Place in Space: That it is natural for all the different Kinds of Beings to tend to its Good and Perfection, and unnatural for any to deviate from the original Plan of Existence and Order.[61]

To begin with, the perfect specimens became suitable as examples of species, one might suggest, because, in a sense, they agreed the best with nature's intent.

### *Perfection of Species and the Œconomia Naturæ*

At the level of species, the idea of perfection was transposed into a more clearly formulated teleological framework already foreshadowed in this conception of the perfection of individual animals. Raising the question of perfection versus imperfection once again, however this time at the level of species, Bradley advanced that it was impossible to distinguish between perfect and imperfect species. This assertion, it should be noted, was made in reaction to a notion, launched by Aristotle and revitalised during the Renaissance, of animals being classifiable on a scale according to their degree of perfection – with man usually embodying the highest possible degree of (terrestrial) perfection and insects, inversely, being regarded as the most imperfect:[62]

---

59 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 436.

60 J. Hunter, *Observations* (1786), p. 199.

61 S. Johnson, *The Philosophic Mirrour* (1763), p. 273.

62 Cf. A. O. Lovejoy, *The Great Chain of Being* (1948), chs. II and IV. On Aristotle's notion of perfection, see also A. L. Peck, 'Introduction' (1965), pp. xii-xxiv.

It is an antient Error to make the Distinction of *Perfect* and *Imperfect Animals*. Our Eyes do not discover the same Parts that are in some *Animals*, in *Worms*, *Butterflies*, *Flies*, *Bees*, and other *Insects*; so that some have thought such Parts were wanting.[63]

This conception of the necessary perfection of every species had a theological dimension to it, as the reverend William Jones, also a keen natural historian, highlighted in a sermon. The idea of an imperfect species would be an affront against a Creator who by definition embodied the Good:

When vegetable and animal life are compared, different things are to be admired, but nothing is to be preferred; for the wisdom of the Creator, being infinite, is every where equal to itself; to its works nothing can be added with advantage, nothing can be taken from them without loss. All things are perfect in their several kinds, and possessed of that goodness or sufficiency which must be found in every work of God.[64]

Although quite a few eighteenth-century zoologists, among these incidentally Bradley, Smellie and Jones, in fact did unfold a peculiar species of the Aristotelian notion of a scale of perfection when they changed their perspective from that of species to that of the Great Chain of Being, as we will see in Chapter 7, they also consistently maintained that at a species level animals were perfect in their own kind.

What was meant by this, being perfect in one's kind? Smellie gave a hint, as he linked perfection to the destiny of the species: 'Every creature is perfect, according to its destination.'[65] It was in relation to the working of nature at large that the perfection of species and thereby their nature could be understood and explained: 'Beings must not be contemplated individually, but by their rank, and the relations they have to the constituent parts of the general system of Nature'.[66]

In eighteenth-century natural history, the 'general system of Nature' was generally conceptualised through two interrelated complexes of ideas: the idea of the Great Chain of Being, and the notion of Œconomia Naturæ. The notion of the Great Chain of Being – or *scala naturæ* as it was sometimes alternatively called – almost universally embraced by eighteenth-century natural historians, outlined the structure of relations between species in hierarchical terms.[67] Joseph Addison succinctly sketches the outline of the Great Chain of Being here:

The whole Chasm in Nature, from a Plant to a Man, is filled up with diverse Kinds of Creatures, rising one over another, by such a gentle and easie Ascent, that the little Transitions and Deviations from one Species to another, are almost insensible. This intermediate Space is so well husbanded and managed, that there is scarce a degree of Perfection which does not appear in some part of the World of Life.[68]

Every species, then, had its particular, pre-ordained and fixed place on the Great Chain of Being. I shall return to a more extensive discussion of the Great Chain of Being in connection

63 R. Bradley, *A philosophical account of the works of nature* (1721), p. 104; emph. in org.

64 W. Jones, *Considerations* (1785), p. 2. A. O. Lovejoy, *The Great Chain of Being* (1948), ch. V, reviews the arguments made in favour of the goodness of God and the concept of sufficiency.

65 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 428.

66 Ibid., vol. II, pp. 435-6.

67 A. O. Lovejoy, *The Great Chain of Being* (1948), pp. 184ff.

68 Addison, *The Spectator*, no. 519 (Oct. 25, 1712), reprinted in R. J. Allen, *Addison and Steele* (1970), p. 436.

with my analysis of the entire taxonomic scheme in Chapter 7. What I would like to examine in more detail here is the doctrine of Œconomia Naturæ, which had a more direct bearing on the understanding of species' perfection. Though never, to my knowledge, thoroughly developed as an exegetical theory by any British author in the period,[69] nevertheless the zoologists time and again invoked a notion of nature's œconomy in order to account for the nature and destiny of species. Before we turn to the œconomy of nature itself, it seems useful to take a closer look at the more general ideas associated with 'œconomy' in eighteenth-century Britain, in order to clarify the meaning of this term.

Far from only related to a narrow field of economy in the strict sense of the term, œconomy was applicable to much wider fields in eighteenth-century discourse – hence, besides 'rural œconomy' and 'the nation's œconomy,' authors also talked about 'human œconomy,' 'regal œconomy,' 'moral œconomy,' 'political œconomy,' 'religious œconomy,' 'divine œconomy,' and, of course, 'natural œconomy.' Philosophy, husbandry, politics, physiology, theology, morals, national economy, and natural history – the range of fields in which the concept of 'œconomy' was made use of was wide, and its semantics consequently rich. We might, however, discern some common denominators. Firstly, as Edward Watkinson underscored in *An Essay upon Oeconomy*, '*Oeconomy* is a *comprehensive* Word': 'It includes all that *provident Care, exact Uniformity,* and *prudent Conduct,* so absolutely requisite in human Life.' Œconomy was 'a *moral,* it is a *Christian* Virtue'.[70] In a similar fashion, Arthur Young stressed that by œconomy, one was not merely to understand 'frugality', but a 'system of GENERAL MANAGEMENT', far transcending the narrow bounds of pure economic concerns.[71]

In the sense of a doctrine of 'general management,' œconomy was above all concerned with the maintenance of relationships between part and part, and a part and the whole in a given domain. Hence, within human society, œconomy was used both as a model of and, when applied as a moral, a model for[72] the proper management of social relations between king, landholder, merchant, mechanic, and labourer, and their relation to the whole nation. In general, the requirement of being œconomic in these relations meant accepting the terms of subordination, embracing ones place in life and acting, as it was repeated time and again, with 'moderation' so that social order could be maintained for the sake of the commonwealth: 'What

---

69 To my knowledge, the most thorough treatment of the doctrine in the period is to be found in a tract by the Swede Isac J. Biberg from 1750, translated into English in 1762, by Benjamin Stillingfleet as part of his collection of tracts by or made under the auspices of Linné. I. J. Biberg, *Œconomia Naturæ* (1750); B. Stillingfleet, *Miscellaneous Tracts* (1762).

70 E. Watkinson, *An Essay upon Oeconomy* (1763), pp. 3, 4; emph. in org.

71 A. Young, *Rural Oeconomy* (1770), p. 2; cap. in org.

72 The distinction between 'model of' and 'model for' is drawn from C. Geertz, *The Interpretation of Cultures* (1973), pp. 93-5. Here the distinction is applied in connection to an explanation of religion.

is required of man, is for every one in his particular station to perform their part in this great world, and then the blessings of heaven will allow to every individual in the land', as one essayist explained.[73] In contrast to human society, where œconomy had to be turned into moral decrees for order to be maintained – because man was, as we have seen, equipped with both self-will, passions, and desires which might entice him to transgress his appointed place in society – no such decrees were needed within nature as animals possessed none of these self-indulging faculties. Nature managed itself. The laws of nature ensured that every animal was kept in its place in the natural hierarchy of subsumation on the Great Chain of Being. Watkinson, after having elaborated on his doctrine of human œconomy, thus pointed out:

OBSERVE the *DIVINE* OECONOMY, Ranging and adjusting *every* thing in such a manner, that there is not a *Particle* of Matter but what hath its proper Place in Subserviency to the *whole* of the Creation.

'ORDER is Heav'n's first Law.' [...]

View the whole Frame of the World, (the wondrous Work of Him who is perfect in Knowledge.) Reflect on the great Laws of Nature, by which it is preserved in Order and Beauty!

Every Part of the Creation concurs to prove that GOD is, (as the Apostle speaks) *not* the Author of *Confusion*, but of *Order*.

Look unto the Heavens, and see *all* the celestial Bodies are *constant* in the Courses! They speak in the common Voice of Reason, and want *no* Interpreter to explain their Meaning. [...]

In every *other* Part the Powers of Nature are duly and *regularly* exerted! Even the *inanimate* Things of the World have their Office!

*Every* Work of the Creation hath its *proper* Business, and is designed by the first Cause of all Things to serve *some* wise End.[74]

It was in this extended sense of a general management directed towards the maintenance of order that the concept of œconomy would be employed within natural history.

Within the animal kingdom the divine œconomy managed order primarily through two means: by the physiological make-up of the animals, and through regulating their appetites. The working of the divine œconomy could thus already be observed in the very physiology of, primarily, species as God had wisely designed every species of animals for their particular place and destination in nature. 'Nature' had, as the zoologist Frederick Watson explained, 'provided for the Necessities of All Animals, by adapting the Structure of their Parts, and the immediate Organs of Life to them.'[75] Or, in the words of the natural history poet Richard Collins:

In ev'ry Clime, in ev'ry Soil, we see,
A different Kind of Beast, to this agree;
And all the Parts of ev'ry different Kind,
Adapted to the proper use design'd —[76]

73 Anonymous, *Populousness with Oeconomy* (1759), p. 21; cf. Anonymous, *The New Oeconomy of Human Life* (1766), pp. 1-3 and *passim*; R. Dodsley, *The Oeconomy of Human Life* (1767), pp. 20-2 and *passim*; S. Johnson, *The Philosophic Mirrour* (1763), p. 85 and *passim*.

74 E. Watkinson, *An Essay upon Oeconomy* (1763), pp. 13-4; cap. and emph. in org.

75 F. Watson, *The Animal World Display'd* (1754), p. 138.

76 R. Collins, *Nature Display'd* (1727), p. 69.

Some birds, zoologists observed, were thus made for the 'purpose' of inhabiting the 'empty regions of air'; others also for swimming and diving for fish, and hence, they had their wings and legs placed further back in order to facilitate movement in water;[77] some birds which were 'continually passing through hedges and thickets' had membranes on their eyes to protect them 'from external injuries'.[78] Like the various species of birds, so the various species of quadrupeds had also been formed to occupy their specific place in nature:

> The head of Quadrupeds are generally adapted to their mode of living. In some, it is sharp, to enable them to turn up the earth, where they find their food deposited; in others, it is long, in order to afford room for the olfactory nerves; in many, it is short and thick, to strengthen the jaw, and qualify it for combat. Their legs and feet are entirely formed to the nature and exigencies of the animal. When the body is heavy, the legs are thick and strong; when it is light, they are active and slender. Those that feed on fish, are made for swimming, by having webbed feet; those that prey upon animals, are provided with claws, which they can draw and sheath at pleasure; but the more peaceable and domestic animals are generally furnished with hoofs, which, being more necessary for defence than attack, enable them to traverse the immense tracts which they are destined to pass over, either to serve man, search for food, or avoid hostilities.[79]

Finally, some animals, like the dromedary and the camel (as well as the horse, the sheep, the oxen and cow, and many other beasts of burden or of common use[80]), had been made particularly for the benefit of man:

> When we consider the structure of the camel and dromedary, we cannot be deceived with regard to their destinations. The four stomachs indicate a vegetable diet, and the same docility and gentleness of manners which characterise the whole ruminating tribes. From the addition of a fifth bag, or reservoir for the reception and preservation of water, we should expect to find some peculiarity of disposition. In this conjecture we are not deceived. Of all animals which man has subjugated, the camel and dromedary are the most abject slaves. With incredible patience and submission they traverse the burning sands of Africa and Arabia, carrying the burdens of amazing weight. [...] Both the constitution and structure of camels are nicely adapted to the soil and climate in which they are produced.[81]

The underlying purpose of this pre-ordained design of animal forms was, as Smellie concluded after having given a number of examples, to make each species fit for the grand scheme of nature:

> In all the variety of animated beings whose general structure has been exhibited, the intelligent reader will easily perceive, that the bodily forms of the different kinds are exactly adapted to the rank they hold in the creation, and that their œconomy and manners are strictly and invariably connected with their structure and organs.[82]

In the very creation of animal forms, the general order of nature had been implicated: Animal species had been predestined to occupy a specific recess in a nature which (like in the Bible) was already created before the species were formed.

It was not only the relationship between animal species and habitat which nature had taken care of. Also the relationships between species were regulated by nature's wise management, most importantly by dietary means. 'Nature had provided', Brookes said, 'that

---

77 R. Brookes, *A New and Accurate System* (1763-72), vol. II, pp. xi-xiii.
78 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, p. 111.
79 Anonymous, *The Beauties of the Creation* (1790), pp. 2-4.
80 Cf., for instance, Anonymous, *The Beauties of the Creation* (1790), p. 4.
81 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, pp. 100-1.
82 Ibid., vol. I, p. 121.

each species shall make war' on other species in order to feed and hence, to survive.[83] As Smellie observed in the same manner, it was 'an established law of Nature' that the 'existence' of every animal 'universally terminates in death and dissolution':[84] 'The Goat feeds the Glutton, the Glutton the Mice, and the Mice the Owl';[85] the sparrow-hawk prey on the thrush and the falcon on the bustard;[86] in fact, the carnivorous animals invariably feed on the 'weaker and more timid tribes'.[87]

At a first glance, such an arrangement might appear invidious, as authors were quick to note:

In contemplating the system of animation exhibited in this planet, the only one of which we have any extensive knowledge, the mind is struck, and even confounded, with the general scene of havock and devastation which is perpetually, and every where, presented to our view. There is not, perhaps, a single species of animated beings, whose existence depends not, more or less, upon the death and destruction of others.[88]

Although such apparent evil proved to be something of a theological knot in the eighteenth century – for how could a wise and good God have created a world displaying preying destruction?[89] – within zoology this theological problem was usually passed over in silence, and the cruelty explained as, in fact, a very wise way of maintaining order.

Although a war might be going on in nature; it was not a war without providentially defined rules. Nature, exhibiting her 'wise and wonderful economy,' had thus 'with such amazing precaution [...] severally formed' her 'children' so 'that the discriminating appetites of every individual continues as distinct as their species.'[90] Thus, every species had, in the words of Bradley, 'a Food natural to it'.[91] In addition, by the general fashioning of carnivorous species, nature had ensured that no species of prey would be unduly hunted and hence, exterminated:

In general, whatever be the food, nature seems finely to have fitted the creature for procuring it, tho' never without a proper exertion of its strength, or industry. Large animals of the forest, such as the Elephant, and Lion, want swiftness, and a distinguishing scent for catching their prey, but have strength to overcome it: Other who want strength, such as the Wolf and the Fox, make it up by their cunning; and those to whom nature has denied both strength and speed, as the Hound, and the Jackal, follow by the smell, as all the last overtake their prey by perseverance. Thus each species seems only possessed of one talent in perfection, so that the power of destruction in one class, may not be greater than the power to escape in another.[92]

Inversely, then, nature had also equipped the prey with a fair means of escape:

83 R. Brookes, *A New and Accurate System* (1763-72), vol. II, p. xiv.
84 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 184.
85 F. Watson, *The Animal World Display'd* (1754), p. 31.
86 R. Brookes, *A New and Accurate System* (1763-72), vol. II, p. xiv.
87 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, p. 89.
88 Ibid., vol. II, p. 184.
89 A. O. Lovejoy, *The Great Chain of Being* (1948), pp. 208ff, discusses the precarious role of evil in eighteenth-century theological thought.
90 Anonymous, *Beauties of Natural History* (1777), p. vi.
91 R. Bradley, *A philosophical account of the works of nature* (1721), p. 58.
92 R. Brookes, *A New and Accurate System* (1763-72), vol. I, pp. xxix-xxx.

As Nature has given to many Animals in the several Ways [...] Instruction to escape and Means to save themselves from the Violence of their Enemies; so has she not been wanting in giving to many others a peculiar Sagacity, and instructing them in many singular Methods of catching their Prey. In this, as throughout her whole Œconomy, all is regular and appropriated, and the Advantages given on either Side are as just disposed as they are wanted.[93]

The œconomical laws, which guided the 'war' between the species, hence served, not too unlike those moral decrees for moderation advocated within human society, to ensure that the relationship between hunter and prey remained the same at the end of the day:

The Provision which is made for one Species of Animals by the Number and Bigness of others, is in general very regular, and calculated for the Support of the several larger, without the Destruction of the several smaller Kinds. Thus the Tygers are less numerous than the Wolves; and the Creatures in general, as they severally prey upon one another, are in the largest and fiercest Kinds least numerous, and in the smallest of all, most.

In general, the Country which breeds any particular Kind, produces also the several smaller Creatures, which become naturally its Prey, in greater Numbers, as there are more of the Destroyers[.][94]

Smellie summed up the implications of such a maintenance of order, after also having reviewed these laws of nature's œconomy:

There is a wonderful balance in the system of animal destruction. If the general profusion of the animated productions of Nature had no other check than the various periods to which they live, when not extinguished by hostilities of one kind or another, are limited, the whole would soon be annihilated by an universal famine, and the earth, instead of every where teeming with animals, would, unless re-peopled by a new creation, exhibit nothing but a mute, a lifeless, and an inactive scene. If even a single species was permitted to multiply without disturbance, the food of other species would be exhausted, and, of course, a period would be put to their existence.[95]

Had it not been for this œconomy of nature whereby nature had moulded the appetites of species, and controlled the relationship between hunter and prey, the 'herbivorous and frugivorous races' would 'increase to an hurtful degree'; insects would 'cover the surface of the earth', and 'hares, rabbits, mice, and rats' would have multiplied enormously.[96] In order to maintain order, destruction was needed, then. What is crucial to note here is that such destruction, however, always and invariably involved the destruction of *individuals*:

Nature, it must be confessed, seems almost indifferent to individuals, who perish every moment in millions, without any apparent compunction. But, with regard to species of every description, her uniform and uninterrupted attention to the preservation and continuation of the great system of animation is conspicuous, and merits admiration. Life, it should appear, cannot be supported without the intervention of death. Through almost the whole of animated Nature, as we have seen, nothing but rapine, and the destruction of individuals, prevail. This destruction, however, has its use. Every animal, after death, administers life and happiness to a number of others.[97]

By allowing animals to prey upon each other according to œconomical laws, the stable order of nature could continue to exist.

In this world of destruction and reanimation, nature was, indeed, in a state of flux, and yet she remained the same. The perpetual changes at the level of individual animals – birth and growth, death and destruction – did not alter the basic order: the relationship between species. On the contrary, these perpetual changes worked to maintain the equilibrium: 'A circle of

93 F. Watson, *The Animal World Display'd* (1754), p. 56.

94 Ibid., p. 62.

95 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 217.

96 Ibid., vol. II, pp. 217-8.

97 Ibid., vol. II, pp. 211-2.

animation and destruction goes perpetually round. This', as Smellie concluded, 'is the œconomy of Nature.'[98] What had appeared at first sight as utter cruelty proved, upon a closer inspection, to be a very wise mode of management. The war of individual hunters and prey was necessary for the continuation of the species order.

It is, I will suggest, within this context of the ideas of perfection and the œconomy of nature – of every individual animal having a potential for perfection, but only the fully-grown male realising it; of every species being perfect in its kind and for its preordained place and destination in the grand managed order of nature – that we have to understand the judgement of prototypicallity in the eighteenth-century zoological definition of species. Although the individual animals as specimens were epistemologically essential for the empiricist zoologist, and although the individual animals as prey or hunter were essential for nature to maintain its perfect order, they were cosmologically insignificant. In the grand scheme, only the species mattered, and within these it was the most perfect animals, those realising their species potential most fully and hence, in the best possible way illustrating the pre-ordained destination of the species, which were judged to be the best possible representatives for the species as such. Although they were made the prototypes of the species, the perfect specimens did not exhaustively represent all of the specimens included in the category – hence, the need for additional information on the larva, the tadpole, the foal, the young ones etc. in the more elaborate descriptions of species. And that neither was their task when they were used as the basis for the species definition, I will argue: On the contrary, the perfect specimens were used as prototypes in order to represent that potential perfection of the species which became of significance in relation to the grand order. There were good reasons, then, to conceal the categorial heterogeneity in the species definition: in the final analysis, this variety simply did not matter.

## Male Prototypes

Let me now turn to the role of the male in the judgement of prototypicallity. We have already seen some examples above of the singling out of the perfect adult *male* as the best representative of the species. Let me here give a few more examples. The practice can be no better observed than in the case of species of deer and birds, where the traits considered to be characteristic would often not even be present in the female specimens. The species of the deer kind would, for instance, normally be defined with reference to, among other characteristics, their antlers, as in Brookes' typical definition of the deer: 'These animals chew the cud, and

98 Ibid., vol. II, p. 225.

shed their horns every year, which are always solid, and this sufficiently distinguishes them from others of the ruminating kind.'[99] In the definition of each species of deer, the exact position and layout of the antlers would normally be included in the species definition.[100] Remember, however, that antlers are only present in the male deer.

The effects of this prototypical judgement are also evident in the more elaborate descriptions of the species. Usually, an author would start out by describing the male and either leave the description at that or else proceed to a description of the female in terms of the characteristics in which she differed from the male. A typical example of this can be found in Peter Brown's description of the 'black ostrich':

SIZE, Ostriches are sometimes twelve feet high.
HEAD, and NECK, brown.
BACK, lower part of NECK, BREAST, and RUMP, black.
WINGS, and TAIL, of a snowy whiteness.
PLACE, Africa. [...]
At the Cape of Good Hope the people assert, that the males of Ostriches, when full grown, are always black as the bird here described, and the females of a pale greyish-brown.[101]

Or, in this description by Catesby of the hen of the 'little hawk' given after a full description of the cock qua 'little hawk':

The Hen differs from the Cock, as follows: her whole Wing and Back is of the same colour as the Back of the Cock; the Tail of the Hen is marked as in the Back, with transverse black lines; her Breast has not that strain of red as in the Cock.[102]

As here, the females would in general, if at all, be represented as 'deviations' of the male.[103]

This preference for the traits of the male specimens was even extended to the level of pronouns. In the many cases where the neutral pronoun IT or the plural THEY were not used, the male pronoun HE would be employed with few exceptions in the description in reference to the species as such, as here in Brookes' description of the lion:

All the members of a Lion in general express the strength of his body, and he has a very majestic gait, with a noble air, and a large mane. He has lively sparkling eyes, with dreadful paws, and his steady pace cannot but excite the attention of the beholder; plainly shewing that he is the king of quadrupedes.[104]

It was only in a few cases of animals, such as the pelican, which were strongly associated with what was conceived to be female qualities, that the authors occasionally used the female pronoun in reference to the species. The pelican, hence, was often described as exceptionally maternal as, in a frequently retold story, *she* was depicted as gathering water often from sources far away in '*her* great gular pouch' to fill in *her* nest 'in order to cool *her* young ones'

99 R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. 58.
100 Ibid.; see, for instance, also T. Pennant, *Synopsis of Quadrupeds* (1771), pp. 40ff.
101 P. Brown, *New Illustrations of Zoology* (1776), p. 38; emph. in org.
102 M. Catesby, *The Natural History of Carolina* (1731-43), vol. I, description accompanying Plate 5 (unpaged).
103 Cf. L. Schiebinger, *Nature's Body* (1993), pp. 88ff., who makes this argument in connection with eighteenth-century studies of anatomy. I shall return to this study later.
104 R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. 178.

from the burning heat in the torrid desert where the pelican allegedly usually breed.[105] Such cases were exceptions to the rule, however. In general, the male would stand for all, like the lion for the lions: Prototypically the species was male.

Although at times authors gave more explicit consideration to the relationship between male and female, as we presently shall see, the reasons for this judgement of prototypicallity remained tacit. In seeking an explanation for the self-evidence with which the prototype gained a sex, it is worth taking a closer look at both the ideas of the relationship between male and female in the animal kingdom and in the world of humans. In order not only to elucidate this point in the species formation, but at the same time also to indicate why women were excluded from the possibility of forming such species – the two things were, in fact, connected through the same chain of ideas – I shall here dwell a bit longer on the conceptualisation of gender in human society than is, strictly speaking, necessary to explain the sex of the species alone.

In addition to the differences in reproductive organs, between brute males and females it was most often the strength of the male that was singled out as his distinctive mark:

> One of the most general marks is the superior strength of make in the male; and another circumstance, perhaps equally so, is the strength being directed to one part more than to another, which part is that most immediately employed in fighting.[106]

The same matrix of differences would be unproblematically transposed to the realm of humans, as Smellie does here, starting with a description of animals and moving straight on to differences between man and woman:

> The bodies of males, though not without exceptions, are, in general, stronger, larger, and more active, than those of the females. In the human species, the male is not only larger then the female, but his muscular fibres are firmer and more compact, and his whole frame indicates a superior strength and robustness of texture. He does not acquire his full growth, and best form, till he arrives at the age of thirty years. But, in women, the parts are rounder, and their muscular fibres more feeble and lax than those of men, and their growth and form are perfect at the age of twenty.[107]

Within human physiology, remaining within the world of humans for the present, the firmness of man's fibres, his 'superior strength and robustness of texture' would in general, as here, be contrasted to the softer qualities of the female body, as Ludmilla Jordanova observes: 'In the descriptions of the smallest constituents of women's bodies, images of softness, rotundity, delicacy, feebleness and childishness were used.'[108] Again, as is also intimated in the quotations

105 See, for instance, T. Pennant, *Synopsis of Quadrupeds* (1771), pp. 165-6; emph. added.

106 J. Hunter, *Observations* (1786), p. 63. It should be noted that Hunter as, to my knowledge, the only author from the period, advocated for including only the traits shared by male and female in the species definition. Hence, after having determined the general differences between males and females, he stated: 'where the sexes are separate, and the animals have two characters, neither of them can be called the true one; the true distinguishing properties being those peculiar to neither sex' (ibid., p. 65). Hunter, however, was a physiologist rather than a zoologist, and this assertion did not become influential in the zoological practice of the eighteenth century.

107 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, p. 374.

108 L. Jordanova, 'Naturalizing the Family' (1986), p. 108.



Ill. 6.8 FALLOW DEER AND FEMALE FALLOW DEER (Buffon ed. Smellie, *Natural History*, vol. IV, 1780). Female animals were usually described as a derivation of the males. This mode of conceptualisation became evident even in the designation of the animals, as here in the case of the fallow deer.

from Hunter and Smellie above, it would be the features of the male that determined the terms of comparison between the sexes. As Londa Schiebinger has pointed out in her analysis of eighteenth-century bio-medical discourse, the man would be portrayed as 'the universal subject' while the woman would be construed as 'a sexual subset.' It was the traits, which distinguished her from man, and mainly those associated with her reproductive abilities (breasts and reproductive organs), which would get the main attention in physiological and anatomical literature.[109]

This conception of the female as, in the words of Schiebinger, a 'deviation' from man[110] resonated with a more general conception of the relationship between the sexes, voiced in political and philosophical literature from the period.[111] As has often been noted, the relationship was construed in complex terms, and the fact that theory was one thing and practice could be quite another only added to the complexity.[112] For the purposes here, it suffices to focus on the exegetical representations, and I shall further mainly concentrate on how the relationship was construed in terms of marriage. An area, which in the period under consideration here became one of the, if not *the* most important focal point for discussing the nature and roles of man and woman.

In the seventeenth century, a model of patriarchy had been predominant in the conceptualisation of marriage. Often legitimised with reference to the institute of God in the Garden of Eden and the commands of Exodus and Deuteronomy and/or with reference to the greater rational capacities granted man by nature, man was made the natural master of his wife. As John Milton stated in *Paradise Lost*, after he had made God create Adam and Eve:

> Not equal, as their sex not equal seemed;
> For contemplation he and valor formed,
> For softness she and sweet attractive grace,
> He for God only she for God in him[.][113]

'You must lay it down for a foundation in general', the Earl of Halifax similarly told his daughter, 'that there is Inequality in the Sexes, and that for the better Œconomy of the World, the Men, who were to be the Lawgivers, had the larger share of Reason bestow'd upon them.'[114] In this patriarchal model, a wife became akin to something like 'an upper servant' of her husband.[115]

---

109 L. Schiebinger, *Nature's Body* (1993), p. 88.
110 Ibid.
111 Also cf. R. Porter, *English Society in the Eighteenth Century* (1982), pp. 35ff.
112 See, especially, L. Jordanova, 'Natural Facts' (1980), and L. Colley, *Britons* (1996), ch. 6. Both authors discuss the relationship between theory and practice.
113 J. Milton (1667/1952), *Paradise Lost*, Bk. IV, l. 296-9.
114 Earl of Halifax, *The Lady's New Year Gift* (1688), Introduction (unpaged), quoted in R. Porter, *Enlightenment* (2000), p. 322. See J. B. Elshtain, *Public Man, Private Woman* (1981), pp.102-8, for a more general discussion of the theories underlying this patriarchal model.
115 Cf. R. Trumbach, *The Rise of the Egalitarian Family* (1978), pp. 151-3.

During the long eighteenth century, the patriarchal model was relaxed and new terms of distinction were introduced.[116] An increasing number of, in particular, liberal writers, among these John Locke, argued that man and woman were born free and equal and with souls of a like quality.[117] As this idea became more widespread, the terms of marriage to some extent changed. Still, however, throughout the eighteenth century, a woman would come under the legal authority of her husband by entering into marriage:

By marriage, the husband and wife are one person in law, that is the very being or legal existence of the woman is suspended during the marriage, or at least is incorporated and consolidated into that of her husband.[118]

A wife's belongings thus entered into her husband's care: 'She can't let, sell, give away, or alienate any thing without her husband's consent. Her very necessary apparel, by the law, is not her's [sic] in property.'[119] The importance of this legal subordination of the wife under her husband lay not only in the fact that the husband, legally, was made the guardian of his wife, but also in the fact that the wife, devoid of her own property and dependent on her husband, could not by definition be a citizen with political rights: By implication, women were excluded from the public-political sphere.[120]

Outside the law, however, terms of greater equality were introduced into the institution of marriage. Not only did the idea of marriage as a union made by mutual consent gain prominence – hence, the wife might legally be under the authority of her husband, but she entered into that position by free consent. In addition, marriage was still more often clothed in romantic terms within the aristocracy and the middle echelons, as a union of companionship entered into for reasons of love.[121] Despite consent, romance and companionship, husband and wife did not stand in a symmetrical relationship in this union, however. Fusing the patriarchal model with that of companionship, it was still common to portray marriage as a hierarchical relation by the second half of the eighteenth century: 'Remember, thou art man's reasonable companion, not the slave of his passions', Robert Dodsley cautioned his female readers in 1767, but went on declare that 'the end of their [the wives'] being is to assist [their husbands] in the toils of life, to smooth him with their tenderness, and recompense his care with soft endearments.' Hence 'Submission and obedience' would be 'the lessons of her [the wife's]

---

116 J. B. Elshtain, *Public Man, Private Woman* (1981), pp. 108-31, and M. L. Shanley, 'Marriage Contract' (1982), discuss the transition at some length.

117 See, for example, J. Locke, *Two Treatises* (1690/1988), p. 269/II,§4.

118 W. Blackstone, *Commentaries on the Laws of England* (1765-9), vol. I, p. 430, citing *Magnae Britannie Notitia* (1716, pp. 192-3); quoted in R. Porter, *Enlightenment* (2000), pp. 320-1.

119 *The Laws Respecting Women as they Regard their Natural Rights* (1777), p. 65; quoted in L. Colley, *Britons* (1996), p. 252.

120 It was not until 1832, that they would be excluded by law from the franchise. That had been self-evident until then, as Linda Colley observes. L. Colley, *Britons* (1996), p. 263.

121 On the aristocracy, see R. Trumbach, *The Rise of the Egalitarian Family* (1978), esp. ch. 2, and on the middle echelons, see P. Earle, *The Making of the English Middle Class* (1989), chs. 7-8; M. Hunt, *The Middling Sort* (1996), esp. ch. 8.

life'.[122] Likewise, Samuel Johnson would make the wife her husband's 'Fellow Companion', but at the same time allocate her a place only 'next in equality to him.' The husband remained 'the Governor of all', and among these his wife, 'committed to his Care'.[123]

The reason for this designation of roles was found in a difference in 'dispositions' between the two sexes, making them naturally suitable for different roles within society. Although, in particular, the liberal writers argued that man and woman were born equal and free, they got into a bit of a problem explaining the origin of the different dispositions and roles of male and female – and almost always left the matter unexplained[124] – some authors based their idea of the different dispositions in nature. Hence Smellie, for instance, after having taken note of the difference in physiology between men's strength and women's feebleness, went straight on to observe in not uncommon terms that 'A similar observation is applicable to the minds of the two sexes':

> Man is, comparatively, a bold, generous, and enterprising animal. Women, on the contrary, are timid, jealous, and disposed to actions which require less agility and strength. Hence they are entitled to claim, and, by their amiable weaknesses, they actually receive our protection. Men are endowed with majesty of figure and force of mind; but beauty, and the graces, are the proper characteristics of women.[125]

Whereas women – sensible, feeble, emotional and physiologically created for child rearing – seemed fashioned for the domesticity of the private sphere, men (or at least the free citizens who were made to stand for men in general) were as strong and reasonable creatures better suited to participating in the affairs of the public sphere. Although, in practice, women certainly did transcend the realms of the private world in a number of different ways,[126] this 'doctrine of separate spheres,' as it is often called, became crucial for the conceptualisation of the relationship between the sexes in broader sociological terms. Ultimately, the distinction between private and public centred on a distinction between desire and understanding. As we have already seen, in order to enter into the public sphere, to become acceptable as a political agent or a man of knowledge, a man was required to be free. As the eighteenth century progressed, he had to be free not only, and, with regard to especially learning, not even necessarily, in the traditional civic humanistic sense of being autonomous economically, but more importantly, to be free in the sense of having disciplined and hence transcended his own desires and self-interests. Thereby he would have become eligible for entering the public sphere and work for the common good in the political realm, or for understanding the general laws of nature in the learned. Women, being always dependent on someone else (a father or a

122 R. Dodsley, *The Œconomy of Human Life* (1767), pp. 44-5.

123 S. Johnson, *The Philosophic Mirrour* (1763), pp. 86-7.

124 Cf. R. Porter, *Enlightenment* (2000), pp. 334ff.

125 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, pp. 374-5.

126 L. Colley, *Britons* (1996), ch. 6, discusses their range of political engagement; M. Hunt, *The Middling Sort* (1996), ch. 5, discusses women's involvement in the economic sphere; and J. Brewer, 'The Most Polite Age' (1993), touches upon their participation in the cultural domain of the public sphere.

husband) and being unable to transcend their private selves to the same extent as men, were considered genetically unsuitable for the affairs of political and philosophical life.

Although women were certainly more strongly associated with passions and desires than men were, and hence, also more strongly associated with the private sphere, and, inversely, men were more strongly associated with reason and the public sphere, we should be careful not to read this as a rigid distinction, at least as regards the men.[127] As we have also seen earlier, reason did not have an exclusive hold over man; passions and desires lived in him as well: 'Our reason and passions are in a kind of civil war within us', as an anonymous author noted, 'and whichever of the two is most predominant, so are we either good or bad.'[128] A man might turn out 'bad,' but as a man, genetically he had the potential to overcome his private passions and self-interest in a way that women had not. What distinguished man from woman, therefore, was not that the former possessed reason and the latter only passions, but that man had a potential to overcome his desires and develop his rational faculty in such a way that he could most perfectly realise mankind's most distinguishing quality vis-à-vis the brutes: his transcendental reason. And in such a way that he, to the extent that he was also civilised and learned, could form species out of the brutes, which women could not.

It was, I will suggest, this understanding of man and woman which made it self-evidently meaningful to describe the female brutes solely in terms of her deviations from the males and which, more fundamentally, made it sensible to judge the male specimens as the best representatives of the species as such. It was this understanding of the relationship between the sexes which made it perfectly meaningful within the animal kingdom to define deer species by, among other characteristics, its antlers, or the black ostrich by the male's black colour. As man, so also the male specimens displayed the perfection of the species.

This mode of prototypical judgement, making the perfect adult male the representative of the species, constitutes, I will argue, one of the basic pillars in the formation of species throughout eighteenth-century zoology. The contents of the definitions of species would, as we have seen, be subject to continual change as more specimens were brought to Britain from all over the world, allowing the zoologists to redefine species with more precision. The mode of prototypical judgement was not, however, subject to change. We might say that, in conjunction with the exegesis of species, it provided the basic conceptual structure for defining species in practice, and hence also for the way new specimens would be incorporated into the order of species. For a considerable period, witnessing the discovery of an abundance of new animals, some of them as strange as the kangaroo, or (if not discovered, then at least rediscovered by some eighteenth-century zoologists) the giraffe, the conceptual system underpinning the

127 Cf. L. Jordanova, 'Natural Facts' (1980), p. 63 and *passim*.
128 Anonymous, *The Mirrour* (1759), p. 93.

formation of species remained unaffected. Although the contents of the concrete species definitions changed, the conception of nature's œconomy, of species' position in nature, and of the nature of the category of species itself did not change during the long eighteenth century.

## SPECIFYING NORMALITY

So, a species was first and foremost characterised by its perfect members, and natural history itself could, in fact, be described as a study of perfection: 'Amongst the many Acts of Gratitude we owe to God, it may be accounted one, to study and contemplate the Perfections [sic] and Beauties of Nature', as George Edwards stated in the first volume to his seven books on natural history by way of making a justification for the publication:[129] It was the perfect animals which mattered in zoology. Although the females, the young, the tadpoles, the larvae and all of the other in some way less perfect animals were occasionally mentioned in the zoological works, there was a whole group of animals which were consistently rejected from the pages, being not merely imperfect, but downright contrary to perfection: the monsters. Thus, Brookes noted in the introduction to his six volumes on the animal and vegetable kingdoms:

> I have been sparing however in the description of the deviations from the usual course of production, first, because such are almost infinite, and [, second,] the Natural Historian who should spend the time in describing deformed nature, would be as absurd as the Statuary, who should fix upon a deformed man from whom to take his model of perfection.[130]

A similar equation of perfection with the zoologically interesting which Edwards made explicit in his statement above is here underlying Brookes' argument for excluding any animals deviating 'from the usual course of production': That deformity should be interesting had become an absurdity by the eighteenth century.

How exactly this 'usual course of production' was to be defined – or, in other words, where normality ended and monstrosity begun – was never made explicit. It was easy enough to explain what a monster was, in principle. Here defined by Chambers in his *Cyclopædia*:

> MONSTER, MONSTRUM, a birth, or production of a living thing, degenerating from the proper and usual disposition of parts, in the species it belongs to. – As, when there are too many members, or too few; or some of them are extravagantly out of proportion, either on the side of defect or excess.
>
> Aristotle defines a *monster* to be a defect of nature, when acting towards some end, it cannot attain to it, by reason some of its principles are corrupted.[131]

In practice, however, the identification of which specimens were monstrous and which were not, proved to be more difficult. In some cases, animals from far away places would be brought to the zoologists in Britain which appeared to differ markedly from nature's 'common course of production,' but which did so consistently in a number of specimens. 'Nature' could, for

129 G. Edwards, *A Natural History of Birds* (1743-51), vol. I, p. v.
130 R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. xv.
131 E. Chambers, *Cyclopædia* (1741), vol. II, 'Monster' (unpaged); note excluded, cap. and emph. in org.

instance, 'be said to have violated the general rules of proportion' in the flamingo, according to George Shaw, as it had furnished these birds with 'enormously and even awkwardly long' legs and neck.[132] Likewise, when creating the species of armadillo, covered with crust as it was, the porcupine, covered with 'prickly feathers', and the pangolin, 'armed with scales like fish', nature appeared to have deviated from her common mode of fashioning quadrupeds, as quadrupeds would be expected to be covered by fur:

[W]hen we talk of a quadruped, the very name seems to convey the idea of an animal covered with hair; as, when we mention a bird or a fish, feathers or scales present themselves to our imagination, and seem inseparable attributes of these creatures: yet Nature, as if willing to deviate from this characteristic uniformity, and to astonish us by uncommon productions, manifests herself contrary to our general ideas, at variance with our denominations, and with the characters which we have acknowledged, and amazes us still more by her exceptions than by her laws.[133]

In New Holland, as it occurred towards the end of the century, nature seemed to have made an entirely 'new world' of animals and plants as the president of the Linnean Society of London, James Edwards Smith said.[134] Here, entire species of animals deviated to such an extent from the common course that at times it even seemed appropriate to include 'anomalous' in the very name of their species, as in the case the 'Anomalous Hornbill'. This was, as White stressed, a 'bird so very singular in its several characteristics that it can scarcely be said to which of the present known genera to refer it':

In the *bill* is seems most allied to the *hornbill*, but the *legs* are those of a *toucan*, and the *tongue* is more like that of a *crow* than any other[.][135]

More examples of such uncommon species could be cited, but these instances suffice to indicate that, firstly, while an idea of nature's common course of production – a variety of which we have already encountered above in Chapter 3 – worked in understanding species, uncommon shapes in species was not a reason to exclude them from the space of zoological attention. However much the hornbill, the armadillo, the flamingo, or the pangolin deviated from the common course, and however difficult they might be to classify in the taxonomic scheme, they still deserved the attention of the zoologist because, despite their peculiarities in external form, they obeyed a more fundamental law of nature: They were capable of reproducing themselves, and hence, they allowed the zoologist to draw relations between specimens and make a species out of them.

In a sense, the animals excluded from the zoological study can be said to be those that did not allow the zoologists to draw any such relations. Monsters, by definition, were singular occurrences. Hence, when discussing whether that excrescence, mentioned above, on one of the 'skinc-formed lizards' he had received from White in New Holland, was 'natural' or a

132 G. Shaw, *Museum Leverianí explicatio* (1792), vol. III, p. 134.

133 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. II, 'Six-Banded Armadillo' (unpaged).

134 Quoted in B. S. Smith, *European Vision and the South Pacific* (1960), p. 124; see ibid. pp. 124ff. for a more general discussion of the conceptualisation of Australian flora and fauna towards the end of the eighteenth century.

135 J. White, *Journal of a Voyage to New South Wales* (1790), p. 142; emph. in org.

'monster,' Wilson took special note of the fact that White had seen a number of lizards with such excrescences and conjectured: 'Now if it was a monster, arising either from accident, or originally so formed, it would hardly be so common as to be taken notice of'.[136] Edward Tyson, in a similar fashion, reflecting on whether the 'Pygmies' described by Homer in *Iliad* as participatants in the battle of Troja[137] might be the same with that 'pygmie ape' Tyson himself had dissected, observed that although Homer certainly had taken 'the liberty of pleasing the Reader's Phancy' in his description, subsequent writers had taken his portrayal at face value. However, such species of animals could not exist, as Tyson concluded:

> *Nature* never formed a whole *Species* of *Monsters*; and 'tis not the *heat* of the country [Africa], but the warm and fertile Imagination of these *Historians*, that has been more productive of them than *Africa* itself.[138]

As is here indicated, monsters were invariably to be found at the level of specimens. They belonged thereby, as Thomas Browne said while determining a two-headed snake to be a monster, to the 'Quæ genus' of nature:

> [Such] are monstrous productions, and beside the intention of Nature, and the statutes of generation, neither begotten of like parents, nor begetting the like againe, but irregularly produced to stand as Anomalies, and make up the *Quæ genus*, in the generall booke of Nature[.][139]

So, the monsters belonged to a special class in nature, or, maybe more accurately in the words of Browne, 'beside' nature: Within the context of a nature which was conceptualised as a regular field, managed by unchanging laws, the monsters which had played such a significant part in Renaissance scholarship, lost their philosophical appeal. As abnormal specimens, by the eighteenth century they were systematically excluded from the field of zoology. Indeed, it was only logical that they should be so excluded from a study concerned with this type of regulated, well-managed nature.

In particular, anthropologists working in the field of folk classification have shown that the systematic exclusions of one kind of animals or another (or other items) from classificatory systems are far from uncommon. To the extent, as Roy Ellen has argued, that there is necessarily an element of arbitrarity in all classificatory systems, these systems will have the potential of creating anomaly.[140] Such anomaly is what Mary Douglas, in her cross-cultural study of classification, has called 'dirt': 'Order implies restrictions; from all possible materials, a limited selection has been made [in the classification] and from all possible relations a limited set has been used.'[141] Dirt, then, is all of those items that do not fit into the classification, given its particular definition of restrictions and limitations. Dirt is 'matter out of place:'

---

136 T. Wilson, 'Appendix' (1790), p. 242.
137 Homer, *Iliad*, p. 117/bk.III, vv. 1ff.
138 E. Tyson, *Orang-Outang, sive Homo Sylvestris* (1699), Philosophical Essay, p. 7; emph. in org.
139 T. Browne, *Pseudodoxia Epidemica* (1646), p. 142; emph. in org.
140 R. Ellen, 'Introductory Essay' (1979), p. 14.
141 M. Douglas, *Purity and Danger* (1966), p. 94.

It implies two conditions: a set of ordered relations and a contravention of that order. Dirt then, is never a unique, isolated event. Where there is dirt, there is system. Dirt is the by-product of a systematic ordering and classification of matter, in so far as ordering involves rejecting inappropriate elements.[142]

In some places, such dirt or anomaly tends to become tabooed. The swine was in the Old Testament defined as unclean because it fell between two generic categories of animals, those which have a divided hoof and those which chew the cud, respectively;[143] the pangolin, having the body and tail of a fish but also four legs like quadrupeds, and, moreover, a preference for living in trees, is tabooed by the Lele and endowed with spiritual potential,[144] and so forth.

In eighteenth-century British zoology, the monsters were neither tabooed nor endowed – as in the Renaissance – with a peculiar preternatural potentiality. Looming at the periphery of zoology, on the contrary, they were associated with chaos and confusion. This point becomes especially clear if we consider those kinds of monsters which eighteenth-century British zoologists, despite their general exclusion, often did make a reference to: the hybrids.

'Tho' we cannot discover how animals are generated, we know that every species is still transmitted down without mixture, and that the same characteristic marks which distinguished them in the times of *Aristotle* and *Pliny*, divide them to this day', Brookes observed, reiterating the idea of the immutability of species. That order of things was, however, disturbed by the existence of hybrids:

---

142 Ibid., p. 55. In a well-known article, Dan Sperber has (D. Sperber, 'Pourqois les animaux parfaits' (1975)) criticised Douglas' theory. He rightly points out that taxonomic classification is only one kind among a variety of different modes of classification, and goes on, focusing only on taxonomic classification, to show that taxonomic systems by definition always classify normal animals logically and exhaustively: 'La taxinome, dans sa structure générale et dans le format de ses définitions, est telle que tout animal sans exception en relève. Elle constitue une partition exhustive et cohérente de la faune' (p. 26). Hence, Sperber asserts, that a taxonomic classification cannot produce 'dirt' as Douglas has argued (p. 23). The reason for some animals being endowed with a peculiar symbolic potential according to Sperber, cannot to be found in classificatory systems, but beyond them. Although Sperber is right to highlight the importance of the more general conceptual frame for the understanding of symbolism (a thing Douglas, to be fair, in fact also does in her analyses, if not very explicitly in her theory), it appears to me that Sperber misses two basic points in his critique of Douglas. Although it might be possible, as Sperber argues, to construct a thoroughly logical taxonomy without internal contradictions – and that in itself is questionable (even the classificatory system by the logician of logicians, Linné, was fraught with contradictions, as W. T. Stearn has shown in 'The Background ' (1959), pp. 16ff.) – that does not mean that every classification has been developed along such purely logical lines. In fact, assuming that they have, as Sperber tacitly seems to do, would imply assuming that nature is somehow made in such a fashion that it is possible to classify it logically. It might be, but to my knowledge, nobody has ever proved that it was so. Moreover, as Sperber himself notes, taxonomic classification far from exhausts the field of folk classification (or classification in the history of biology, for that matter), and even though some of the classificatory schemes that Douglas deals with tend to be of a taxonomic nature, others are not. Although on the basis of Sperber's critique, it might be necesary to give a more prominent role to the broader cultural context in the theory of 'dirt,' Sperber's critique does not, as far as I can see, fundamentally invalidate Douglas' thesis. On all accounts, as I hope to demonstrate in the present section, the eighteenth-century zoological classification of specimens into species *did* produce anomalies, though we have to go outside the narrow realm of classification in order to account for the nature and significance of them.

143 M. Douglas, *Purity and Danger* (1966), ch. 3.

144 Idem., *Implicit Meanings* (1975), pp. 33ff.

Creatures of different kinds may be brought to produce between them, indeed an animal partaking something of each, yet different from either, but here the confusion ends; for this new being, this monster of nature, is incapable of continuing the breed, and is marked with perpetual sterility.[145]

In a similar vein, though in shorter terms, an anonymous author made the same observation specifically with regard to the mule. It might be 'engendered' by a horse and an ass,

But that that distinction which nature has established among the several orders of her children may not be confounded, she has marked this mongrel production with unerring and lasting sterility.[146]

Monsters, mongrels, hybrids loomed in eighteenth-century zoology because by their very being, they challenged the order of specific nature: the production of like by like guaranteeing the immutability of species. The monsters, as another author stated, threatened to contaminate the perfection of creation, had it not been for their barrenness:

This [their barrenness], indeed, seems to be the barrier between every species of animals, which keeps them asunder, and preserves the unities of their forms. If the mule, or monster, bred between two animals whose forms nearly approach each other, be no longer fertile; we may conclude that the animals, whatever external similitude appears between them, are distinct and separate kinds. Nature, who always provides for the perfection and preservation of her productions, has wisely stopped the fecundity of these ill-formed productions, to preserve the form of every animal uncontaminated: were not this the case, the different species of animals would soon be blended with each other; no one kind would preserve it's original perfection; every creature would quickly degenerate; and the world must inevitably be over-run with monstrous and deformed productions.[147]

A fundamental dimension of nature's general management of order was not only to keep the relations between the species in place, but also and prior to this, to keep those species perfect and, which amounted to the same thing, distinct. The boundaries between species were constitutive for nature's order: they were the foundation on which the order rested.

Given the nature of the classificatory system, concerned as it was with clearly defined self-reproducing species, and given the notion of œconomia naturæ implied in this classificatory scheme, of every species working together to reproduce the same order of nature by their very being, the monsters, indeed, became matter out of place. They pointed to the confusion which would have existed had it not been for a God, who ensured that even though like might not always produce like, the offspring of like and unlike would invariably be unproductive, and hence, not be able to contaminate the primeval order:

Since the visible Creation is sustained always, producing the same Forms of natural Things, which succeed from one Generation to another, through the Course of Time; which could not be, if senseless *Chaos* prevailed, as some have taught; for were the immense Mass of Matter without a living, all-powerful Being to animate it, it must rest without Motion, or at best act by a lifeless Ferment, that would always generate new and monstrous Forms.[148]

The monsters, in brief, pointed to the chaos of a world without a God.

Although the monsters were systematically excluded from the order of nature, and were not considered interesting to zoology they, then, nevertheless, served their task for zoology. By their sheer existence, they pointed to the chaos that would have existed – the

145 R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. xlii.

146 Anonymous, *Beauties of Natural History* (1777), pp. 5-6.

147 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. I, 'Ass' (unpaged).

148 G. Edwards, *A Natural History of Birds* (1743-51), vol. II, pp. 108-9; emph. in org.

degenerated contamination, the confusion, the deformation – had nature not in general been wisely and œconomically managed. By being made sterile and hence, placed outside of the order of species, they also pointed to the antidote provided by nature against such chaos: the inviolable boundaries, and hence, the immutability of species. The monsters, then, accentuated that enormous significance accorded to unchanging boundaries in the understanding of species. Boundaries that had only, indeed, could only have been made visible as the implicit species concept was made explicit during the late Renaissance and early modern period. By incarnating chaos, the monsters, in a word, pointed to the absolute necessity of laws guiding the life of species for order to be maintained in nature as a whole.

Although the eighteenth-century zoologists, with their notion of œconomia naturæ developed a theory of life to some extent, it is significant that those relationships examined within the domain of œconomia naturæ – between animal and habitat, between species and species – only in an indirect way, through the judgement of prototypicallity, entered into the species definition, and only by implication. In contrast to the Renaissance use of extraneous relations to classify their basic level taxa – relations between plants or animals and medicine, other plants or animals, scala humanæ, or all sorts of things which they might resemble – the eighteenth-century empiricists only made use of such relations in order to explain the nature of species. Although the conception of these relations framed the mode of defining what was peculiar, common, and indelible in a species, the characteristic traits highlighted in the species definition were invariably to be found in the animals themselves. This, in turn, allowed the eighteenth-century zoologists to systematically integrate the species into a taxonomic scheme, as we will see in the next chapter.

Chapter 7

# Inaccurate Orders

Some authors, such as William Frederick Martyn, George Edwards and Peter Brown, dedicated their zoological work to the description of species, or at times even specimens, alone. They merely presented a selection of animals in an often random order, or as we saw Edwards say earlier regarding the arrangement of animals in his oeuvre, as they by the hand of different patrons had 'offered themselves to' him.[1] Most zoologists, however, went further than that and attempted to classify the species in relation to each other in their work.

The purpose of such a classification might be one of two, and in most cases both at the same time. William Smellie summed up these two aims, repeated time and again throughout the zoological corpus, as he noted that, 'In natural history, two ends can be attained by system': 'System may be employed either to facilitate the distinction of objects, or to ascertain their relations in the scale of being.'[2] 'The first species of system', Smellie went on to observe,

> must consist entirely of a series of external or internal characters. It is of little moment, whether the objects ranked under particular ORDERs be mutually connected [...]. If the general and particular characters be so marked, that a student, after learning the divisions and language of the author, can investigate the proper names of the objects presented to him, then is this system perfect; because its sole and primary intention is fulfilled.[3]

This kind of system, then, worked as a 'technical index or dictionary,' which helped a student to identify particular species, but which did not help him to determine their place in nature. It was an entirely 'artificial arrangement,' as it were. Within botany, where the known species outnumbered those of the animal kingdom by thousands, this idea of system as a 'technical index' gained importance. The 'second species of system,' inversely, was directed towards revealing some of nature's own order, and therefore deemed more 'elevated and sublime' than

1 G. Edwards, *A Natural History of Birds* (1743-51), vol. IV, p. 235. Edwards did, however, in appendices to two of his volumes order the species he had described in a taxonomic table, as I also noted in the previous chapter. Ibid., vol. IV, pp. 236-43; idem., *Gleanings of Natural History* (1758-64), vol. III, pp. 327-47.

2 W. Smellie, 'Preface' (1780), pp. ix-x.

3 Ibid., p. x; cap. in org.

the first. As Smellie noted, in contrast to the first, this kind of system 'includes the whole philosophy of Nature'.[4] Establishing the true relations between species, establishing a 'natural system,' as it were, relied upon an understanding of the way that nature worked, the way species interacted with each other and the very nature of creation. Taxonomy here, I would say, became intermingled with cosmology, as the order of nature itself was attempted reconstructed by taxonomic means.

Although none of the empiricist zoologists claimed that their taxonomy was 'natural,' and that for good epistemological reasons as we will see later, those who attempted to go beyond the mere description of species, nevertheless inclined more to the second kind of system than to the first: their order was motivated with reference to nature's order, though no one dared to claim that his taxonomic system directly mirrored nature's order.

In the present chapter I shall examine the entire taxonomic system, and its relation to nature's order. Beginning with a discussion of the indigenous idea of system which quickly, as we will see, turned out to have a double-edge, I shall turn to an analysis of the exegesis of the formation of higher level taxa, before I zoom in on the formation of the taxonomic system in practice. Having reviewed both the conceptual and structural dimensions of the taxonomic system, I move on to a discussion of the cosmological context and model, as it were, for the taxonomic system: the notion of the Great Chain of Being. This discussion will pave the way for a concluding section on the relationship between man's and nature's orders.

Before commencing, a note on my use of taxonomic terminology will be in place. As it will soon become evident, the British zoologists did in many cases not employ a consistent taxonomic terminology equivalent to that outlined, for instance, by Linné in the introduction to *Systema Naturæ* (Class, Order, Genus, Species, Variety, see Chapter 5). In British zoology, the names of the generic taxa varied greatly, not only across the empiricists' zoological corpus, but frequently also within a single zoologist's work. As the existence of this terminological inconsistency can be seen in itself as highly significant for understanding the empiricists' taxonomic endeavour, I have not wanted to impose a too regular terminology, for instance, by adopting Linné's clearly defined concepts in my analysis, as is often done in historical studies of natural history. Instead, I have employed a more technical, and rather tedious, terminology, using 'supreme taxa' to refer to the taxonomic categories at the highest levels, and 'intermediate taxa' to refer to those at one or more of the intermediate levels between the species and the supreme taxa. The term 'species' is kept in reference to the basic level taxa.

4 Ibid., p. x.

## SYSTEMS' DOUBLE-EDGE

It seems fair to say that the empiricist zoologists had a somewhat precarious relation to systems, such as taxonomic schemes. On one hand, too much system – a too consistent application of a system, a too strict adherence to favourite doctrines – was likely to be read as a sign of preconceived notions. And, as we saw in Chapter 2, preconceived notions were condemned by the empiricist natural historians as entirely contrary to a proper natural history (remember Sprat's cautious portrayal of the natural philosopher who was led astray in his investigations and out of 'Presumption' and 'warmth of Imagination' only took note of those observations which suited his hypotheses: *Quod volumus, facile credimus*). From this perspective, system could easily be read as prejudices, as the author of the *Naturalist's Pocket Magazine* here makes clear while contemplating on systems, in general, and on Buffon's notion that the animals of America were degenerated species of the Old World, in particular:

> The fact seems to be, that we are all more or less under the influence of particular prejudices; and that we have, generally, too little charity, for those who are attached to notions, perhaps not more erroneous or absurd than those entertained by ourselves, but only of a different nature. [...] No slave of system [...] can more rigorously contend for his favourite arrangement of any particular species; nor any nomenclator for his select name of distinction; than Buffon constantly labours to establish his favourite doctrine, 'that the animals of the Old World, as Europe, Asia, and Africa, are denominated, will never be found precisely the same in America, or the New World, unless they are transported thither.' This rule, though very general, has certainly, like most other general rules, as they are called, many exceptions.[5]

'Method' and 'system' in taxonomic schemes could at times be easily equated with 'wild conjuncture' and contrasted with 'rational demonstration':

> In attempting to methodize, and reduce to classes, creatures opposite in their propensities, dispositions, and conformations, though accidentally corresponding in some particular instances, the lights presented to the eyes of man serve only to bewilder and confound him. The analogy between some creatures is evident, and the genus distinct: this encourages him to proceed in the investigation of his favourite hypothesis and insuperable chasm interrupts his progress, and wild conjecture usurps the place of rational demonstration.[6]

Too much method and system, then, indicated that one had not formed one's ideas about nature on the basis of a proper study of nature itself, but that, on the contrary, they stemmed from the mere prejudices of a man who had not been able to overcome himself and his private notions in the study of nature.

On the other hand, however, it seemed undeniable to the overwhelming majority of naturalists that there did exist an order in nature, created by God at the beginning of time.[7] Sir Thomas Pope Blount, for instance, pointed out in introduction to *A Natural History*, that 'Whoever Surveys the Curious Fabrick of the UNIVERSE' could not fail to see but that it

---

5 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. II, 'Virginian Opossum' (unpaged).

6 W. F. Martyn, *A New Dictionary of Natural History* (1785), vol. I, Preface (unpaged).

7 There are a few exceptions, however, like Martyn (W. F. Martyn, *A New Dictionary of Natural History* (1785), vol. I, Preface (unpaged)) who saw only a 'sublime disorder' in nature; or like Richard Pulteney (R. Pulteney, *A General View* (1781), p. 108, emph. in org.) who advanced that 'nature does not seem to have observed *any* system'.

'carries with it the Impress of its Maker', of God, 'the great Architect'.[8] Likewise, a century later, William Smellie asserted with the same sense of self-evidence that, 'To men of observation and reflection, it is apparent, that all the beings on this earth, whether animals or vegetables, have a mutual connection and a mutual dependence on each other'. To 'men of reflection,' it was hence apparent that everything in the universe was ordered in one 'graduated scale or chain of existence.'[9] In brief, it also appeared evident, then, that nature *was* ordered systematically, and it was considered laudable to attempt to reconstruct this order in taxonomic schemes.

In fact, when narrating the history of zoology, as well as of botany, the long eighteenth century would be singled out by the natural historians themselves proudly as the age of 'systematic zoology',[10] and contrasted with the 'age of [Renaissance] commentators', as Sir James Edward Smith did it in his general review of the history of natural history:

> It is remarkable that a part of natural history, so evidently the most important and the most interesting to man, who is himself at the head of the animal creation, should have lain so long uncultivated. From the time of Aristotle to Gesner and Aldrovandus, little or no improvements were made in the knowledge of animals, nor with respect to classification was any alteration attempted till the time of Ray.[11]

Though Aristotle had laid the seeds, and Gesner and Aldrovandi contributed with information, it was unanimously agreed that the glorious age of zoology started with John Ray: the age of taxonomy.

The zoologists' way out of this dilemma – unveiling some of nature's order and hence, part of God's design without landing in the ditch of merely imposing one's own order *aka* prejudices on nature – was, not surprisingly, to opt for an empiricist approach to the formation of the taxonomic system, and, perhaps more surprisingly, intentionally to remain inaccurate in its formulation. In the following I shall, firstly, look more closely into the formation of the supreme and intermediate taxa of the taxonomic systems and into how the relations between them were drawn and defined. Secondly, I shall review the outline of the systems, which were thus made, before returning to the inaccuracy of the systems and the reasons for celebrating it.

## Taxonomies

When the species had been 'formed' and 'recorded in the memory, as the perceptions of sense were before', Lord Monboddo observed,

> the mind again exerts its power of comparison upon them; and discovering among them likewise resemblances, forms of those resemblances another set of generals above the first; with respect to which they are, in the language

8 T. P. Blount, *A Natural History* (1693), The Preface (unpaged); emph. removed, cap. in org.

9 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 427.

10 J. E. Smith, 'Introductory Discourse' (1791), p. 18.

11 Ibid., p. 15.

of logic, said to be the *genus*. And thus we arise from *general* to *general*, till we come up to those of the *highest order*, which are distinguished from those of inferior order by the name of *universals*.[12]

As the species would be formed on the basis of an analysis of similarities and differences between specimens, so the higher taxa of the taxonomic system would also, in principle, be formed on the basis of a similar analysis. In this way, the taxa of the immediately preceding level came to play an analogous role to that of the specimens in the formation of species, as the 'many' in which a more abstract category would specify the 'one' of the similarities uniting them.

Like in the formation of species, the super-species taxa would also be established through an analysis of the *general* resemblance between sub-categories. Hence, as Frederick Watson noted, usually, though not invariably, a general 'uniformity' between taxa would allow for the grouping of them together:

The Uniformity is in general so great among the several Creatures of the same Kind, that if any one who had not been seen by a Person before, should be met by some Accident, he would be able to call it by its general Name. Thus the Man who had never seen a Mule, would as soon as he met it say it belonged to the Horse; and he who for the first Time saw a Buffaloe [sic] would not scruple to say it belonged to the Ox Kind.[13]

Like the species also the higher taxa had, in principle, to be defined polythetically in an upward, inductive movement.

Making induction the proper method of classification meant, furthermore, that the empiricist zoologists also at the level of higher taxa found reason to argue with other naturalists, such as Linné or Klein or Brisson, who only made use of a few traits in their formation of super-species taxa, and in effect, tended to define them monothetically. Thus, while praising Richard Brookes for his classification of animals on the basis of 'their most obvious similitudes; so that all those which at first view appears most to resemble each other, he has referred to the same genus', an anonymous reviewer contrasted this mode with the Linnean:

Linnæus, a friend to systems, seems to examine every subject for minute resemblances, and classes his animals by very trifling characteristics. He draws, for instance, the distinction of one class from the similitude of claws, that of another from the teeth, a third from the number of paps [teats], and so on; thus with him two animals that have no resemblance to each other, except in the teeth or paps, are of the same class, as a mole and an elephant. This is in fact not following the resemblances of nature, but forcing a similitude.[14]

Likewise, Thomas Pennant would criticise Klein's classification of the sloth together with the camel in one taxon, and the mole and the bat in another, because Klein, thus, 'by a servile regard to a method taken from the number of toes, [...] has jumbled together most opposite animals.'[15] Also the super-species taxa, then, had to be established on the basis of an analysis of similarities and differences along numerous axes. The taxonomic system would, in principle,

12 L. Monboddo, *Of the Origin* (1774), vol. I, p. 4; emph. in org.
13 F. Watson, *The Animal World Display'd* (1754), p. 100.
14 *Critical Review*, vol. 16 (Aug., 1763), p. 146.
15 T. Pennant, *Synopsis of Quadrupeds* (1771), p. iv.

be built up step-by-step, horizontal level for horizontal level from the bottom up, and not on the basis of some predefined differentiæ.

In practice, however, everything was not quite as neat. Firstly, both the generic taxa at the various levels above the species (like 'tribe,' 'family,' 'race,' 'genus,' etc.) were usually not explicitly defined, nor were the generic concepts consistently used to designate taxa at the same level of generality; and neither did the name of individual taxa (like 'cat,' 'coot-footed tringa,' 'quadrupeds') designate in any transparent way a particular taxon's place in the taxonomic system. Both generic and designatory naming worked against the construction of a transparent taxonomy. Secondly, and as a not surprising consequence of this, the relationship between taxa at different levels of generality would often, though not always, be only implicitly defined. In the following I shall look at these two points in turn, the question of the language of taxonomy, and the question of the structure of the taxonomy, in order to encircle the peculiarities of the empiricists' taxonomic schemes.

## The Language of Taxonomy

Eighteenth-century natural history has, especially in the work of Michel Foucault, been described as 'a well-constructed language'.[16] Pointing to that separation of language from things which took place during the seventeenth century whereby language was made entirely arbitrary in relation to the world (and which I have touched upon in Chapter 3), Foucault has argued that the task of the natural historian became to bring language and nature as close together as possible again in their taxonomic scheme:

> natural history [...] is the space opened up in representation by an analysis which is anticipating the possibility of naming; it is the possibility of *seeing* what one will be able to *say*, but what one could not say subsequently, or see at a distance, if things and words, distinct from another, did not, from the very first, communicate in a representation.[17]

Closing the gap between language and natural beings were by the natural historian – and in Foucault's analysis the natural historian usually denotes Linné and Buffon[18] – done through, firstly, a filtering of the visible, and, secondly, a critical reconstruction of language. In the first respect, Foucault argues that all beings were reduced to four describable variables – form and quantity of elements, respectively, their distribution and relative magnitude. This filtering in turn, according to Foucault, allowed for the construction of a universally valid language: 'confronted with the same individual entity, everyone will be able to give the same description;

16 M. Foucault, *The Order of Things* (1970), p. 158.

17 Ibid., p. 130; emph in org.

18 Hence, it is Linné's and Buffon's works, with the clear emphasis on the former, which receive the overwhelming part of the attention in the analysis. Besides these, other 'great' and mainly French naturalists from the period (such as Tournefort, Adanson, Bonnet and Robinet) are also referred to at times.

and, inversely, given such a description everyone will be able to recognize the individual entities that correspond to it.'[19] Designation was, in effect, superimposed upon articulation – naming a living being and designating it became one and the same thing.[20] The reconstruction of language in turn, Foucault claims, allowed for a transcription of the structure of nature's beings to a table in the natural historian's representation. Through an analysis of similarities and differences between the four, and according to Foucault *only* four, variables in living beings, the natural historian was enabled to tabulate the visible in a taxonomic structure. In Foucault's analysis, natural history thereby became 'a fundamental arrangement of knowledge, which orders the knowledge of beings so as to make it possible to represent them in a system of names.'[21] Natural history became 'nothing more than a nomination of the visible', in which a transparent and universally valid representation of the visible was made possible thanks to the critical reconstruction of the language of natural history.[22]

Now, the central point in Foucault's thesis is, of course, that the gaze of the natural historian was severely filtering nature and that the natural historian's language was, in fact, critically reconstructed to unequivocally suit its taxonomic task. This seems to a large extent to hold good for Foucault's major representative of eighteenth-century natural history, namely Carl von Linné, and not least for the final editions of the *Systema Naturæ*. The British empiricists' gaze and language were also reconstructed to a certain extent. As we saw in Chapter 3, at the level of the description of specimens, the zoologist's representation was removed from everyday language in order to be suitable for describing animals as matters of facts. As we also saw, the gaze of the zoologist was pointed, directed mainly towards morphological and anatomical traits. However, as we have also seen in the preceding chapters, the empiricist's vision was never filtered to such an extent that he only took note of the same few characteristics in all cases, which would have made his description universally valid, in the sense that Foucault gives to the term, and which would have allowed him to succinctly nominate taxa and transparently transcribe nature's order onto a regular table: The necessity of polythetic definitions impeded him from doing this. I shall return to this point below in my discussion of the structure of taxonomy. For now, the focus will be on taxonomy's language.

Although language was certainly shaped in order to represent the traits of animals one to one in the zoologists' representations of specimens, language was by no means so fundamentally reconstructed in practice within empiricist zoology, that it could serve as a universally valid nomination of the visible.[23] That 'lack' of fundamental reconstruction, to put

19 Ibid., p. 134.
20 Ibid., p. 136.
21 Ibid., p. 157.
22 Ibid., p. 132.
23 Though attempt also were made at doing that in Britain most notably by John Wilkins in J. Wilkins, *An Essay* (1668). On Wilkin's universal language, see the chapter on this in H. Aarsleff, *From Locke to Saussure* (1982); B.

the matter negatively for now, reverberated in the formation of higher-level taxa. Besides not only describing many more kinds of traits that the four identified by Foucault, and besides, furthermore, making use of various of these traits in the formation of species, the higher level taxa were also only implicitly defined generically in most cases. Moreover, at the level of designation, the individual taxa were not unambiguously named within British zoology in such a way that they transparently designated the place of a taxon in the taxonomic structure, as they were in Linné's nomenclature, where through the introduction of a binomial system of nomination, Linné designated all animals by genus and species.[24] Although, from the natives' point of view, the description of specimens ideally should represent nature transparently, the zoologists' polythetic definition of species and higher level taxa, their general lack of generic definition of the higher-level taxa, and their frequent vagueness as to which level of generality a specific taxon belonged to, all contributed to preventing their taxonomic systems from becoming a transparent representation of nature's order, even on their own account. Seen in relation to Foucault's portrait of the natural historian's well-structured nomination of the visible, the empiricists' taxonomies, in fact, appear to be rather perplexing. There were good practical, historical, and epistemological reasons for them being so, however. To elucidate those reasons we shall firstly take a look at the generic definition and designation of taxa.

As we have seen in the preceding chapters, the 'species' was not only defined genetically as the basic level taxa, it was also relatively consistently designated as 'species' or with its English equivalents, 'kind' or 'sort,' even if the two last concepts did not unequivocally refer to basic level taxa. In the generic designation of the higher-level taxa, the picture becomes more blurred. Across the zoological corpus, as well as often within a single work, the same taxa could easily be called 'kind,' 'genus,' 'tribe,' 'family,' 'race,' among other things. There are exceptions to this 'unclear' taxonomic terminology, to put it once again in negative terms, most notably to be found in the works of Thomas Pennant, John Berkenhout, George Shaw and John Hill. Even though they differed between themselves, these authors employed an almost consistent taxonomic terminology. However, both across the zoological works and within the majority of individual books such a consistency cannot be observed.

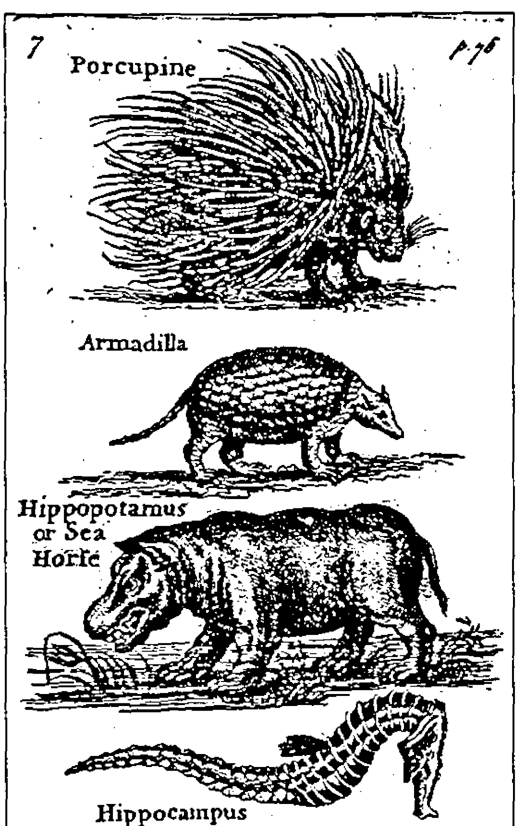
The consequence of this inconsistent use of taxonomic terminology – except in most cases for the 'species' – was that, out of context it became virtually impossible to determine at which level of generality a taxa – a 'kind,' a 'race,' a 'genus,' a 'class,' a 'family,' etc. – belonged. Even within a given context the level of generality was not always made entirely clear since, as

---

Shapiro, *John Wilkins* (1969); for more general discussions of the quest for the construction of a universal language in the seventeenth- and eighteenth-century, see N. Hudson, *Writing and European Thought* (1994), pp. 41ff.; T. Frängsmyr, 'Drömmen' (1974).

24 The binomial system was introduced in the tenth edition of C. Linné, *Systema Naturæ* (1758/1939). On Linné's binominal system of nomination, see W. T. Stearn, 'The Background ' (1959).


Ill. 7.1 THE COOT-FOOTED TRINGA (G. Edwards, *Gleanings of Natural History*, vol. I, 1758-64).




Ill. 7.2 THE HIPPOPOTAMOS AND HIPPOCAMPUS (F. Watson, *The Animal World Display'd*, 1754)

Although species, and especially the non-descripts, at times would be christened after a careful analysis of their distinguishing species traits, like the coot-footed tringa above, in many cases, the name of species far from transparently signified the animal in question, as the case of the hippopotamos and hippocambus, below, shows – through the course of time both species had also received the name of 'sea-horse.'

we will see below, also the relations between the different taxa were only implicitly defined in many cases.

An analogous case of names defying their transparent nominative potential may be found in the designation of individual taxa. In principle, a trivial name ought to capture the distinguishing marks of a taxon, as Nehemiah Grew stressed, and hence, work as a 'short Definition' of the taxon in question:

So that the Names of Things should be always taken from something more observable declarative of their Form, or Nature. The doing of which, would much facilitate and Improve the Knowledge of them many ways. For so, every Name were a short Definition, here as if Words are confus'd, little else can be distinctly learn'd.[25]

Even though a taxon could not be defined entirely by a name, the name ought at least to give an idea of the most distinguishing mark of the taxon in question: 'trivial names should if possible always be contrived in such a manner as to convey some idea, (even tho' an indistinct one), of the subject itself'.[26] Especially when christening non-descripts this principle was often followed. Hence Tyson's opossum, for instance, got its name after a careful analysis of its distinguishing marks:

Upon the whole, since it is an Animal *sui Generis*, and in several Parts having a great Resemblance to those of different *Species*; I think, a *Denomination* might be best given to it, from that Particular, wherein 'tis most distinguished from all other; which is that remarkable *Pouch* or *Marsupium* it has in the *Belly*; into which, upon any Occasion of Danger, it can receive its Young. [...]

This Consideration (it being so distinguishing a Character of this Animal from all others, that as yet we know of,) makes me most inclinable to find out some Name, that might be most expressive thereof; nor can I think of, at present, a better, than to call it, *Marsupiale Americanim*.[27]

Hence, we also find a new species of tringa or snipe named the 'coot-footed tringa,' again after a careful analysis of distinguishing characters (see Ill. 7.1 for the plate referred to):

This bird is like in shape to most others of the tringa or snipe kind. [...] I choose, by way of distinction, to name it the coot-footed tringa, as it differs from other birds of that genus no otherwise, than in having its toes webbed in the same particular manner as the fulica, or our bald-coot. One of its feet is shewn in the plate, magnified a little, to make it the better understood, in what manner the webs or membranes spreading on both sides of the toes are scalped or indented at each of the toe-joints.[28]

Likewise, the 'long-tailed sparrow' was so named because 'the length of the tail certainly forms it's chief peculiarity';[29] the 'cicadæ sanguiflua' was given this name 'on account of the bloody veins' which could be observed at its wings;[30] the 'great boody' had gotten its name because it resembled the boody in all other respects and could only be distinguished from this with reference to its size;[31] and so on. Also at this level, naming should be in principle and sometimes were in practice, a function of classification. Here, Foucault's conception of classic

25 N. Grew, *Museum Regalis Societas* (1681), Preface (unpaged), emph. removed.
26 G. Shaw, *Museum Leveriani explicatio* (1792), vol. I, p. 30.
27 E. Tyson, *Carigueya* (1698), p. 3; note excluded; emph. in org.
28 G. Edwards, 'An Account of a new-discovered Species' (1757), p. 254.
29 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. VI, 'Long-Tailed Sparrow' (unpaged).
30 P. Brown, *New Illustrations of Zoology* (1776), p. 62.
31 M. Catesby, *The Natural History of Carolina* (1731-43), vol. I, description accompanying plate 86 (unpaged).

language as a transparent system of signs entirely exhausted by its representational role and of natural history as a nomination of the visible becomes evident: naming equalled knowing.[32]

As Grew's use of the subjunctive mode in his statement on the designative function of names also suggests, such classificatory names, however, did not exhaust the actual names employed by zoologists. Far from, actually. For one thing, different ways of classifying yielded different ways of naming taxa; moreover, different authors might use the same name for different taxa; and on top of that – and evident, in particular, in relation to species – a variety of names had already been given to the same animals through the ages and in different countries, so that by the eighteenth century, an animal could easily be known and identified by five, ten, or even, as in the not untypical case of Pennant's description of the hog, thirteen different names.[33] Often all of those names would, as in Pennant's case, be given as 'synonyms' at the beginning of the description of a species. Predictably, this 'multiplication of names,' as it were, was condemned as it gave rise to uncertainty as to the object of reference. Take this description of the 'sea otter' as an example:

> Many are the names under which this amphibious animal has been described by naturalists; and, as usual, the variety of appellations has given birth to great confusion. It is the Mustela Lutris, Plantis Palmis Pilosis, Cauda Corpore quadruple breviore, of Linnæus; the Jiya, called at Brasil the Carigueibeju, of Marcgrave; the Lutra Brasiliensis, of Ray; the Lutra Nigricans, Cauda depressa et glabra, of Barrère; the Loutre, or Carigueibeju, of Desmarchais; the Lutra Marina, of Kalm; the Lutra Atri Coloris, Macula sub Gutture Flava, of Brisson; the Saricovienne, of Thevet; the Saricovienne, or Sea Otter, of Buffon; and the Sea Otter, of Muller, Pennant, and most other naturalists.[34]

As it later became evident, this multiplication of synonyms had indeed caused confusion, since, in their descriptions, Buffon and Pennant had not been able to agree upon exactly which animal should be designated by all these names. It was not, as Watson also concluded, always possible to know an animal simply by knowing its name (see Ill. 7.2):

> So many Persons have written concerning Natural History, and so few of them have understood it, that the Names of Things are often strangely confounded, and those of one Animal given to another. If any one were to mention that he had seen a Sea-Horse, the best Naturalist could not tell by that Name, whether he meant an Animal somewhat of the Shape of a Horse, and as big as the larger Coach-Horse; or a Creature without Legs, or any Resemblance of a four-footed Beast, and of the Bigness of his little Finger.
>
> The Animal of the quadruped Kind intended to be treated of here is called the Hippopotamus, in *English* the River-Horse: The other little Creature is usually seen dry, and has so much the Appearance of some Insect, that the Antients, not well acquainted with what it was, called it Hippocampus; but this they leant to call it the largest Kind of Caterpillar; the Term expresses the Horse Caterpillar: And thus they called the largest Kind of Ant the Horse-Ant; and so other Animals of extraordinary Size in their Kind. This Hippocampus is a Sea Fish of a particular Class; and partly from its old Name, and partly from some forced Resemblance between the Shape of the Head and Neck of this Creature and those of a Horse, People have also called this the Sea-Horse.[35]

32 M. Foucault, *The Order of Things* (1970), p. 62.

33 T. Pennant, *Synopsis of Quadrupeds* (1771), p. 68.

34 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. IV, 'Sea Otter' (unpaged).

35 F. Watson, *The Animal World Display'd* (1754), pp. 91-2.

Although well-known species, and taxa more generally, would at times be renamed,[36] the British zoologists were usually reluctant to introduce new names, which would only add to the confusion, even though they might designate the taxon of reference more precisely. Hence, for instance, the 'order' of the 'tail-less maucauco' retained its name since it had been established by 'universal consent,' even though, in fact, there existed a number of species of maucaucos without tails, because, as the author observed, 'These names, [...] being once given, great authority would be requisite to change them with advantage.[37] Likewise, the name of the 'ugly lizard' was kept in Thomas Shaw's account, since

> there is nothing that occasions greater Confusion in the several Branches of Natural History, than that any *Species* of Plants or Animals should have *new* Names and Descriptions given to them, after that their *old* ones have already received a sufficient Sanction and Authority.[38]

In one of the more extreme cases, John Ellis, the 'discoverer' of the animal nature of zoophytes, retained the names developed within botany to denote their taxa:

> In order to be the better understood, in treating of the several marine Productions, which are the Subject of the following Essay, I find myself under a kind of Necessity to speak in the common Language of those, who, considering them merely as Plants or marine Vegetables, have, as Botanists, reduced them to certain Classes; and, with the celebrated *Ray*, shall divide them into *Corals, Coralines, Keratophyta, Escara, Sponges*, and *Alcyonia*.[39]

Though signs, ideally, should signify transparently, there were other and more pragmatic concerns at play in the practical naming of taxa. A description not only had to signify but also be intelligible, and if intelligibility could be obtained by employing names with a less transparent signification, then such established names were not always, but in most cases adopted.

Language was not fully reconstructed and the signs never entirely made a function of the taxonomic endeavour neither in the context of generic concepts nor in the context of trivial names. The articulation of a name and the designation of a taxon never entirely merged in a tabulated structure in British empiricist zoology. And that is not so very surprising when it is taken into consideration that that structure itself was far from always unequivocally laid out, as we now shall see.

## The Structure of Taxonomy

The structure of the taxonomic system – the levels of taxa and their mutual relations – were usually not directly addressed in the British zoologists' works. That does, however, not mean that such relations were not laid down; but it does mean that they often worked tacitly,

36 E.g. G. Shaw, *Museum Leveriani explicatio* (1792), vol. I, p. 30; G. Edwards, *Gleanings of Natural History* (1758–64), vol. III, p. 244; Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. VI, Paca (unpaged).

37 Ibid., vol. IV, 'Tail-less Maucauco' (unpaged).

38 T. Shaw, *A Supplement* (1746), p. 62; emph. in org.

39 J. Ellis, *An Essay towards a Natural History* (1755), p. 1; emph. in org.

although more transparently in some works than in others. In the following section, I shall look into how the taxonomies were structured, and in order to allow for a closer comparative reading of different empiricist schemes, I shall zoom in on the classification of quadrupeds. Before doing so, it will be useful to see how the taxon of the 'quadrupeds' itself came into being in the grand division of the animal kingdom into supreme taxa – this mode of division in itself being, of course, an example, though in some ways an unusual one, of how the taxonomic scheme was structured.

### *Grand Divisions*

As we saw above, the zoologists themselves related the eighteenth-century zoological system to two main fathers: Aristotle and John Ray. John Ray's grand classification of the animal kingdom, and, in particular, his delimitation of the category of quadrupeds, would be adopted with some modifications by most of the eighteenth-century zoologists. In *Synopsis Methodica Animalium Quadrupedum* (1693), where Ray's zoological scheme was outlined, Ray himself did engage in a dialogue with Aristotle. Although quickly dismissing Aristotle's categorisation to a large extent, it might be worth briefly considering what he dismissed before turning to discuss Ray himself.

From Aristotle's works, and especially from *Generation of Animals*, a grand classification of animals into seven general groups had already been extrapolated by Renaissance scholars, and similar divisions were made use of, for instance, in Gesner's division of his *Historiae Animalium* into five volumes, each corresponding to a major animal class (I. Viviparious quadrupeds, II. Oviparious quadrupedes, III. Birds, IV. Fishes, V. Serpents). Aristotle divided the entire animal kingdom into general classes partly on the basis of the perfection of the offspring of animals and, partly, on the blood and respiratory organs. Both of the latter aspects was by Aristotle linked to the combination of hot and cold, and solid and fluid substances through his theory of the animals' 'blend,' *krāsis*. Leaving out his considerations of the blend, as that was to be neglected by the zoologists under consideration here, Aristotle's classification might be extrapolated thus: 1) Vivipara: comprising animals which 'bring their young to perfection, and bring forth externally a creature similar to themselves';[40] and which, furthermore, have lungs and blood. Such as, for instance, man, horse, sheep, dog, etc. as well as the Cetacea. 2) Ovovivipara: animals which 'are internally oviparous at the first stage, and thereafter are externally viviparous', that is, which first produces a 'perfect' egg within the parent, before it produces an offspring which is born as a 'perfect' animal. The Selachian fish and the viper would be examples of this. 3) Ovipara I: animals which 'lay their eggs in a

40 Aristotle, *Parts of Animals* (1963), p. 135/II.i.732a; for a more detailed discussion of Aristotle's theory of generation and classification, see A. L. Peck, 'Introduction' (1965), pp. xiiiff.

## *Animalium Tabula generalis.*

Animalia ſunt vel

- *Sanguinea*, eáque vel
  - *Pulmone reſpirantia*, corde ventriculis prædito,
    - *Duobus*,
      - *Vivipara*,
        - *Aquatica*; Cetaceum genus.
        - *Terreſtria*, Quadrupedia, vel, ut *Manati* etiam complectamur, piloſa. Animalia hujus generis amphibia terreſtribus annumeramus.
      - *Ovipara*, Aves.
    - *Unico*, Quadrupedia vivipara & Serpentes.
  - *Branchiis reſpirantia*, Piſces ſanguinei præter Cetaceos omnes.
- *Exanguia*.
  - *Majora*, quæ vel
    - *Mollia*, Μαλάκια, Polypus, Sepia, Lolligo.
    - *Cruſtacea*, Μαλακόςρακα, Locuſta, Aſtacus Cancer.
    - *Teſtacea*, Ὀςρακόδερμα, quæ vel univalvia, vel bivalvia, vel turbinata.
  - *Minora*, Inſecta.



Ill. 7.3 J. Ray: Animalium Tabula generalis (J. Ray, *Synopsis*, 1693).

perfected state', such as 'birds, oviparous quadrupeds and footless animals, *e.g.*, lizards and tortoises, and the majority of serpents'.[41] 4) Ovipara II: animals which 'lay their eggs in an imperfect state, as the Fishes, and the Crustacea and the Cephalopods[...], whose eggs do grow in size after they are laid.'[42] 5) Larvipara: bloodless animals that produce larvae, such as locusts, spiders, wasps and cicadas. 6) Insecta: produced through spontaneous generation, like fleas, bugs and lice. 7) Testacea: shellfish, produced through spontaneous generation.

Now, although Ray acknowledged the importance of this scheme, he also rejected its most basic axis of division, the status of the egg, as a cardinal axis, as he argued that all animals were generated from eggs, regardless of whether that egg was hatched inside or outside the womb of the mother.[43] Instead, Ray introduced the respiratory system as the most important axis for the classification of animals into the supreme taxa, making use only occasionally of the status of the egg. Even though Aristotle, as we saw, also made use of the organs of respiration, the more immediate source for Ray's classification seems to have been seventeenth-century physiological and comparative anatomical studies,[44] and most notably William Harvey's study of the circulation of the blood and the heart.[45]

On the basis of the information provided by such comparative studies, Ray made a general division of animals into: I. Sanguinae and II. Exanguiae, dividing the first into 1) those breathing by lungs, and subdividing this class further into a) those with a double ventricle and hot blood (further subdivided into i/ Vivipara (Quadrupeds and Cetacea) and ii/ Ovipara, Birds), and b) those with a single ventricle (Batrachians, Lizards, Snakes), and 2) those breathing by gills, namely the blooded fish except the cetaceous. The Exanguia was subdivided according to size into 1) the greater (Pedata, Cephalopods, Crustaceaus, Apoda, Snails, Shellfish, and Slugs), and 2) the lesser (Insecta). (See Ill. 7.3)

Although this scheme would appear to give an unambiguous division of animals there, in fact, arose problems. Most clearly, this can be seen in the case of the cetaceous – the whales, sperm whales and dolphins. In Ray's introduction, it was suggested that they should be classed as quadrupeds on the basis of the respiratory organs, and this classification was an entire novelty – during the Renaissance whales had been consistently treated as fish. Ray, however, chose to exclude them from the main body of the text in the synopsis of quadrupeds: 'To remain in agreement with common opinion', he noted in the introduction, 'and to avoid the appearance of affected novelty we shall list the Cetaceans among Fish even though they

41 Aristotle, *Parts of Animals* (1963), p. 135/II.i.732b.

42 Ibid., pp. 135-6/II.i.732b.

43 J. Ray, *Synopsis* (1693), p. 55.

44 C. E. Raven, *John Ray* (1986), pp. 373-9.

45 William Harvey, *An Anatomical Disputation Concerning the Movement of the Heart and Blood in Living Creatures* (1657). On esp. Harvey, see also A. Wear, 'William Harvey' (1983), an on comparative anatomy in the period, F. J. Cole, *History of Comparative Anatomy* (1944).

obviously agree with viviparous Quadrupeds in everything save for hair, feet and the element in which they live.'[46] Although Linné would later include the cetaceous within his class of mammalia, most empiricist zoologists followed suit with Ray. For, as Thomas Pennant argued almost a century later, even though they 'breathe by means of lungs' and 'Like land animals [...] have warm blood, [and] are furnished with organs of generation, copulate, bring forth, and suckle their young, shewing a strong attachment to' the land animals,[47]

yet there still remains other [characteristic marks], that in a natural arrangement of the animal kingdom, must determine us after the example of the illustrious *Ray*, to place them in the rank of fish; and for the same reasons, that first of systematic writers assigns,

That the form of their bodies agrees with that of fish.
They are entirely naked, or covered only with a smooth skin.
They live entirely in the water, and have all the actions of fish.[48]

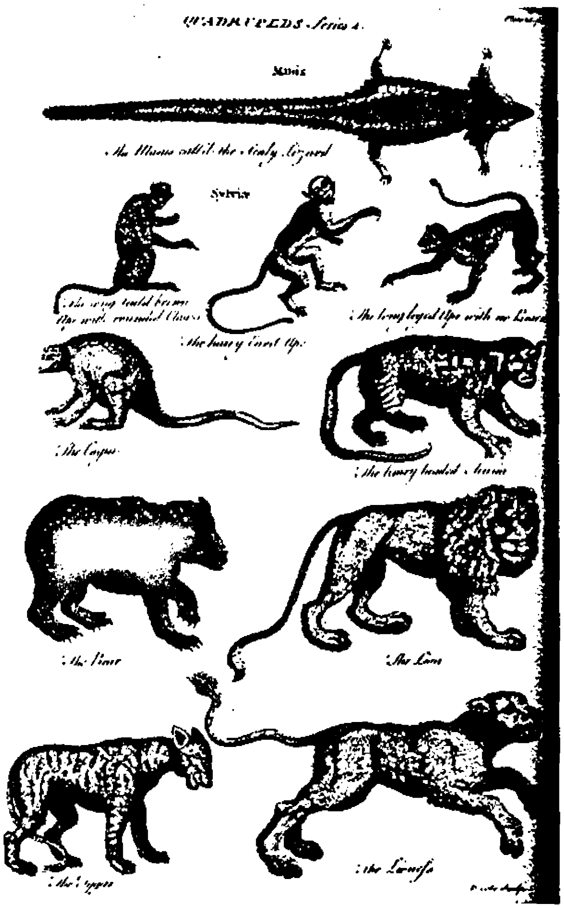
Appearance could still, within empiricist zoology, overrule the classification made on the basis of only a few internal characteristics.

Although later zoologists both would modify Ray's general division of animals in this case of the cetaceous as well as in other cases, as we will later see, in its general outline Ray's division was almost universally accepted and adopted in eighteenth-century zoology. Often, however, the grand division between Sanguinae and Exanguiae would be neglected, and the highest taxa of the taxonomic system usually be defined as Quadrupeds, Birds, Reptiles, Fish, Insects. Thereby the more apparent, visible similarities of the animals would be foregrounded, while hidden similarities in the heart and blood, the lungs and gills, inversely, would be backgrounded, although they were not necessarily forgotten about.[49]

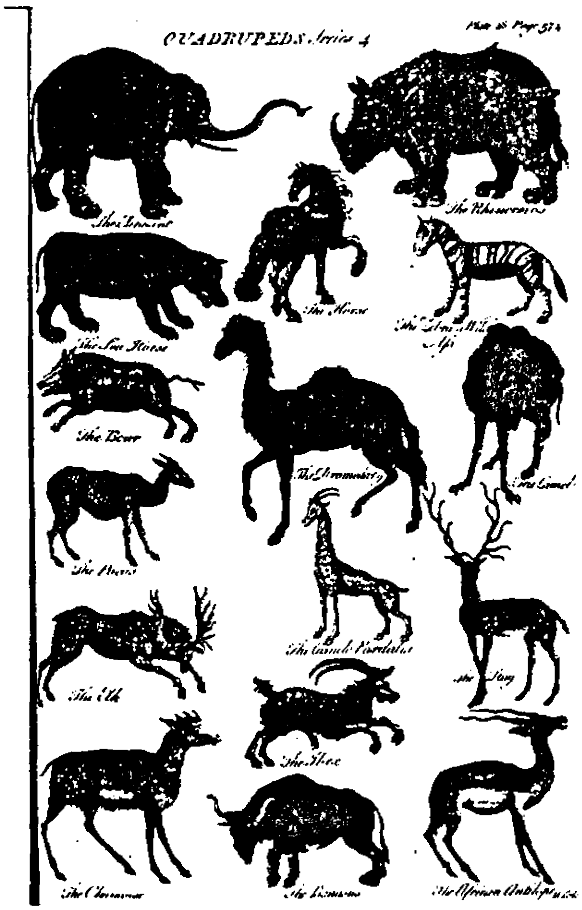
### *Intermediate Taxa*

This division of the animal kingdom into supreme taxa was untypical in the sense that these taxa, although usually neither genetically named nor delimited in exactly the same way by all zoologists – as the case of the whales shows – nevertheless, provided an almost uncontested general framework for the classification of animals. Like the species unequivocally provided the basic level for classification, the supreme taxa also provided the most general divisions of the taxonomic schemes. Within this framework, through a mixture of upward and downward classification, the animals would be distributed into categories at one, two, three or four intermediate levels of generalisation – which were less general than that of the supreme taxa, and more general than that of the species.

46 J. Ray, *Synopsis* (1693), p. 55.
47 T. Pennant, *British Zoology* (1768-77), vol. III, p. 33.
48 Ibid., pp. 33-4; note excluded, emph. in org.
49 Especially in the definition of reptiles, the blood usually played a role; and likewise in the definition of fish, reference was usually made to the gills.



Ill. 7.4 J. HILL: QUADRUPEDS, SERIES 2 (J. Hill, *A General Natural History*, vol. III, 1751-58).



Ill. 7.5 J. HILL: QUADRUPEDS, SERIES 4 (J. Hill, *A General Natural History*, vol. III, 1751-58).

In contrast to Cesalpino, who had lined up his taxa as a well-regulated 'army' of 'classes,' 'genera,' and 'species,' and in contrast to Linné, who ordered his taxa clearly and unambiguously in five labelled ranks – 'class,' 'order,' 'genus,' 'species,' and 'variety' – in the empiricists' zoological works, the order which emerged between the species and the supreme taxa was in general rather more blurred. In order to investigate how the space opened up between the basic level of the species and the supreme level of the grand divisions was structured in the British empiricists' taxonomies, it is necessary to distinguish between two partially different ways of defining the relations between taxa, the one more explicit in its layout of the taxonomy, and the other more covert.

The first group consists of a few authors, all from the second half of the eighteenth-century – such as Thomas Pennant, John Hill, and John Berkenhout – who employed a relatively consistent taxonomic terminology, and who each defined the relations between taxa in a relatively regular fashion. John Berkenhout 'implicitly' which is to say 'in regard to arrangement'[50] followed Linné's classificatory scheme, and even the typographical layout of *Systema Naturæ,* in his description of British fauna, and he, thus, divided the animals into classes, orders, genera, species, and varieties, each being named, and in the style of Linné, succinctly defined.[51]

John Hill, although in the introduction to his volume on the animal kingdom stressing that he had 'adopted so much of the method of Linnæus, as is consistent with observation', nevertheless, introduced new terms of taxonomy, partly drawn from a literary terminology. Hence, the book, like the animal kingdom, was divided into 'parts,' 'books' – which were sometimes also called 'classes' – 'series' – which were sometimes also called 'classes' – 'genera' and 'species.' Thus, Part I was made up of 'The lesser animals, called ANIMACULES and INSECTS', Part II of amphibious animals, Part III of Shell-fish, Part IV of Fish, Part V of Birds, and Part VI of Quadrupeds. To take just the quadrupeds as an example of the division of the intermediate taxa, basing the divisions on the visible, these were defined as 'animals which have the body covered with hairs, which walk on four legs, and the females of which bring forth their young alive, not in the egg state, and nourish them with milk from their teats.'[52] These were further subdivided into the following 'classes' or 'series' (see Ill. 7.4 and 7.5): 1) Glires, comprising the genera mouse, sorex, sciurus, lepus, castor, hystrix and didelphis; 2) Agriæ (genera: ant-bears and manis); 3) Sylviæ (genera: bradypus and simiæ); 4) Feræ (genera: ursus, felis, lutra, canis, phoca, meles, erinaceus, daasypus, talpa, vespertilio); 5) Jumenta (genera: elephant, rhinoceros, hippopotamus, equus, sus); 6) Pecora (genera: camelus,

50 J. Berkenhout, *Outlines of the Natural History of Great Britain* (1769-72), vol. I, p. viii.

51 Ibid., vol. I-III.

52 J. Hill, *A General Natural History* (1751-58), vol. III, p. 515; emph. removed.

moschus, cervus, capra, ovis and bos). In each case, the taxa would be briefly defined, with the emphasis, as in Linné, being on the teeth, feet and teats.

In *Synopsis of Quadrupeds,* Thomas Pennant leaned more towards the system of Ray than that of Linné. Quite exceptionally, in introduction to his work Pennant summarised his classificatory scheme in a table, entitled 'Method' (see Ill. 7.6), and consistently uses this scheme as a framework for classification throughout the book. Like Ray, in his classification of quadrupeds, Pennant distinguished between two grand 'divisions,' as they were called with a new term: I. the Hoofed, and II. Digitated quadrupeds. In addition, Pennant added another two divisions, III. the Pinnated, and IV. the Winged. These were further subdivided into 'Sections,' and these were again divided into 'Genera' (sometimes also called 'kinds'[53]) and 'Species.' The first Division, for instance, was divided into 'Section I': 'Whole hoofed' (genus: horse), and 'Section II': 'Cloven hoofed' (genera: ox, sheep, goat, giraffe, antelope, deer, musk, camel, hog, rhinoceros, hippopotamus, tapir, elephant). Finally, within the main body of the text, some of the Sections would, be further divided into sub-genera, as in the case of the 'Cloven hoofed' quadrupeds which were divided into those '* With tails' and those '** Without tails' (Pennant himself did not give any generic name to these taxa).

Even by the very names of the Divisions ('Hoofed,' 'Digitated,' etc.) and Sections ('Whole hoofed,' 'Cloven hoofed,' etc.), a short characterisation of the taxon in question was already offered in the introductory table. In a few more words, the central features of the genera would be summed up at the beginning of each new genus in the main body of the text. Regarding the genera goat it read, for instance: 'Horns bending backward, and almost close at their base. Eight cutting teeth in the lower jaw, none in the upper. The male generally bearded.'[54] Such summaries were, however, not to be taken as any thing more than preliminary, shorthand definitions which allowed for an expeditious identification of taxa, but which did not exhaustively define the taxa. As Pennant already stressed in the Preface, 'a system of quadrupeds cannot be formed from the character of a single part'.[55] Only a polythetic definition would do in a proper classification.

More, though not many more, examples of zoologists could be mentioned who employed a relatively uniform taxonomic terminology and who, either by way of an introductory table as in Pennant's case, or, as in his, Hill's, and Berkenhout's case, through the organisation of the literary presentation, the hierarchical relations between taxa at different levels were made clearly visible. These example will suffice, however, as illustrations of the

53 E.g. T. Pennant, *Synopsis of Quadrupeds* (1771), p. 24.
54 Ibid., p. 13.
55 Ibid., p. ix. I have already previously quoted Pennant on this point, but to repeat: 'We ought [...] to drop all thoughts of forming a system of quadrupeds from the character of a single part: but if we take combined characters of parts, manners and food, we bid much fairer for producing an intelligible system, which ought to be the sum of our aim.'

[ xi ]

METHOD.

Div. I. HOOFED QUADRUPEDS.
II. DIGITATED.
III. PINNATED.
IV. WINGED.

Div. I. Sect. I.
Whole hoofed.

Genus
I. Horse.

Sect. II. Cloven hoofed.

II. Ox
III. Sheep
IV. Goat
V. Giraffe
VI. Antelope
VII. Deer
VIII. Musk
IX. Camel
X. Hog
XI. Rhinoceros
XII. Hippopotame
XIII. Tapiir
XIV. Elephant.

Div. II. DIGITATED.

Sect. I. Anthropomorphous, frugivorous.

XV. Ape
XVI. Maucauco.

Sect. II. With large canine teeth separated from the cutting teeth. Six or more cutting teeth in each jaw. Rapacious, carnivorous.

XVII. Dog
XVIII. Hyæna
XIX. Cat
XX. Bear
XXI. Badger
XXII. Opossum
XXIII. Weesel
XXIV. Otter.

Sect. III. Without canine teeth, and with two cutting teeth in each jaw. Generally herbivorous, or frugivorous.

XXV. Cavy
XXVI. Hare
XXVII. Beaver
XXVIII. Porcupine
XXIX. Marmot
XXX. Squirrel
XXXI. Jerboa
XXXII. Rat

XXXIII. Shrew

[ xiii ]

XXXIII. Shrew
XXXIV. Mole
XXXV. Hedge-hog.

Sect. IV. Without cutting teeth. Frugivorous, herbivorous.

XXXVI. Sloth
XXXVII. Armadillo.

Sect. V. Without teeth. Insectivorous.

XXXVIII. Manis
XXXIX. Ant-eater.

Div. III. PINNATED. Piscivorous, or herbivorous *.

XL. Walrus
XLI. Seal
XLII. Manati.

Div. IV. WINGED. Insectivorous.

XLIII. Bats.

* This Element chiefly the Water.

SYSTEMATIC

Ill. 7.6 T. PENNANT: METHOD (T. Pennant, *Synopsis of Quadrupeds*, 1771).

first taxonomic strategy: Here the animals were distributed into taxa in an apparently clearly defined structure, supported by an almost consistent taxonomic terminology, and by clearly visible, if not necessarily explicitly defined relations between the taxa.

The second mode of structuring taxa, and most often not genetically consistently defined taxa, tended to rely more heavily on the textual divisions of the book. Hence, Richard Bradley, for instance, in his *A Philosophical Account of the Works of Nature* (1721), used the chapters the main structuring device. After having treated the Earths and minerals in Ch. I, Corallines, fungus, and sponges in Ch. II, and 'Plants and Super-plants' in Ch. III, he turned in the reminder of the book to the animals, dividing the kingdom into: Ch. IV: 'Immovable Shell-fish, of such as have local Motion; with Variety of Observations upon the rest of the Fish-Kind in Salt and Fresh Waters'; Ch. V and VI (*sic*: these two 'chapters' were joined together in one section – in itself a striking indication of the importance of textual divisions for taxonomic classification): 'Of Serpents, the Crocodile, Lizard, Camelion, and other of the Scaly Tribe, which are Amphibious, and Inhabitants of the Land; and of Flying Lizards, &c which seem to be the immediate Passage between the Fish and Birds Kind'; Ch. VII and VIII (*sic*, again): 'Of Birds and Fowls; as also of the Bat (or Flying mouse), Flying Squirrels, &c which seem to be the Passage between Fowls and Four-footed Beasts'; Ch. IX: 'Of Quadrupeds, or such Animals of the Viviparous Race, as have four legs or Branches to their Bodies'; Ch. X: 'Of Frogs, Toads, and such Creatures as are partly Animal and partly Insectal'; Ch. XI: 'Of Snails, Earth-worms, Milepeds, spiders, and Insects without wings, which may be styled Irregular Insects'; Ch. XII and XIII (*sic*): 'Of the Papilionaceous or Butterfly Kind; and of Bees, Flies, and some others observed with the Microscope.' Each category of animals would be briefly described at the 'chapter' level, and narratively subdivided into 'heads,' 'races' or 'kinds,' as for instance, the 'tribe of four-footed beasts':

> The Tribe of *Animals* with four Feet are for the most part clothed with *Hair;* but some few only have a *Scaley* Covering, or else are clothed in *Spines*. The general Heads I shall range them under are, the *Tallon-footed*, the *Claw-footed*, the *Hoof-footed*, and the *double Hoof* or *Cloven-footed*: And again, those of the *Horned* Race I shall distinguish by the Characters of the *Perennial horn'd*, and the *Annual horn'd Beasts*.[56]

Within the realm of the chapter, these intermediate taxa and the species they comprised would be described successively, usually without marking the transition from one 'race' to another in any way, other than by the beginning of a new paragraph.

In the same manner, the author of *Beauties of Natural History* (1777) divided the animals by means of 'Books' into five supreme, though partly unnamed groups (I: Unnamed, but treating of Quadrupeds, which were also defined here; II: 'The Serpent tribe, Lizard tribe, Frog or Toad Tribe'; III: Unnamed, but dealing with insects; IV: Unnamed, dealing with birds; V: 'Fishes'). These were again divided into, sometimes named, sometimes unnamed, 'classes' or

56 R. Bradley, *A philosophical account of the works of nature* (1721), p. 88; emph. in org.

'tribes,' which again comprised 'kinds,' 'sorts' or 'species'. In the classification of quadrupeds, the tribes would, like was also the practice of other authors, as we will later see, be organised according to a tame-savage continuum. Hence, the author started his description of the Quadrupeds with those which 'share our friendship' (the Horse tribe, Cow tribe, Sheep, Deer, Hog, Cat, Dog), proceeding to those which led a 'savage life' (Weasel, Rat, Prickly Tribe, Scales and Shelly Tribe, Bat, Amphibious animals and Monkey), and ended with the 'Solitary Tribe' (comprised of Elephant, Rhinoceros, Hippopotamus, Camel, Lama, Bear, Badger, Tapir, Racoon, Sloth, and others).[57]

Finally, to give just one more example of this classificatory strategy, Richard Brookes also made use of the divisions offered by the textual presentation in order to organise his oeuvre on nature. Hence, in each of the six volumes of the work, a different supreme taxa or kingdom was dealt with (Vol. I: Quadrupeds, II: Birds, III: Fishes, IV: Insects, V: Water, Earth, Stones, Fossils, Minerals, VI: Vegetables). Each volume would then be divided into chapters, each dealing with a different 'kind' (see Ill. 7.7). With regard to Quadrupeds, also Brookes in broad outline organised the presentation of taxa along a tame-savage continuum:[58] 'Of Animals with an undivided Hoof, of the Horse kind'; 'Ruminating Animals, or those that chew the cud'; 'Of the Bull, Ox, and Cow'; 'Of the Ursus, Buffalo, Bison, Bonasus, and other Animals of the Beeve Kind', 'Of Sheep', 'Of Goat', 'Of Animals of the Deer kind'; 'Of the Animals of the Hog kind, which are cloven-footed, but do not ruminate, or chew the Cud'; 'Of Anomalous Quadrupeds with regard to their Hoofs' (like the tapir, the rhinoceros, the elephant, the musk, and the hippopotamus among others); 'Animals of the Camel kind'; 'Apes, Monkeys, and Baboons'; 'Mankind'; 'Animals of the Cat kind'; 'Animals of the Dog kind'; 'Animals of the Weasel Kind, commonly called Vermin'; 'Animals of the Hare kind'; 'Animals with divided feet and a longish snout' (like the hedge-hog, the armadillo, the mole and shrew); 'Animals of the Bat kind'; 'Of the Sloth or Sluggard'; 'Sanguineous animals, which breath through the lungs, and which lay eggs' (frogs and toads); and finally – and taking the four feet literally – 'Of lizards'.

Beyond the brief definition of some of the 'tribes' in the headlines, these taxa would not be further defined in most cases, as Brookes usually in the very first sentence of a chapter began describing the first 'species' or 'sort' within the 'tribe.'

It would be easy to reject taxonomic systems like these as outside the province of natural history proper as the work of unaccomplished amateurs who did not possess the gift of abstract or consistent thinking, and who, consequently, did not contribute to the development of natural history. But that would be a mistake if we want to understand natural history as a

57 Anonymous, *Beauties of Natural History* (1777), ch. I.
58 Cf. R. Brookes, *A New and Accurate System* (1763-72), vol. I, p. xxvi.

THE

# CONTENTS.







## A TABLE to the PLATES of QUADRUPEDES.



Ill. 7.7 R. Brookes: The Contents (R. Brookes, *A New and Accurate System*, vol. I, 1763-72).

socio-cultural phenomenon. And, even more importantly, these works, I will argue, can be read as an accentuation of a general epistemological strategy where vagueness and inaccuracy became an important means in the construction of taxonomies. The ideal taxonomy might be a regular system of signs transparently denominating the structure of nature, but the humanly-made taxonomy did not necessarily need to be so, and, in fact, as we will see, even the regularity displayed in the taxonomic schemes of the first type reviewed above would be qualified in essential aspects by their authors.

The vagueness and 'inaccuracy' in the representation of taxa was actually something that would receive praise by contemporary reviewers. Hence, Brookes compared John Ray's system to that of Linné and concluded that the former was to be preferred over the second, since Ray

> was sensible that no accurate idea could be formed from a mere distribution of animals into particular classes; he has therefore ranged them according to their most obvious qualities; and, content with brevity in his distinctions, has employed accuracy only in the particular descriptions of every animal.[59]

'Those', Brookes later observed in the same vein, 'who have attempted accuracy in classing the productions of Nature, have only embarrassed their works by their endeavour to arrange them methodically.'[60] Likewise Brookes' own system was, again through a comparison with Linné's and this time also with Buffon's fellow naturalist Daubenton, praised for its inaccuracy by a writer in the *Critical Review*: Brookes had thus ordered his material,

> in the most judicious method; not quite wedded to system, nor yet wholly abandoning it. His manner of classifying animals seems to be taken from their most obvious similitudes; so that all those which at first view appears most to resemble each other, he has referred to the same genus. By this means, in our opinion, he has judiciously steered between the extremes of Linnæus and Daubenton.[61]

It was in this connection that the reviewer went on, in the passage I quoted in the introduction to this section, to determine Linné to be a 'friend to systems' who was not 'following the resemblances of nature, but forcing a similitude' in his scheme.[62] Too regular a system, and too well-defined categories could be read as an 'embarrassment,' then, while inaccuracy in the description of taxa and vagueness in the classification, inversely, clearly served a recognised purpose.

Even those authors who employed their taxonomic concepts relatively systematically, such as Hill, Berkenhout and Pennant, still qualified, to some extent, as being 'inaccurate' in as much as 'inaccuracy' also included defining animals polythetically 'according to their most obvious qualities,' as Brooked had it above. The inaccuracy of polythetic definition arose, of course, because the taxa which were defined along a large number of axes, partly differing from taxon to taxon, did not allow the zoologists to lay down a consistent grid, regularly

59 Ibid., p. xi.
60 Ibid., vol. III, p. xix.
61 *Critical Review*, vol. 16 (Aug., 1763), p. 146.
62 Ibid.

defined by equivalent differences, as would be possible in a taxonomic system which relied on a monothetic definition of taxa and on a method of logical division as the structuring device. Polythetic definition did not allow the zoologists to define all taxa by the same few traits, and hence, to establish a common and universally valid foundation for the formation of a structure. The construction of such a uniform foundation was, inversely, seen as a clear sign of the prejudiced system, since it implied defining the fundamentum divisionis and the method of division, prior to empirical analysis – that was exactly the core of the 'embarrassment.'

Moreover, the zoologists from the first group described above, qualified, to a significant extent, the regularity of their systems in their introductory statements. Hence Berkenhout, who faithfully copied Linné in the main body of his work as we saw, stressed in the introduction that 'That the System [of Linné] is imperfect is most certain; but those who expect perfection in a system of Nature, are unacquainted with the subject'. Given the nature of nature, it would not be possible to construct an entirely faithful representation of it in a taxonomic scheme:

> The works of the Creator are linked in one continued perfect chain, so as to admit of no absolute division, and consequently can never be reduced to a positive system. All that we can expect is such an artificial arrangement and division of bodies into kingdoms, classes, orders, genera, and species, as may enable us to distinguish, with precision, one body from another.[63]

Likewise, Pennant qualified the neat categories of his classificatory system as he noted that there would necessarily be many 'exceptions' in the book and that this could not be 'otherwise in all human systems':

> we are ignorant of so many of the links of the chains of beings, that to expect perfection in the arrangement of them would be the most weak presumption.[64]

Even the most consistent of the empiricists's taxonomic systems were not presented as a tabulation of nature's order, then. The zoologists certainly attempted to approach such an order – it was, indeed, the 'age of systematics' – but the taxonomic system itself did not square with that order, as Berkenhout and Pennant indicated above: All that could be hoped from the structuration of taxa, in more or less vague, more or less consistent form, was the 'producing', as Pennant stated, of 'an intelligible system', which allowed man to get an idea about nature, but which did not, indeed could not, as we will see below, pretend to be, or be presented as, an accurate tabulation of nature's order.

Positioning themselves between system, on one hand, always threatening to turn into embarrassing prejudices, and, on the other hand, sheer randomness which French naturalists like Buffon and Daubenton, not quite fairly, came to represent, the intentional inaccuracy became a third way. Allowing the higher level taxa to remain to some extent covert – even if it was only, as in Pennant's and Hill's case, by refraining from generically defining them, and by

63 J. Berkenhout, *Outlines of the Natural History of Great Britain* (1769-72), vol. I, p. viii.
64 T. Pennant, *Synopsis of Quadrupeds* (1771), p. ix.

defining the actual taxa polythetically – made it possible for the zoologists to avoid the dangers of too much method and system, and still approach the order of nature. Vagueness and inaccuracy here became an epistemological strategy.

Ultimately, the reasons offered for the need to take up this position were grounded in man's epistemological insufficiencies vis-à-vis nature. To elucidate this epistemological strategy further, we thus have to turn to the relationship between the zoologists' taxonomy, the order presumed to exist in nature, and man's ability to obtain knowledge about that order.

## Nature's Order

Without comparison, the most common way to conceptualise nature's order, indeed the order of the universe, within eighteenth-century natural history, was through the notion of the Great Chain of Being, as also noted in Chapter 6. 'For the attainment of [the] Philosophy of Nature,' Robert Kerr observed,

> it is necessary to possess some knowledge of the objects of creation, as they are connected with each other in one vast chain of being, and naturally arranged under greater or lesser links of mutual relation. Without an acquaintance with these, the pleasing and highly important study of Nature, as a Science, must, if not utterly impossible, be extremely difficult and embarrassing.[65]

The ideas about nature's order expressed through the idiom of the Great Chain of Being did not originate within natural history, but were entertained, refined, and interpreted much more widely within contemporary society. The Great Chain of Being, moreover, had a history of some two thousand years, as a variation of the notion can be found in Aristotle's conception of a chain of increasingly perfected beings (touched upon in Chapter 6 in connection with the perfection of offspring).

We have already encountered glimpses of the Great Chain of Being, and I shall not go into the history of the notion here, which has already been so well examined by Arthur Lovejoy in his classic study;[66] it is sufficient here to give a more comprehensive review of the notion and the use which was made of it in conceptualising nature's order within the context of the eighteenth century. It should be noted from the outset that quite a few of the zoologists under consideration here did not contemplate elaborately on this notion. As often as not, the Chain was simply taken for granted, alluded to or mentioned in passing as a justification for the arrangement of animals, or as an explanation for the particular attributes or manners of a single species. Often, then, the complex of ideas signified by the notion of the Great Chain of Being remained in the background of the zoological works.

---

65 R. Kerr, 'To the Public' (1792), pp. v-vi.

66 A. O. Lovejoy, *The Great Chain of Being* (1948).

The Great Chain of Being or, in its Latin version, *Scala Naturæ*, as Lovejoy has observed, gained an unprecedented 'diffusion and acceptance' within and beyond natural history in the eighteenth century.[67] The notion relied on a creationist conception of nature as 'designed' – as purposely constructed and ordered by, again, God, the Architect. Although it was oftentimes stressed that man had but a 'very imperfect' knowledge of this the Creator's work,[68] nevertheless, outlines of that order were given time and again. '[T]he whole universe', Smellie stated, 'is linked together by a gradual and almost imperceptible chain of existence both animated and inanimated.'[69] As we have already seen, all beings were considered to be connected on this chain by almost imperceptible links of similarities and differences, from the smallest plant, through zoophytes to the animals, and through gentle transitions in the animal kingdom gradually rising up to man, who again was connected to the angels who through countless ranks, finally, reached God at an infinite distance from the terrestrial beings. Often conceptualised as a chain of perfection, the Great Chain of Being would invariably be understood as a vertical hierarchic order, stretched out between 'brute matter' at one end, and pure spiritual intelligence at the other.

The notion of the Chain of Being relied on three principles, as Lovejoy has pointed out.[70] Firstly, the 'principle of plentitude' – of the creation of an infinite variety of beings in the world, created in such a manner that no 'chasm' on the scale of being was possible. In the eighteenth century, this did not imply, however, that every being imaginable would have been created – the mermaid, the centaur, the three-headed snake, for instance, were by the eighteenth century deemed to be 'creatures of the Imagination,' as we have seen: Not only the principle of plentitude, but also the law of nature's 'common course of production' set limits on how beings could be created. Secondly, the 'principle of continuity' – the idea that every being had 'a mutual connection' with other beings, linked together by means of similarities and imperceptible differences. The idea of continuity could be applied at a number of different levels: from that of major groups of beings (e.g. Plants, Animals, Man, Angles), through species, to individuals. There was no clearly defined unite of connection, no theory about the level that the principle of continuity applied to – it functioned as a transferable principle. Finally, 'the principle of gradation': the idea that every being (at some level or another) differed ever so slightly from its neighbour on the chain, that it became hard to identify the specific differences. Hence, Brookes in discussing the polyp pointed out that 'Nature chuses to mix the kinds of beings by imperceptible gradation, so that it becomes hard to determine

67 Ibid., p. 183.
68 See, for instance, W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 430.
69 Ibid., p. 436.
70 A. O. Lovejoy, *The Great Chain of Being* (1948), *passim.*

where the animals end, or the vegetables begin'.[71] Likewise Soame Jenyns, employing the metaphor of shimmering colours, described the nature of the links:

The manner by which the consummate wisdom of the divine artificer has formed this gradation, so extensive in the whole, and so imperceptible in the parts, is this: – He constantly unites the highest degree of the qualities of each inferior order to the lowest degree of the same qualities belonging to the order next above it; by which means, like the colours of a skillful painter, they are so blended together, and shaded off into each other, that no line of distinction is anywhere to be seen.[72]

On the Scale of Being, there were no definite distinctions; the chain was held together by virtue of the nature of neighbouring beings being mixed.

Although the Great Chain of Being could not be observed by man, by joining these three principles together in the notion of the Great Chain of Being, the perceptible, infinite variety in the world could not only be explained, but it could also – in cosmological theory – be reduced to a simple, uniform, and harmonious structure, worthy of a rational God. 'Were there no other argument in favour of the UNITY of DEITY,' Smellie thus observed after having described the chain in outline, 'this uniformity of design, this graduated concatenation of beings [...] seems to be perfectly irrefutable.'[73] Likewise Benjamin Stillingfleet stressed in a poem on nature how this order pointed to God:

Almighty Being,
Cause and support of all things, can I view
These objects of my wonder; can I feel
These fine sensations, and not think of thee?
[...]
Without thy ray divine, one dreary gloom;
Where lurk the monsters of phantastic brains,
Order bereft of thought, uncaus'd effects,
Fate freely acting, and unerring Chance.
Where meanless matter to a chaos sinks
Or something lower still, for without thee
It crumbles into atoms void of force,
Void of resistance – it eludes our thought.[74]

As in the case of the monstrous productions, chaos here again was presented as the only possible alternative to a Divine order, and this order was, tautologically, read as a certain sign of the existence of God.[75]

An important consequence of this opposition of only one possible kind of order to chaos was, that every being had to be kept in its place on the Chain. It was, of course, in this connection, in explaining the stability of the God-given order that the notion of œconomia

71 R. Brookes, *A New and Accurate System* (1763-72), vol. IV, p. xv.

72 Soame Jenyns, *Disquisitions on Several Subjects* (1790), quoted in A. O. Lovejoy, *The Great Chain of Being* (1948), p. 197.

73 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, pp. 436-7.

74 Stillingfleet, quoted in T. Pennant, *British Zoology* (1768-77), vol. IV, pp. vii-viii.

75 For more general discussions of nature's ability to communicate something about God, as this idea was developed within eighteenth-century deism and natural theology, see N. C. Gillespie, 'Natural History, Natural Theology' (1987); C. C. Gillespie, *Genesis and Geology* (1969), ch. 1; C. L. Becker, *The Heavenly City* (1977); C. B. Tinker, *Nature's Simple Plan* (1922).

naturæ, discussed in Chapter 6, gained significance. Concluding his work on the three kingdoms of nature, Bradley thus in a typical way connected the Great Chain of Being and the doctrine of nature's œconomy by concluding 'that all Bodies have some Dependence upon one another; and that every distinct Part of Nature's work is necessary for the support of the rest; and that if any one was wanting, all the rest must consequently be out of Order.[76] The working of œconomia naturæ explained the stability of the Chain.

I shall not go further into the notion of œconomia naturæ here, since it has already been reviewed at length in the previous chapter; what I would like to stress in this connection is the complete monopolisation of the Great Chain of Being in the cosmological conceptualisation of nature's order within eighteenth-century zoology, which the doctrine of œconomia naturæ helped to support: The Great Chain of Being not only emerged as a simple, stable structure which subsumed the universal variety of beings under its uniform, gradated and harmonious hierarchy, but also as the only thinkable alternative to chaos.

## Nature's Order cf. Man's Order

'It is vain for us to pretend to lay down any one certain uniform Rule,' Tubervill Needham cautioned, 'and say to Nature, This is thy Scheme; such are thy Statutes; and from these thou shalt not deviate.'[77] Though the warning was offered in connection with some thoughts on the generation of animals, it seems to be relevant for attempts to recreate the Great Chain of Being in taxonomic schemes, as well.

Surely, the Great Chain of Being was posited as the divine model for the zoological classificatory endeavour – the imperceptible order, structuring all beings in the world, which ought to be reconstructed by taxonomic means in natural history. And zoologists certainly drew on the conceptions of order relating to the Great Chain of Being in their classification of animals: Like the Great Chain of Being, the taxonomic schemes were structural hierarchies which, in principle, transcended both time and place. At a more specific level, the zoologists identified intermediate links between groups of animals in their works. Hence, for instance, frogs would be described as a connecting link between quadrupeds and insects,[78] the genus of antelope as connecting the goat and deer 'kinds';[79] the polyp as the link between animals and vegetables;[80] the flying maucauco and the flying squirrel, respectively, as links between the

76 R. Bradley, *A philosophical account of the works of nature* (1721), p. 159.

77 T. Needham, *Observations upon the Generation* (1749), p. 14.

78 R. Bradley, *A philosophical account of the works of nature* (1721), p. 116.

79 T. Pennant, *Synopsis of Quadrupeds* (1771), p. 25.

80 E. Bancroft, *An Essay on the Natural History of Guiana* (1769), p. 225; R. Brookes, *A New and Accurate System* (1763-72), vol. IV, p. xiv-xv.

O' Lord, how Wonderfull are thy Works.

Publ.d May 21 1790 by G. Riley Ludgate St.

Ill. 7.8 O'LORD, HOW WONDERFULL ARE THY WORKS (Anonymous, *Beauties of Creation*, 1790). Natural history and theology merged in natural theology, and nature could thus be approached and studied as a second divine book, complementing the revealed word of the Bible.

quadrupeds and birds,[81] the sea otter as a link between fishes and quadrupeds,[82] and so on and so forth.

At a more comprehensive level, the zoologists would also, in most cases, organise their entire presentation of animals according to a scheme whose layout closely followed the Chain's gradations of perfection. Starting with the quadrupeds, they would often, but not invariably, proceed to the birds, move on to the fish and insects and, if they went this far, which quite a lot of zoologists did not, end with the most imperfect class of all animals, approaching to the vegetables in their nature, the animacules. Or, some zoologists would, inversely, go through the same chain of animals the other way around. Although the zoologists could not, as they noted time and again, actually *know* anything about the imperceptible Chain, nevertheless, it served in crucial ways to make sense of the animal kingdom.

But there were significant differences as well between the man-made order and the (man-made) divine order. Firstly, where the Great Chain of Being displayed an exclusive hierarchy in which each animal group, like the ranks of soldiers in an army, was not included in the category above it, an inclusive hierarchy was unfolded in the taxonomic schemes, in which the lower taxa would be included in the higher taxa, like in a pyramidal structure. The systems were essentially of two different kinds, and it would therefore be logically impossible to reconstruct the Great Chain of Being in the taxonomic scheme.

Secondly, although the zoologists certainly mentioned intermediate links every from time to time, and although species belonging to the same higher taxon would most often be represented in a series which stressed their interconnections (the bull would be followed by the ursus, then the buffalo, the bison, the bonassus, the sheep, the goat;[83] the 'true apes' without tails would be followed by the baboons with short tail, and those by the monkeys with long tails,[84] etc.), there would be only sporadic attempts made to connect the last species of one super-species taxon to a series of species in another super-species taxon. The series would usually end nowhere. In effect, the llama, for instance, would in one scheme be standing between the dromedary (to which it on the zoologists' account did bear a resemblance) and the ape (to which it did not);[85] the sea-cow would stand next to species of the strix genus, to which no connection was made, which would again be placed beside the genus of falco, to which it did bear resemblance, and so on.[86]

Thirdly, the Great Chain of Being was built up by interconnected groups of animals chained together in an analogous series, while the taxonomic system, in its basic structure,

81 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. II, Flying Maucauco (unpaged).
82 G. Shaw, *Museum Leveriani explicatio* (1792), vol. III, p. 111.
83 As in R. Brookes, *A New and Accurate System* (1763-72), vol. VI, pp. 23ff.
84 For instance, T. Pennant, *Synopsis of Quadrupeds* (1771), pp. 94ff.
85 R. Brookes, *A New and Accurate System* (1763-72), vol. VI, pp. 114-6.
86 J. Hill, *A General Natural History* (1751-58), vol. III, pp. 316ff.

built on a digital distinction between animal groups. True, the polythetic characterisation of taxa, in contrast to a monothetic one based on logical division, contributed in some way to reducing the difference between these two ways of structuring the animal kingdom, since it allowed the zoologists to partly characterise different taxa of the same level by the same traits. But only in part: although a taxon could share traits with another taxon, the combination of those traits still had to be unique in each case, and the choice of where an animal belonged still had to be made in the end: either this taxon or that one. The taxonomic system was predicated on the drawing of borders, regardless of how these were defined, while the Great Chain of Being, like shimmering colours, defied borders. In the first case, differences had to be made visible in order for classification to proceed; in the second case, though differences had to exist for the Chain to continue its progression, they were by definition 'imperceptible.'

Though the Great Chain of Being provided the zoologists with the most important cosmological frame for their taxonomic endeavour, cosmology was not, then, simply reproduced in zoology. In practice something else was created in its place. The metaphor for the eighteenth-century taxonomic schemes would have been that of a branched tree rather than of a chain, allowing, however, for not all of the branches being visible (had it not been to take the metaphor too far, I would have said a branched tree with leaves turned upside down).

The zoologists themselves were well aware of the discrepancies between their own order and nature's. Rather than questioning nature's order (or more accurately: their assumptions about nature's order), and rather than letting such discrepancies challenge their taxonomic endeavour, the zoologists turned to what was presented as 'natural' and, hence, inevitable shortcomings in their own practice and conceptualisation of nature in order to explain the discrepancies.

Firstly, a simple lack of knowledge about innumerably species was offered as part of the explanation for the defects of the humanly created system: 'Seas and Deserts hide Millions of Animals from our Observation', Joseph Addison pointed out after he had reviewed the possibility of constructing a universal natural history: 'Innumerable Artifices and Statagems are acted in the *Howling Wilderness* and in the *Great Deep*, that can never come to our Knowledge', and besides these there were 'infinitely more Species of Creatures', so petite that even 'the finest Glasses', that is microscopes, could not reveal them to the human eye.[87] There was simply still too much to be discovered in the empirical world for perfection to emerge.

Secondly, and more basically, the principal difference which I took note of above between the analogous construction of the continuous Great Chain of Being as an exclusive hierarchy, and the digital construction of the taxonomic systems as an inclusive hierarchy, which would make a perfect taxonomic reconstruction logically impossible, did not escape at

87 J. Addison, *Spectator*, no. 121 (Jul. 19, 1711).

least some of the zoologists' attention. Hence, we have already seen Berkenhout pointing to this logical impossibility above. Also Smellie touched upon the problem as he remarked,

When examining the characters by which beings are distinguished from each other, we perceive that some of them are more general and include a greater variety than others. From this circumstance all our distributions into classes, orders, genera, and species, are derived. Between two classes, or two genera, however, Nature always exhibits intermediate productions so closely allied, that it is extremely difficult to ascertain to which of them they belong.[88]

In practice, this difference in the definition of categories and their mutual relations on the Great Chain of Being and in the taxonomic scheme became most obvious in connection with animals of an intermediate nature – animals falling between clearly recognisable taxonomic categories. The 'extraordinary animal' the gnu was one such:

It partakes of the horse, the ox, the stag, and the antelope: the shoulders, body, thighs, and mane, are equine; the head completely bovine; the tail partly one and partly the other, exactly like that of the quacha [sic]; the legs, from the knee-joints downwards, and the feet are slender and elegant like those of the stag, and it had the *subocular sinu* that is common to most, though not all of the antelope tribe.[89]

'Nature', Barrow concluded after having given this description, 'though regular and systematic in all her works, often puzzles and perplexes human systems, of which this animal affords an instance.'[90] To solve the puzzle Barrow proposed to form a new and intermediate genus, especially for the gnu.

The hog was another animal, which repeatedly caused problems for the zoologists. 'These animals are remarkably singular', the author of the *Naturalist's Pocket Magazine* noted,

Their species is solitary, and detached: it is approached not by any neighbouring species which, like that of the horse and ass, and of the sheep and goat, may be regarded as principal or as accessory; neither is it subject to a variety of races, like that of the dog. It participates of several species, but essentially differs from the whole.[91]

It had cloven hoofs, but it did not resemble those of other cloven hoofed animals, as the hog had both clearly visible toes, cutting teeth in the upper and lower jaw, no horns and only one stomach; neither could it be ranked with the digitated animals since it walked on its toes, and in relation to the whole hoofed tribe, it evidently differed in the form of its feet:

In short, the Hog seems to be of an equivocal nature; or, rather, it appears so to those who mistake the hypothetical arrangement of their own ideas for the common order of Nature, and only perceive, in the infinite chain of being, some conspicuous points, to which they would refer every natural phænomenon.[92]

Such species, which were impossible or very difficult to classify, are to be meet with fairly frequently within the zoological literature. And that, as also indicated in this quote, was not at all surprising. Given the differences between the taxonomic system and nature's order, it was only logical that some animals, as Ray said (though in connection with botanical classification), should become 'homeless' in man's taxonomic scheme:

But I would not have my readers expect something perfect or complete; something which would divide all plants so exactly as to include every species without leaving any in positions anomalous or peculiar; something which would

88 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 433.
89 J. Barrow, *An Account of Travels* (1801-04), vol. I, p. 260; emph. in org.
90 Ibid.
91 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. I, 'Wild Boar' (unpaged).
92 Ibid.

so define each genus by its own characteristics that no species be left, so to speak, homeless or be found common to many genera. Nature does not permit anything of the sort. Nature, as the saying goes, makes no jumps and passes from extreme to extreme only through a mean. She always produces species intermediate between higher and lower types, species of doubtful classification linking one type with another and having something in common with both – as for example the so-called zoophytes between plants and animals.[93]

What collided here, then, were two different conceptions of animal categories and their interrelations, each playing an important part in the zoologists' conceptualisation of nature. On the one had, the zoologists' taxa, which were digitally defined, and, as becomes especially evident in the case of species, were taken to be immutably delimited groups and, furthermore, ordered in an inclusive pyramidial structure. On the other hand, the animal groups on the Great Chain of Being, which were analogously defined and interconnected in an exclusive hierarchy in such a way, that borders between them vanished. In some measure, the discrepancy would be attempted resolved by introducing intermediate genera or species, like that of the gnu or hog. But this did not solve the fundamental problem: it was logically impossible to reproduce the Great Chain of Being transparently in the taxonomic schemes because it was of a different nature.

But why, a stranger could ask a bit naively, why did the zoologists not simply reconstruct the Great Chain of Being in their works, as it was, after all this order they had set out to unveil? Why did it become sensible to make such taxonomic systems in which some taxa were difficult to classify and others became 'homeless,' and within the framework of which it, on any account, was impossible to accurately reproduce nature's order? The short answer to this question is, because it was impossible for man to reconstruct nature's order. The longer answer, and hence, also the fundamental cause of the discrepancies between the two systems, can be found in the human predicament of knowledge.

'To mark the distinctions, to investigate the relations, to ascertain the great chain that unites the numerous tribes with people and adorn the universe, would demand talents of superior genius, perhaps, to those of humanity', Smellie underscored in the preface to his translation of parts of Buffon's work in 1780.[94] Ten years later he elaborated on this point:

Our knowledge of the chain of intellectual and corporeal beings is very imperfect; but what we know gives us exalted ideas of that variety and progression which reign in the universe. A thick cloud prevents us from recognising the most beautiful and magnificent parts of this immense chain of being.[95]

In similar terms, George Edwards compared previous attempts of zoologists' to classify different animals and observed that 'not two men, who had not consulted others, would place them in the same order',[96] and accounted for such differences by also pointing to the human predicament of knowledge:

93 J. Ray, *Methodus Plantarum Nova* (1682), Præludia Botanica (unpaged), quoted in C. E. Raven, *John Ray* (1986), p. 193.

94 W. Smellie, 'Preface' (1780), p. xi.

95 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 400.

96 G. Edwards, *Gleanings of Natural History* (1758-64), vol. II, p. xvi.

I believe it would be a vain attempt, in the most knowing naturalist, to think of ranging all the productions of nature, animals, vegetables, and minerals, in such a true and natural order, that each particular body should stand precisely in its proper place, between two other bodies that justly and naturally should go before and follow after it. There arise insurmountable difficulties, when we go about to consider what relation any one body or thing bears to another: sometimes, indeed, the chain of connection may be carried on, in seeming regular links, for a little way; but we shall find it impossible for human judgement to continue it to any great length.

And the reason:

Man is a creature too weak and imperfect to trace the works of the Great Creator in their just and natural gradations.[97]

In a world where man had access only to perceptible particulars and where the essential part of God's order remained hidden, man's attempts at reconstructing that order would inevitably fall short. Perfect definitions, in the sense of a definition corresponding to nature's, of animal groups and of their relations were not even to be hoped to be achieved within this epistemological frame. '[D]efitions, when applied to natural objects, must always be vague and elusory', Smellie concluded after having attempted to make the, for zoology, very basic distinction between the animal and vegetable kingdoms: 'We know not the principles of animal life. We are equally ignorant of the essential causes of vegetable existence. It is vain, therefore, to dream of being able to define what we can never know.'[98]

It is, I will suggest, this human predicament of knowledge which impeded man from knowing the defining essences of things, which also impeded man from obtaining certain knowledge about God's order and the essential principles structuring it: It is all these shortcomings of human knowledge, produced by the 'weak and imperfect understanding' of man, which were made visible in the intentional inaccuracies in the empiricists' taxonomic schemes. The inaccuracy in definition, and the accentuation of this in the vagueness of presentation of taxonomic schemes in some cases, made the human origin of the zoologists' taxonomic orders plain.

## The Great Unknown

The observation of the human imperfections vis-à-vis nature's order also served another purpose. Viewed in hindsight and from a stranger's point of view, the natives' idea of the impossibility of constructing a perfect scheme might, as one possible scenario, have led to a redefinition of some of their basic assumptions and hence, of the entire system. Of, for instance, the definition of taxa, and especially of the species, whose immutable borders the zoologists stubbornly retained even though this idea of species collided with the idea of animal groups without precise borders premised in the Great Chain of Being, and which, furthermore, made it

97 Ibid., vol. II, p. xvii.
98 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, pp. 4-5.

difficult, if not impossible in some cases, to classify some of them in the taxonomic schemes. Nothing of the sort was, of course, to happen until the nineteenth century, and especially, until the theory of evolution was introduced as the explanation for the origin of species, and higher-level taxa, whereby also, as we will see in Chapter 8, the stable borders of taxa were partially dissolved. The eighteenth-century zoologists might have questioned the nature of the relations between taxa, defined solely in terms of similarities and differences between perfect, adult specimens, whether it was in terms of morphology, anatomy, manners and habits or a mixture of these. Or, they might have reviewed their assumptions about the Great Chain of Being and Œconomia Naturæ, but never once did they attempt to do that. The basic assumptions and the basic methods remained unquestioned, self-evidently true, and, consequently, they remained intact throughout the entire period. The changes, which can be observed in the taxonomic schemes during the one hundred and forty years under consideration here, are rather to be found at a more 'superficial' level in the specific arrangement and particular content of the definitions of taxa. Given the preying awareness of the discrepancies between nature's order and the zoologists' order in the natives' own accounts, this stability seems to be as much in need of an explanation as the changes which took place at the beginning and end of the period.

Even though the zoologists seemed to know a considerable amount about what they also knew they could not know anything about with certainty, namely God's order, they did not know everything about it. Far from. Although the Great Chain of Being would be described in detail from time to time, the idea of an order existing in nature beyond the reach of man at the same time functioned as what I shall call the 'Great Unknown.' The Great Unknown constituted a space demarcated by what the zoologists, possibly through conjuncture, had some knowledge about, but the major part of which, like an iceberg beneath the water, remained hidden for the human eye and understanding due to man's epistemological limitations.

The lack of perfection in the man-made taxonomic order, the failure to account for the proper place of any one animal, the impossibility of ascertaining the cosmologically meaningful raison d'être of each and every animal would be explained with reference to this space of concealed divine causes. Now, as a human being one might not be able to understand the causes which conditioned the being, form and structure of the harmonious universe, but that was no reason, as it was repeatedly underscored, for not reckoning with them. Hence Smellie, for instance, cautioned the reader in the introduction to the translation of Buffon's *Natural History*, that one should be wary in accepting Buffon's, as well as other French philosophers' disregard for 'final causes':

it is a subject of much regret, that philosophers, the persons who are best qualified to unfold the mysteries of Nature, instead of comforting and informing mankind, by showing that her most hostile forms are real expressions of benevolence, and that the great chain of causes and effects, whether in the natural or moral world, are all intended to promote general felicity, should so frequently stretch their fancy for the perverse purpose of throwing a gloom over all her productions, and of excluding design from the operations of her great Author. Because they cannot comprehend the supreme Being, because they are unable to perceive his mode of acting upon matter, they, therefore, seem willing to disbelieve his existence. [...] It shall only be remarked, that a universe without design and intelligence, is more incomprehensible than an active machine without a moving principle.[99]

The same mode of explanation was employed more specifically as well. We have already seen above, how the zoologists referred the imperfections in their taxonomic order to 'man's imperfect knowledge,' to 'a thick cloud' preventing man from seeing the Great Chain of Being, and so on. In many other cases, the Great Unknown was also at one and the same time evoked as the limit to man's knowledge, and the reason why some things in natural history simply had to remain unexplained and imperfect. Hence, while Brookes discussed the reason for the creation of noxious snakes, he firstly pointed out that at least in some places, some of them were used by man, and then went on to observe, 'Whether Providence intended that all things should be for man's use, is a question we cannot resolve, as we are ignorant of the designs of Providence.'[100] Likewise, the author of the *Naturalists' Pocket Magazine*, while not being able to decide why the 'small mud tortoise' had got an armed tail, concluded: 'We do not, however, undertake to penetrate into all the wonderful designs of Nature; which, we conceive, are frequently inscrutable to man.'[101] While discussing whether fossils might be extinguished species and why the earth where they were found was always so fertile, John Ray noted, after having reviewed the arguments pro and contra: 'tho' we acknowledge that there is an End in all the Productions of Nature; yet it is no less certain, that we are often but very improper Judges of such final Causes.'[102] And later, although this time in connection with whether God might create a new race of rational beings to inhabit the earth after the day of judgement: 'there may be an End of the restoring of the World, tho' we are not able to find out or determine what. We are too short-sighted to penetrate the Ends of GOD.'[103] Similarly, to give just one last example, discussing, like Brookes above, the raison d'être and place of snakes in nature, Charles Owen summed up in a succinct manner the logic of the Great Unknown:

The Divine Wisdom so variously displayed in the Works of Nature, even the lowest Order of them, entertains the human Eye with Prospects exquisitely beautiful and pleasurable: As our Knowledge is defective, we are at a loss how to account perfectly for the particular Ends of their Formation, and Manner of their Subservience to the Whole of the Eternal Design. However, by Observation and Improvements in Natural Philosophy, we are assured thus far; that as the Almighty Creator made nothing in vain, so all his Work are good, and admirably fitted to answer the Purposes of his Will, and that his Wisdom, like his tender Mercies, shies through all the Systems of his Creation.

That there is not a wise Purpose in every thing that is made, because we do not understand it, is as absurd as for a Man to say, there is no such thing as Light, because he is blind, and has no Eyes to see it.[104]

99 Idem., 'Preface' (1780), pp. xii-xiii.
100 R. Brookes, *A New and Accurate System* (1763-72), vol. III, p. xx.
101 Anonymous, *The Naturalist's Pocket Magazine* (1799-1802), vol. III, 'Small mud tortoise' (unpaged).
102 J. Ray, *Three Physico-Theological Discourses* (1732), p. 202.
103 Ibid., p. 413; cap. in org.
104 C. Owen, *An Essay towards a Natural History of Serpents* (1742), p. vi.

The taxa might not always be perfectly defined; the classificatory schemes far from a perfect representation of nature's order; the explanation of the œconomy of species and hence of their reason d'être, not always possible to elicit, however, that did not challenge the fundamental tenets of the empiricist zoological enterprise. For, reckoning with a Great Unknown – placed far enough beyond the reach of man for him not to be able to specify its contents, yet close enough to man for him to be able to have a vague idea of its contours – the inevitable loops and flaws of the human zoological enterprise found a satisfactory explanation. They had a natural cause, not to be found in nature where perfect order indeed did exist, but to be found in man's nature, which impeded him from perfectly comprehending and representing God and his Creation. In a sense, there was no need for redefining the species concept, or the higher level taxa and their interrelations; no need for remoulding the zoological endeavour, nor for questioning the basic cosmological assumptions, because within this epistemological space of manoeuvring it was perfectly reasonable that the zoological systems should be imperfect: man's blindness explained it all.

So, although the zoologists through their method of comparing specimens and thereby making abstract categories, and through their method of relating these categories to each other within a vaguely defined taxonomic scheme, did transcend the material, particularised perspective of the vulgar, they never quite reached the transcendental sphere of the divine. That would, as we saw Smellie note, require a genius 'superior' to that of 'humanity.' This, once again, would take the pure intelligence of an angel.

Chapter 8

# Man in the Mirror of Nature

Throughout this thesis, we have seen how the British empiricist zoologists struggled to overcome the human predicament of knowledge in their zoological endeavour; how they attempted to control their passions, curb their self-interests, discipline their gaze and purge their mind, so that they could turn the animals into matters of facts. We have seen how they carefully distinguished between ideas and objects, how they compared such ideas, and how they classified the animals in their taxonomic systems by determining similarities and differences between. We have seen how the zoologists in every step they took attempted to establish a perspective from nowhere, and how they were never quite successful in doing that. Removed far enough from the animals to turn them into objects of study, the zoologist was still not enough of an angel to represent them transparently. His relation to nature was precarious, and this precariousness in itself reflected on man's own place in the Creation. Confronted with nature man was also confronted with his own nature. Here, self-fashioning and world-fashioning converged.[1]

In this final chapter, I shall look closer into the play of reflections between man and nature, and by placing it, and thereby also the entire zoological endeavour, within a broader contemporary context attempt to explore the relationship between self-fashioning and world-fashioning further.

It was not only within zoology that man's relation to, and with, nature became of importance. During the long eighteenth century, the distinction between nature and culture, in a modern recognisable form, came into being, and the specific attributes of the two categories and the terms of differentiation between them gained significance as a crucial operator in multiple fields: natural historic and philosophic literature; auto-anthropological

1 To borrow, again, Biagioli's pair of concepts; M. Biagioli, 'Scientific Revolutions, Social Bricolage' (1992).

representations of foreign people and tribes in travel accounts; auto-sociological analyses of the history and progress of society; moral tracts, novels and poems. The relationship between nature and culture was never simple, and consequently, the semantics of the two categories were complex.[2]

While the zoological investigations contributed to specifying the terms of the relationship, the conceptualisation of the nature-culture relation within a broader contemporary context also provided one of the most important contexts for the study of zoology. It became, in particular, important in two ways. On one hand, it contributed to the definition of the zoological object of study, nature, and, on the other, to the definition of the epistemological space of manoeuvring of the zoologist within a broader socio-cultural context. In the following, I shall attempt to elucidate how conceptualisations of the nature-culture relationship, entertained more generally, impacted upon world- and self-fashioning in the zoological endeavour. I start by discussing man's place in zoology and turn, next, to nature's, and culture's, place within contemporary auto-sociological conceptions of society and social classification. This analysis will, in turn, allow me to return to the question, introduced in Chapter 1, of the relationship between the zoological endeavour and 'society,' and to discuss the outcome of the zoologists' simultaneous confrontation with nature and man within this context. In the final section of this chapter, I turn to an analysis of the end to natural history's zoology, and the emergence of biology during the nineteenth-century.

## Man in Zoology

Already in his first edition of *Systema Naturæ* (1735), Carl von Linné had introduced man into zoology. Adopting the category of *Anthropomorpha* from John Ray,[3] Linné extended its borders, so that it not only included the humanlike apes and the sloth, but also man. With the introduction of the binomial system in the tenth edition of the *Systema* (1758), Linné also renamed and partially restructured the categories pertaining to the classification of man. *Mammalia*, literally 'of the breasts,' was introduced as a substitute for the prevalent class of *Quadrupeds*, now defined as all those animals who had a four-chamber-heart, were (in most cases) covered with hair, had three ear bones, and, moreover, who had breasts and suckled their offspring. The first order within this class was the *Primates*, substituting the earlier category of Anthropomorpha, and now included the genera *Homo*, *Simia* (apes), *Lemur*

2 L. Jordanova, 'Introduction' (1986), discusses aspects of this relationship in relation to eighteenth-century 'science;' see also A. E. Pilkington, ''Nature' as Ethical Norm' (1986), and the essays in M. Strathern and C. P. MacCormack, *Nature, Culture, Gender* (1980).

3 J. Ray, *Synopsis* (1693), pp. 148-61.

(maucauco) and *Vespertilio* (bats). Within the genus Homo, man was distinguished by the epithet *sapiens*, 'the knowing man,' from *homo troglodytes* (also called *homo nocturnus*), the cave-man who turned day into night, and lived in caves in Ethiopia, Java, Armbiona, at Mount Ophir in Malacca and on the Ternate Islands. In a note, it was suggested that there might also exist a *homo caudatus*, a tailed man.[4]

There was nothing new in viewing man as an animal. Through the Renaissance, the proposition 'homo est animal,' man is an animal, had often been asserted. But, in this context, man was quickly removed from the animal kingdom again, as the category of animals was divided into 'homo' and 'bestiae' by a logical division on the basis of the possession or lack of reason.[5] What was new in Linné's scheme, then, was that although also he certainly acknowledged man's distinctive rational abilities – cf. the chosen species epithet 'sapiens' – he still found man's morphological and anatomical similarities with the brutes to be so significant that man could be approached as a zoological object.

In contrast to what has sometimes been asserted in studies of the history of biology, Linné's Anthropomorpha, Primates, Mammalia, and Homo Sapiens, in brief, Linné's introduction of man as a zoological object were not readily accepted, at least not by British zoologists.[6] The British zoologists' reception of the Linnean zoological treatment of man, while not necessarily saying so much about Linné's conception of man, reveals quite a lot about their own conception of man and his relation to nature. Only a very few British zoologists in the eighteenth century adopted either of Linné's zoo-anthropological categories, and even fewer of those zoologists accepted Linné's alleged treatment of man as an animal on an equal footing with the brutes, without making explicit and often elaborate qualifications.[7] Hence, Pennant

---

4 C. Linné, *Systema Naturæ* (1758/1939), vol. I, pp. 14ff.; idem., *Systema Naturæ* (1766-68), vol. I, pp. 21ff. For the history of the concept of Mammalia, see T. Gill, 'The Story of a Word - Mammal' (1902), on the introduction of Mammalia into natural history, and for an analysis of its, mainly, gender-political implications, see L. Schiebinger, *Nature's Body* (1993), ch. 2; for a more general discussion of Linné's classification of man, see G. Broberg, 'Homo Sapiens' (1994).

5 For a review of Renaissance conceptions of the relationship between man and animals, see ibid., pp. 158ff.

6 E.g. L. Schiebinger, *Nature's Body* (1993), p. 46, about 'mammalia.' See, however, also G. Broberg, 'Homo Sapiens' (1994), pp. 170-4, for a review of European wide reactions against Linné's classification of man.

7 Among those who, at times, with some qualifications adopted Linné's classification of man, Berkenhout is the only one in my corpus who unconditionally accepted Linné's classification of man within the zoological world – as we have seen, he followed Linné all the way through. As Berkenhout's book dealt with British zoology only, however, he was never confronted with the near resemblance of man to ape. In Britain, homo sapiens remained the only member of the order of Primates. J. Berkenhout, *Outlines of the Natural History of Great Britain* (1769-72), p. 1. Richard Kentish accepted Linné's classification of man, but stressed the difference between man and the rest by pointing to the epithet sapiens: By this 'concise and elegant comment he [Linné] endeavours to shew, that however near his alliance to the mere animal, yet by culture of his facilities, it is in his power to prove himself an *intelligent and moral being*.' R. Kentish, *An Essay on the Method* (1787), p. 79; emph. in org. Towards the end of the century, George Shaw also accepted the inclusion of man into the zoological system, but only on the condition that the genus Homo was vacated by the other species Linné had placed there. G. Shaw, *Museum Leveriani explicatio* (1792), vol. II, p. 56. Finally, also Linné's first British biographer, Richard Pulteney, accepted the classification, but also felt compelled to defend and qualify it: though man 'stands as *an animal*, in

discarded Linné's classification of man, explaining that 'I reject his first division, which he calls *Primates*, or Chiefs of the Creation; because my vanity will not suffer me to rank mankind with *Apes, Monkies, Maucaucos*, and *Bats*, the companions LINNÆUS has allotted us even in this his last system.'[8] Likewise in reference to Linné's earlier categories, John Hill stated:

> Linnæus has distinguished this class by the name of Anthropomorphæ, beasts having the form of the human species. It is an assertion of that author, that he could find no distinction in characters between man and the monkey. I am apt to believe few would join with him in this opinion, but still fewer, in the putting the ignavus or sloth in the same class; since, whatever unlucky likeness there might be between the monkey-kind and ourselves in form, this ugliest of the creation can have no claim to such a resemblance.[9]

Man was entirely excluded from the zoological accounts of both Pennant and Hill. Many authors followed suit, and in the cases where man would be included into the account – except for the few zoologists who accepted Linné's classification – it would always be with a clear indication of a qualitative break between man and the rest. The treatment of man in *Beauties of Natural History* is typical in this respect. 'Such is the ample and complicated scale in which the lovely emanations of universal beauty run through so many delicate distinctions, and assume so many different and distant modifications', the author noted as he ended his description of the brutes and turned to man, 'the King of Animals': 'But in the Human make we are to look for the perfection of this principle, where all its gradations are so justly and happily blended':[10]

> He deviates so invariably and methodically from Nature, and is so totally artificial in every thing, that he is, without exception, the most extraordinary phenomenon in the whole compass of organised existence. He sometimes, though rarely, discovers all the merit and worth conceivable in his nature. His manners are simple and undisguised; his temper, kind and condescending; his sentiments of others, liberal and benevolent; and all his actions adorned with clemency and candour. He is, then, the visible image of the invisible DIVINITY, and the amiable reverse of all that is savage and unrelenting in Nature.[11]

The author went on to describe, not as he had done in his portraits of brutes morphological and anatomical traits, but man's ability to invent, to recollect and reason, his disposition to live in society, his ambitions, and, finally, the relation between his mind and body.[12] '[U]pon the whole', Smellie congenially concluded after having compared man to the brute creation,

> the dignity of man's rank depends not upon the structure of his organs. It is from the powers of his intellect alone that he is entitled to claim a superiority over the brute creation. These powers enable him to form ideas, to abstract, to reason, to invent, and to reach all the heights of science and of art.[13]

As such a distinguished creature, man could not be turned into a zoological creature.

---

the system of nature, at the head of this *order*' it was important to take his epithet into account, because Sapiens was 'the true application of which, he cannot but be sufficiently elevated above every humiliating idea which can otherwise arise from such an association' of man with the beasts. R. Pulteney, *A General View* (1781), p. 65, emph. in org. Again, then, though accepting Linné's classification, it was done in such a way that man, nevertheless, was removed one, crucial step from the other animals.

8 T. Pennant, *Synopsis of Quadrupeds* (1771), pp. v-vi; emph. and cap. in org.

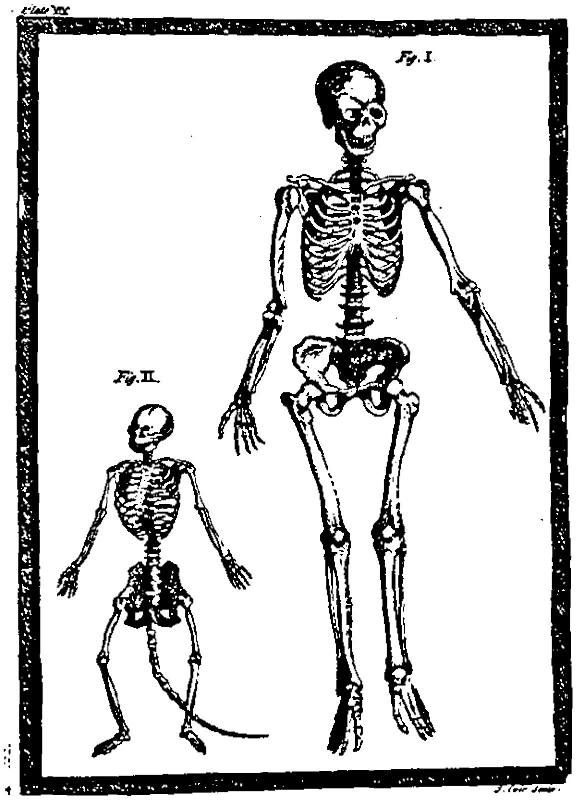
9 J. Hill, *A General Natural History* (1751-58), vol. III, p. 534.

10 Anonymous, *Beauties of Natural History* (1777), p. 327.

11 Ibid., p. 332, cap. in org.

12 Ibid., pp. 327-40.

13 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, p. 98.




Ill. 8.1 SKELETONS OF MAN AND APE (R. Bradley, *A Philosophical Account of the Works of Nature*, 1721).


Ill. 8.2 SIMIÆ (F. Watson, *The Animal World Display'd*, 1754).

The similarities between man and ape were described both in terms of anatomy, as illustrated above, and examined through comparisons of their manners. In the last case, especially the big apes' ability to use their hands and primitive tools were highlighted as a sign of their close relation to mankind, as shown below.

The reluctance to treat man on equal terms with the animals did not arise because the British zoologists did not acknowledge continuities between man and the brutes. Quite on the contrary. As we have seen, man and brutes were considered to be connected on the Great Chain of Being, as both man and brutes possessed a body with all that implied. Man had, as Richard Bradley concluded, 'many Particulars in his frame, which bear Analogy with the Parts of those Creatures he is ordain'd to govern. The Harmony which Nature maintains in the Generation and Production of *Quadrupedes*, is not contradicted in HIM.'[14] Physical similarities between man and beasts were usually taken note of in descriptions of apes.[15] In comparative anatomical studies, such as Edward Tyson's influential comparative study of the pygmy ape, monkey, and man, resemblances in muscles, vessels, speech organs, skeletons etc. would be dissected and specified – Tyson, for instance, took note of no less than 48 points of physical resemblance between the pygmy ape and man[16] (see also Ill. 8.1 and 8.2). Moreover, as we have seen hinted at earlier (esp. Chapter 4) and as will be explained in more detail later, in proto-sociological descriptions of the vulgar and the savages, more similarities would be still brought to the fore. The zoologists, like other writers from the period, even occasionally designated man as an 'animal.'

The British zoologists, then, acknowledged similarities between men and brutes and continuities between them. But, it was argued that these did not define the essential characteristics of mankind. Hence, the reluctance to turn man into a zoological object. Indeed, as we have seen indicated above, it was, conversely, the traits that differentiated man from animals (and, inversely, connected him with the angels), which defined the species of mankind. 'Nature,' Frederick Watson declared while describing the Satyr Ape, 'seems to have created this Animal to give us an humble Opinion of our Bodies; and to inform us, that it is in our Souls, and not in our exterior Shape, that we are properly distinguished from the Beasts that perish.'[17] Nature, it was likewise stated in *Beauties of Natural History*, provided an inverted reflection of man:

> It [nature] seems as if intended as a mirror in which we may recognise most of our own feelings, operating under the unbridled impulse of the blindest instinct, and learn to respect the utility and importance of those powers by which we are enabled to keep them in subjection. For what such brutal creatures are, is a striking picture of what, but for the principles of reason, of conscience, and restraint, we must certainly have been.[18]

---

14 R. Bradley, *A philosophical account of the works of nature* (1721), pp. 167-8; emph. and cap. in org.

15 R. Wolker, 'Perfectible Apes' (1978), and S. J. Gould, 'Chimp on the Chain' (1983), discuss aspects of the ideas of similarity between men and apes.

16 E. Tyson, *Orang-Outang sive Homo Sylvetris* (1699), pp. 92-4. See also, for instance, J. Douglas' comparative study of the anatomy of man and dog, in *Myographiæ Comparatæ* (1707). Regarding Tyson's study, Stephen Jay Gould has noted that Tyson's enumeration of points of similarities seems to be based on an over-zealous emphasis on 'the humanlike qualities' of the pygmie ape. S. J. Gould, 'Chimp on the Chain' (1983), pp.18ff. For those who would like to compare for themselves, the skeleton of Tyson's pygmy ape can still be seen at display at the Natural History Museum in London.

17 F. Watson, *The Animal World Display'd* (1754), p. 332.

18 Anonymous, *Beauties of Natural History* (1777), p. ix.

As Tyson concluded after having compared the organs of speech in man and apes, taking note of their physiological similarities and stressing the fact that only man could speak, man was not 'mere *Brute*[...] and *Matter*': On the contrary, his unique ability to speak, along with his possession of reason showed that

> those *Nobler Faculties* in the *Mind* of *Man*, must certainly have a *higher Principle*; and *Matter organized* could never produce them; for why else, where the *Organ*, is the same, should not the *Actions* be the same too?

'[I]n truth,' Tyson concluded, '*Man* is part a *Brute*, part an *Angel*; and is that *Link* in the *Creation*, that joyns them both together.'[19] In contrast to the brutes, man by virtue of his very being also transcended matter: That, we may now say, was mankind's distinguishing trait.

## Men on the Scale

As a species, man might form an intermediate link between the brutes and the angels, but when mankind was broken down into men, it became apparent that some men were closer to the brutes, and others to the angels. ''Tis a true Remark, which we cannot make without Admiration;' Tyson hence noted in the dedication of the book on the pygmy ape to Lord Somers, President of the Royal Society and Lord Chancellor to William III,

> That from Minerals, to Plants; from Plants, to Animals; and from Animals, to Men; the Transition is so gradual, that there appears a very great Similitude, as well between the meanest Plant, and some Minerals; as between the lowest Rank of Men, and the highest kind of Animals. The Animal of which I have given the Anatomy, coming nearest to Mankind; seems the Nexus of the Animal and Rational, as your Lordship, and those of your High Rank and Order for Knowledge and Wisdom, approaching nearest to that kind of Beings which is next above us; Connect the Visible, and Invisible World.[20]

The structure of the Great Chain of Being could be smoothly transposed from the realm of the natural world to that of the social, where it would be applied as a favourite metaphor in analyses of the interrelations between social groups in both history and contemporary society.[21] Samuel Johnson's observation in *The Philosophic Mirror* is not unusual in this respect:

> we should consider ourselves as so many Links of a Chain united together for one sole Purpose, all to beat a Proportion of Duty, let which will be uppermost, in the middle or lowest, that there are no Gradations but *what are just*, and therefore most eligible for every Individual, to be satisfied in the Place of his Appointment[.][22]

In fact, the idea of 'society' and the relationship between groups of men within it seems to have been virtually inexplicable without the notion of hierarchy in the eighteenth century. 'It is obvious,' Adam Ferguson thus stated, 'that some mode of subordination is as necessary to men

---

19 E. Tyson, *Orang-Outang, sive Homo Sylvestris* (1699), p. 56; emph. in org.

20 Ibid., Dedication (unpaged).

21 P. J. Corfield, 'Class by Name and Number' (1987), p. 40 and *passim*; Cf. A. O. Lovejoy, *The Great Chain of Being* (1948), ch. VI .

22 S. Johnson, *The Philosophic Mirrour* (1763), pp. 84-5; emph. in org.

as society itself; and this, not only to attain the ends of government, but to comply with an order established by nature.'[23] As in nature, so in society: hierarchy equalled order.

In the following section I shall examine how the notion of hierarchy worked in conceptualising society and categorising the different 'ranks' within a society. In the preceding chapters, we have already seen glimpses of the zoologists drawing upon a hierarchical notion of society, especially in distancing themselves from the vulgar. We must, however, transgress the boundaries of zoology, where man and society would not be treated comprehensively, and enter the terrain of contemporary auto-sociology in order to more fully investigate the prevailing ideas about social order.

During the eighteenth century, understanding the nature of society to a very large extent meant analysing the 'progress' of society in history where the social thinkers found a display of a hierarchy of progressingly more perfect and, as we will see, increasingly less natural social organisations.[24] In the first part of this section I zoom in on this auto-sociological analysis, aiming both to make the terms of human hierarchy explicit and to pin down the terms of differentiation between man and animals in more detail. This analysis will pave the way for a more general discussion of the relationship between nature and culture in the next section, and ultimately for a concluding section on the zoologists' and zoology's precarious relation to both.

## Progress of Society

Human history began in nature. Just like the zoologists, the social thinkers preconditioned a fundamental unity in human nature, and hence, asserted that men would be born equal and free. [25] And so they would continue to be, with the possible exception of the relationship

23 A. Ferguson, *An Essay* (1767/1995), p. 64.

24 In the following I shall mainly focus on the common trends in eighteenth-century social thinking, leaving out those points of divergence which certainly also marked the field. For a more comprehensive study of the auto-sociological field, see J. G. A. Pocock, *Politics, Language and Time* (1973); idem., *Virtue, Commerce, and History* (1985); A. Skinner, 'Analytical Introduction' (1999); K. O'Brien, *Narratives of Enlightenment* (1997); and for a discussion of the relationship between English and Scottish Enlightenment thinking, see J. G. A. Pocock, 'Between Machiavelli and Hume' (1976); J. Robertson, 'The Scottish Enlightenment' (1983); J. Dunn, 'From Applied Theology' (1983).

25 See, for instance, J. Locke, *Two Treatises* (1690/1988), p. 269/II,§4; J. Millar, *Observations* (1771), p. iii. A notable, but rare exception is David Hume who, though in general pointing to 'moral causes' as the source of difference, in 'Of National Characters' (1748) argued for a natural difference between the white and the rest: 'I am apt to suspect the negroes, and in general all the other species of men (for there are four or five different kinds) to be naturally inferior to the whites. There never was a civilized nation of any other complexion than white, nor even any individual eminent either in action or speculation. No ingenious manufactures amongst them, no arts, no sciences. On the other hand, the most rude and barbarous of the whites, such as the ancient GERMANS, the present TARTARS, have still something eminent about them, in their valour, form of government, or some other particular. Such a uniform and constant difference could not happen, in so many countries and ages, if

between men and women, in a 'state of nature' or, what amounted to the same thing, in a 'savage state.'

Indiscriminately drawing on material from both historical records and descriptions of 'primitive' societies in contemporary travel literature,[26] the savages were 'allochronistically'[27] identified in age-old and contemporary societies alike as the origin of human society: 'It is in their present condition', Ferguson noted regarding the American tribes, 'that we are to behold, as in a mirror, the features of our own progenitors';[28] 'in the beginning all the World was *America*', John Locke[29] similarly proclaimed in an oft-quoted statement with reference to those Indians, who together with the 'Hottentots,' other African tribes, and the aboriginals of New Holland and the inhabitants of the South Sea, who came to supply the British writers with the material for investigating the natural state of man as the eighteenth century came to an end.

The principal characteristic of men in 'the lowest and rudest state of society', as Adam Smith called it,[30] was that they did not accumulate property at all. In the analyses of the Scottish Enlightenment writers, their economic mode would most often be described as 'hunting and fishing,' its distinctive trait being that man lived from hand to mouth: 'His great object is to be able to satisfy his hunger; and, after the utmost exertions of labour and activity, to enjoy the agreeable relief of idleness and repose', John Millar observed.[31] 'The food of to-morrow is yet wild in the forest, or hid in the lake',[32] Ferguson affirmed, and savage man would not go out to hunt unless his hunger urged him to do so:

> Directed in this particular by the desire of nature, men, in their simplest state, attend to the objects of appetite no further than appetite requires; and their desires of fortune extend no further than the meal which gratifies their hunger. [...T]hey can apply to no task that engages no immediate passion[.][33]

The savages' reluctance to gather property meant, as Locke explained, that no ranks or distinctions would emerge between them. Living in a state 'wherein all the Power and Jurisdiction is reciprocal, no one having more than another', there was

> nothing more evident, than that Creatures of the same species and rank promiscuously born to all the same advantages of Nature, and the use of the same faculties, should also be equal amongst another without Sub-ordination or Subjection[.][34]

---

nature had not made an original distinction betwixt these breeds of men.' Quoted in W. D. Jordan, *White over Black* (1968), p. 253; cap. in org.

26 Cf. P. J. Marshall and G. Williams, *The Great Map of Mankind* (1982), esp. ch. 2.

27 The term is due to Johannes Fabian who coined it to account for 'the denial of coevalness' of the 'primitive' with the 'civilised' in twentieth-century anthropological studies – the idea of the 'primitive other' as an ancient relic lingered for a long time to come. J. Fabian, *Time and the Other* (1983), p. 32.

28 A. Ferguson, *An Essay* (1767/1995), p. 80.

29 J. Locke, *Two Treatises* (1690/1988), p. 300/II,§49; emph. in org.

30 A. Smith, *Wealth of Nations* (1776/1999), vol. II, p. 279.

31 J. Millar, *Observations* (1771), p. 2.

32 A. Ferguson, *An Essay* (1767/1995), p. 81.

33 Ibid., p. 91.

34 J. Locke, *Two Treatises* (1690/1988), p. 269/II,§4.

In fact, such a 'promiscuous' intercourse and organisation not only meant that the savages would remain equal, but also that even 'society,' understood as an ordered structure of subordinated ranks, could not even emerge.

The savages' desire for only such things as would satisfy his 'immediate passions,' furthermore, meant that he never got a chance to develop that human faculty of reason which most decisively distinguished man from the animals. '[T]hey study no science, and go in pursuit of no general principles', observed Ferguson: 'They even seem incapable of attending to at distant consequences, beyond those they have experienced in hunting or war.'[35] In his description of the Indians of Guiana, the traveller Edward Bancroft explained the relationship between lack of possessions, or 'luxury,' and lack of refinement and understanding in detail:

> These *Indians* are indeed unlettered and ignorant, as are all those whose wants are few; the progress of arts and sciences having ever kept pace with luxury. Mankind seldom attends to objects, which are not connected with either their pleasures or necessities; and where curiosity is thus unexcited, reason will never undergo the trouble of investigating the properties and causes of objects, which, when discovered, could afford no entertainment: Where, therefore, the wants and desires of mankind are few, their enquiries, and consequently their knowledge, will be confined.[36]

Living under the sway of their primitive passions, and not having developed their faculty of reasoning, the savages were evidently only barely removed from the world of nature. Comparing 'the lowest Savages of our own species with a Newton or a Locke', George Edwards, indeed, arrived at the common conclusion that 'the disparity will be thought greater than that between the Savage and some of his brute companions of the woods and mountains' – like them the savage would be 'governed by mere instinct and sensual appetite'.[37] 'Man, in his lowest condition,' William Smellie likewise found, 'is evidently linked, both in the form of his body and the capacity of his mind, to the large and small orang-outangs.'[38] Placed at an infinite distance from the learned writers themselves, the savages came to embody the link between the brute creation and mankind.

What separated man from the animals and set the progress of society in motion was the accumulation of property, as Ferguson here explains:

> It must appear very evident, that property is a matter of progress. It requires, among other particulars which are the effects of time, some method of defending possession. The very desire of it proceeds from experience; and the industry by which it is gained, or improved, requires such a habit of acting with a view to distant objects, as may overcome the present disposition either to sloth or to enjoyment. This habit is slowly acquired, and is in reality a principal distinction of nations in the advanced state of mechanic and commercial arts.[39]

What, more fundamentally, instigated the accumulation of property was a 'human' or, as it was also called, an 'instinctive propensity' to, in the words of Smith, 'truck, barter, and exchange', a desire for gain, that is. Such a selfish desire for gain had been condemned in

35 A. Ferguson, *An Essay* (1767/1995), pp. 88-9.
36 E. Bancroft, *An Essay on the Natural History of Guiana* (1769), 342; emph. in org.
37 G. Edwards, *Gleanings of Natural History* (1758-64), vol. II, p. ix.
38 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 431.
39 A. Ferguson, *An Essay* (1767/1995), p. 81.

seventeenth-century civic humanism,[40] however during the eighteenth century, it gained a paramount, and even salutary, role in the history of human society, at first by the periodical writers early in the century and later in Scottish Enlightenment thinking, as it came to be seen as the agent behind that accumulation of property which would gradually introduce ranks and civil government, in short, 'society,' into the world of humans.[41] Singling man out as 'the great storemaster among animals', Ferguson, in no uncommon terms, defined property as 'the principal idol' of man's 'mind': The accumulation of property not only helped to create society; this accumulation also became instrumental for the development of the human character. Relying on a common idea of a fundamental affinity between property and personality,[42] Ferguson described the nature of the relationship thus:

> He [man] apprehends a relation between his person and his property, which renders what he calls his own in a manner a part of himself, a constituent of his rank, his condition, and his character, in which, independent of any real enjoyment, he may be fortunate or unhappy; and, independent of any personal merit, he may be an object of consideration or neglect; and in which he may be wounded and injured, while his person is safe, and every want of his nature completely supplied.[43]

The 'beaver and the squirrel, the ant and the bee' might also accumulate when they collected 'their little hoards for the winter',[44] but in contrast to them when man moved beyond his savage state of nature, he would both accumulate far beyond his needs, and this accumulation would work to shape his manners, and help the human species to progress 'from rudeness to civilisation.'[45]

At first, man would begin gathering livestock, hence the preference of the Scottish Enlightenment writers in particular, of labelling the second stage in the human developmental hierarchy as 'shepherds,' most often exemplified by the Germans, Huns, and Tartars at the time of the Roman empire, and by contemporary desert Arabs. With the accumulation of property, society was introduced. For, on one hand, this accumulation would lead to 'a more remarkable and permanent distinction of ranks', as Millar explained, because some shepherds, 'being more industrious or more fortunate than others', acquired bigger herds, and were thereby 'enabled to live in greater affluence, to maintain a number of servants and retainers, and to increase in proportion their power and dignity.'[46] Thereby a hierarchy of ranks was introduced. Moreover, the accumulation of property necessitated the establishment of a defence, and that became the *raison d'être* of civil government. Entering into civil society by

40 On the changes in the conception of self-interested gain and property from the seventeenth century to the eighteenth century, see J. G. A. Pocock, *Virtue, Commerce, and History* (1985), ch. 6.

41 A. Smith, *Wealth of Nations* (1776/1999),vol. I, p. 117. Cf. E. Gibbon, *The Deline and Fall* (1776-88/1998), p. 280; A. Ferguson, *An Essay* (1767/1995), pp. 16-7.

42 Idem., 'Between Machiavelli and Hume' (1976), p. 160; idem., *Virtue, Commerce, and History* (1985), p. 116.

43 A. Ferguson, *An Essay* (1767/1995), p. 17.

44 Ibid., p. 17.

45 Ibid., p. 7.

46 J. Millar, *Observations* (1771), p. 40.

consent, the shepherds entrusted some of their power to the hands of a legislative body, which in return, guarded their property. 'Civil governments, in their first institutions, are voluntary associations for mutual defence,' Gibbon stressed.[47] Civil government, Smith likewise observed, 'is in reality instituted for the defence of the rich against the poor, or of those who have some property against those who have none at all.'[48] It was the emergence of civil government and the distinction of ranks, which together came to signify the existence of 'society.'

With the formation of barbarian society a change of manners and character also followed, as we saw Ferguson describe above in more general terms. 'Being thus provided with necessaries, he [the barbarian] naturally aims at some little improvement in his manner of living', as Millar explained:

> The leisure, tranquillity, and retirement of a pastoral life, seem calculated in a peculiar manner to favour the indulgence of those indolent gratifications. From higher notions of elegance and refinement a nicer distinction is made with regard to the objects of desire; and the mere animal pleasure is often accompanied with the more delicate correspondence of inclination and sentiment.[49]

The shepherds might have risen above the 'mere animal pleasure' of the savages – their drive to satisfy hunger and to procreate – however, as becomes especially clear in contemporary portraits in travel literature, they were still very rude compared to civilised nations such as Britain: 'Their nastiness in the eyes of Europeans is much against them. [...] The Arabs are the reverse of cleanly', John Taylor hence noted when describing the Arabs he had met in the Great Desert:

> and we cannot fail to remark, that as civilization induces industry, industry in like manner, promotes cleanliness and decorum. The nice and delicate feelings of the human mind are not developed till the age of barbarism is past, and that the community begin to experience the necessity and comfort of accommodating, individually to those habits which pure nature does not inculcate.[50]

Although the barbarians had moved to some extent away from nature, they were still – illiterate, unlearned, unmannered – far way from civilised society.

Gradually, the barbarians would start to settle down and begin cultivating the land. Again the 'desire to gain' would prompt some to accumulate great amounts of land, and slowly their estates would grow so large, that they would not only rent out some land to tenants, but also needed men to hire men to take care of their estates. A hierarchy of ranks was thereby created, and 'a regular subordination, accompanied with a long train of services and duties, from the king down to the smallest proprietor',[51] introduced. Feudal society, often exemplified by the Italian Renaissance city-states and fifteenth and sixteenth century Britain, had come into being.

47 E. Gibbon, *The Deline and Fall* (1776-88/1998), p. 195.
48 A. Smith, *Wealth of Nations* (1776/1999), vol. II, p. 302.
49 J. Millar, *Observations* (1771), pp. 38-9.
50 J. Taylor, *Travels* (1799), vol. I, pp. 244-5.
51 A. Smith, *Wealth of Nations* (1776/1999), vol. II, p. 511.

As the landlords gained possessions they also gained the time to pursue and the means to patronise the arts and sciences – it was in this period that those departments of human enterprise took off – as well as to further refine their tastes and manners:

The improvement of agriculture produceth a greater abundance of the necessaries of life; and excites, in the better sort of people, more attention to those pleasures and refinements of which their situation admits, and to which they are prompted by their natural appetites.[52]

As more property had been accumulated, the society had been divided into more ranks than in the barbarian state, the manners and character of men had become more refined, and their minds more developed, and thereby both society and the character of man had become still more perfected. But the most happy and most advanced state of all, civilised society, had not been realised yet.

In the feudal state, foreign trade was still only in its infancy and 'no other manufactures but those coarse and household ones which almost every private family prepares for its own use' were in existence.[53] As the manufactures began to develop, and with them the cities, where the manufacturers normally congregated, trade gained momentum, and thereby the foundation was laid for the emergence of civilised society. A steady specialisation of production brought about greater productivity, with the result that the country became steadily wealthier: The 'effects of the division of labour', Smith underscored, caused the 'greatest improvement in the productive powers of labour.'[54]

Though specialisation worked to increase productivity it was again, ultimately, the passions of man, which urged on the labourers, and the specialisation: 'Every thing in the world is purchased by labour; and our passions are the only causes of labour.'[55] It was a maxim, to be repeated innumerable times during the eighteenth century, that it was the private passions, the desire to become richer and richer, and the urge to acquire things – fashionable clothes, carriages, paintings, books, china-ware, exquisite furniture, wigs, ribbons, jewellery, curiosities, stuffed animals, exotic butterflies etc. etc. etc. – which was the fundamental cause of the emergence and the continuation of civilised society. Although such passions would have become 'rectified and swayed by reason,'[56] through the course of time – in civilised man refinement went far beyond what a savage was capable of feeling – and though civilised men's passions would often be couched under terms such as 'desire' and 'taste,' they were passions, nevertheless. It was still the human propensity to gain that made society go round.

While men 'in their rude state', due to their common vocation, had displayed a 'great uniformity of manners', in a 'civilised' state, where they would be 'engaged in a variety of

52 J. Millar, *Observations* (1771), pp. 45-6.
53 A. Smith, *Wealth of Nations* (1776/1999), vol. II, p. 281.
54 Ibid., vol. I, p. 109.
55 David Hume, *Of Commerce* (1742), partly reprinted in S. Copley, *Literature* (1984), p. 109.
56 J. Addison, *The Spectator*, Nov. 6, 1711, reprinted in G. A. Aitken, *The Spectator* (1898), p. 225.

pursuits,' they would 'tread on a larger field, and separate to a greater distance', as Ferguson stressed.[57] It was hence not only people's economic position, but also, and in close conjunction with that, their very character which differed substantially within civilised society: 'They', Ferguson said with reference to people's 'employment',

require different talents, and inspire different sentiments; and whether or not this be the cause of the preference we actually give, it is certainly reasonable to form our opinion of the rank that is due to men of certain professions and stations, from the influence of their manner of life in cultivating the powers of the mind, or in preserving the sentiments of the heart.[58]

This diversity of social groups in civilised society was highlighted in social classifications from this period. In Joseph Massie's social table from 1759 on British society – the society most often exemplifying civilised society, possibly together with ancient Greece and Rome – no less than fifty-one socio-economic groups were, for instance, listed. In a descending hierarchy, they ranged from the 'Temporal lords,' 'Spiritual lords,' 'Baronets,' Knights,' 'Esquires,' and 'Gentlemen' at the top through numerous groups of merchants, manufacturers, farmers and military men to the 'Labourers,' 'Cottagers & paupers,' and 'Vagrants' at the bottom. These fifty-one categories were subsumed under four super-taxa, defined by the use of luxury goods: 'Families which drink Tea, Coffee, or Chocolate, Morning and Afternoon,' 'Families which drink Tea or Coffee in the Morning,' 'Families which drink Tea or Coffee occasionally,' and 'Labouring Families, &c'.[59] More moderate was Daniel Defoe's sevenfold classification, offered in 1709 and also based on consumption:

1. *The Great, who live profusely*
2. *The Rich, who live plentifully*
3. *The middle Sort, who live well*
4. *The working Trade, who labour hard but feel no want*
5. *The Country people, Farmers etc., who fare indifferently*
6. *The Poor that fare hard*
7. *The Miserable that really pinch and suffer want*[60]

The contemporary social landscape might also, and would often be categorised simply in three ranks – 'Vulgar,' 'Middle sort,' 'Aristocracy' – or even just two – 'High/Low,' 'Superior/Inferior,' 'Rich/Poor.' Regardless of how the cut was made, how the ranks were labelled, and how many ranks were listed, it was absolutely certain that, just like in the description of the relationship between human societies in history, the relations between social groups would be described in terms of hierarchy. In fact, we might see the hierarchy constructed in the analysis of the progress of society replicated here in a static version as there were striking parallels between the qualities ascribed to men in different states of society in history and to different ranks within civilised society. I have already in different places

57 A. Ferguson, *An Essay* (1767/1995), p. 179.

58 Ibid., pp. 175-6.

59 P. H. Lindert and J. G. Williamson give a sketch of Massie's table, in their 'Revising England's Social Tables' (1982), pp. 394ff.

60 D. Defoe quoted in P. J. Corfield, 'Class by Name and Number' (1987), p. 50; emph. in org.

previously touched upon those qualities which marked the major social groups within Britain in contemporary analysis, so let me just recapitulate the arguments here.

At one end of civilised society's hierarchy were the labourers, peasants, servants, and journeymen, in short, the poor and vulgar, who as a result of having to work in 'mechanic vocations' neither got an opportunity nor leisure to develop their faculty of reason, nor to refine their passions and manners. In this state, reduced to taking care of the '*bare* Necessaries of Life', the vulgar, unlearned and illiterate, were, just like the savage, 'approach[ing] nearer to the *Brutal* State' than any other men.[61] As another author stated in almost similar terms, they 'approach[...] more to the Brute, or has fewer of those Qualities that exalt Mankind above other Animals'.[62] Hence, on the Great Chain of Being the vulgar in the hierarchy of ranks in civilised society came to play a role symmetrical to that of the savages in the hierarchy of societies, because the human part of this hierarchy ultimately was not defined by time, but by the two extremes of nature and culture.

At the other end of civilised society's hierarchy, was the affluent minority: the wealthy traders and merchants, the men of professions, and the aristocrats in whose hands the economic and political power were vested. As society had evolved these men had not only become rich, but their character and manners had also become increasingly civilised. 'In a civilised state every faculty of man is expanded and exercised', Gibbon stressed: His passions were refined, his taste developed, his manners civilised, and on top of that his understanding extended:

> The employments, too, in which people of some rank or fortune spend the greater part of their lives are not, like those of the common people, simple and uniform. They are almost all of them extremely complicated, and such as exercise the head more then the hands. The understandings of those who are engaged in such employments can seldom grow torpid for want of exercise. The employments of people of some rank and fortune, besides, are seldom such as harass them from morning to night. They generally have a good deal of leisure, during which they may perfect themselves in every branch either of useful or ornamental knowledge of which they may have laid the foundation, or for which they may have acquired some taste in the earlier part of life.[63]

Taken together this group of the 'superior' or 'rich' – that is to say, the middle and upper echelons –in the comparison of civilised society to the lower stages of society, came to stand for civilised society as such.

The progress of society had, then, led man further and further away from nature, recreating him as an increasingly 'artificial' being. 'Art itself is natural to man,' Ferguson observed: 'He is in some measure the artificer of his own frame, as well as his own fortune, and is destined, from the first age of his being, to invent and contrive.'[64] 'Custom,' John Taylor

61 Josiah Tucker, *The Elements of Commerce and Theory of Taxes* (1755), partly reprinted in S. Copley, *Literature* (1984), p. 116.

62 J. Richardson, *An Essay* (1725), pp. 27-8.

63 A. Smith, *Wealth of Nations* (1776/1999), vol. II, p. 371.

64 A. Ferguson, *An Essay* (1767/1995), p. 12.

noted, 'becomes second nature'.[65] In the same manner, and partly in the same terms, Lord Monboddo emphasised that 'our nature is chiefly constituted of acquired habits, and [...] we are much more creatures of custom and art than of nature':

It is a common saying, that habit (meaning custom) is a second nature. I add, that it is more powerful than the first and in a great measure destroys and absorbs the original nature: For it is the capital and distinguishing characteristic of our species, that we can *make* ourselves, as it were, over again so that the *original* nature in us can hardly be seen, and it is with the greatest difficulty that we can distinguish it from the *acquired*.[66]

'Art' and 'custom' were, of course, not equally natural to all men. In the case of the savages and vulgar, art and customs had so very far from 'absorbed' the original nature. It was only in civilised man, that man's true nature, his artificial culture, fully showed itself. It was civilised man, who acted the part of the perfect specimen in the human realm, the prototype of men, and it was his allegedly exclusive characteristics – the refined manners, the artificial character, the extended faculty of reason – which were brought to the fore when mankind was compared with the brute creation.

## Between Culture and Nature

Every type of human organisation which had developed throughout history would, then, be conceptualised as 'states of society' linked together on a hierarchical scale, ranging between the two extremes of nature and culture, respectively: savage, barbarian, feudal and civilised state of society. Nature and culture were hereby linked together in a sequential fashion with the savages and the vulgar together accounting for the link between man and the brutes.

At a number of different levels, nature and culture, however, also shared some basic features, and in a sense, it was exactly the sharing of these features, which allowed the writers to connect the natural and cultural realms in the first place. To begin with, in the analysis of the progress of society, the social thinkers relied on a few determinants – without comparison the most important of these was the propensity to gain, which was uniformly located in human nature, and uniformly seen as the agent which set the accumulation of property in motion. This process itself was also taken to evolve along a common course, introducing ranks into society and altering the character of men in similar ways regardless of where or when such alterations took place. Preconditioning a uniformity of human nature and a uniformity of historical causation, social history was represented as unfolding in a consistent and regular universe just like natural history, or maybe more accurately: both social and natural history unfolded in the *same* regular universe. Indeed, just as nature was understood to operate in a providentially ordained universe, the regularity of the human realm was explained with reference to the

65 J. Taylor, *Travels* (1799), vol. I, p. 123.
66 L. Monboddo, *Of the Origin* (1774), vol. I, pp. 24-5; emph. in org.

working of providential forces. Through the human propensities, Providence had thus in the progress of society, as Smith explained, like an 'invisible hand' worked 'to promote an end which was no part of his [man's] intention',[67] by making man gradually realise society in its most happy, that is, civilised state: 'we necessarily pursue the most effectual means for promoting the happiness of mankind, and may therefore be said, in some sense, to co-operate with the Deity, and to advance as far as in our power, the plan of Providence.'[68] Both the natural and the social order, then, were considered preconditioned, so to say, by the same providential force.

Secondly, the analogies between nature and culture went further than that. Drawing on Lévi-Strauss' theory of totemism, where the focus is directed towards the interrelations between series of natural species and series of social groups at a structural level,[69] we might at first note a striking homology between the classification of animals and the classification of men. A homology that was, indeed, made explicit in the contemporary linking of brutes and mankind on the Great Chain of Being. Although the Great Chain of Being was never positively reconstructed in the zoologists' taxonomies, the natural world was still, at least in cosmological theory, conceptualised within zoology as a hierarchy of increasingly more perfect forms of beings, just like the states of human societies, which were portrayed as progressively more perfect forms of society within social thinking. Within both domains, the terms of order were understood through the same medium of a hierarchy of perfection.

Indeed, hierarchy was understood both in the natural and social domain as the *sine qua non* of order. We have already seen how order *aka* hierarchy was contrasted with a threatening and destructive chaos in the natural domain, and we have seen how central this idea was to the zoologists' conceptualisation of species, to their understanding of the relationship between species, of œconomia naturæ, and of nature itself. A similar chain of associations, linking order to hierarchy and contrasting it with chaos, was fundamental to social analysis. By conceptualising contemporary society through a metaphor of a body or an engine, the different ranks were seen as analogous to the different body or mechanical parts: 'Man', Ferguson hence observed, 'is only a part of a whole; and the praise we think due to his virtue, is but a branch of that more general commendation we bestow on the member of a body, on the part of a fabric or engine, for being well fitted to occupy its place, and to produce its effect.'[70] Like every group in the natural world was conceived to be intimately bound up with the whole, and the whole, inversely, was seen to be dependent on every part, so also in human society. Maybe a bit

67 A. Smith, *Wealth of Nations* (1776/1999), vol. II, p. 32.

68 Adam Smith, *The Theory of Moral Sentiments* (1759), III.5.7, quoted in A. Skinner, 'Analytical Introduction' (1999), p. 24. See ibid., pp. 18-26, for a more through discussion of this point in Smith's theory.

69 C. Lévi-Strauss, *Totemism* (1964).

70 A. Ferguson, *An Essay* (1767/1995), p. 59.

ironically given the emphasis on the transformative potential of man in the analysis of the progress of societies, in portraying the hierarchy within British society, it became of prime importance that every part was kept in place for order to be maintained: 'since it is necesssary [sic] in the present constitution of things that order and distinction should be kept up in the world,' Joseph Addison thus stated,

> we should be happy if those who enjoy the upper stations in it would endeavour to surpass others in virtue as much as in rank, and by their humanity and condescension make their superiority easy and acceptable to those who are beneath them; and if, on the contrary, those who are in the meaner posts of life would consider how they may better their condition hereafter, and by a just deference and submission to their superiors, make them happy in those blessings with which Providence has thought fit to distinguish them.[71]

It was in connection with the maintenance of order within civilised society that the notion of œconomia humanæ, touched upon in Chapter 6, gained importance. In order to achieve the same ends as œconomia naturæ, namely the maintenance of an order in equilibrium, œconomia humanæ had, as we also saw, to work through different means, because man, in contrast to the animals, might be induced to act contrary to order due to his possession of self-interests and passions. In contrast to in nature, chaos was considered a real threat to human society.[72] Praising moderation and self-restraint, within the human realm the doctrine of œconomia was turned into a moral device directed towards preserving such an equilibrium as would naturally exist in the natural world. Using nature's equilibrium as an ideal for human society, the moral was brought out loud and clear in John Gay's very popular *Fables*. For instance, in this story where Jove the God had observed discontentment among the animals and called everyone together in order to learn the reason for the prevailing chaos. At first a description of the chaos:

> The lion crav'd the fox's art;
> The fox, the lion's force and heart:
> The cock implor'd the pigeon's flight,
> Whose wings were rapid, strong, and light:
> The pigeon strantg of wing depis'd
> And the cock's matchless valour priz'd:
> The fishes wish'd to graze the plain;
> The beasts, to skim beneath the main.
> Thus, envious of another's state
> Each blam'd the partial hand of Fate.

Then the antidote:

> The bird of heav'n then cry'd aloud,
> *Jove* bids disperse the murm'ring crowd;
> The god rejects your idle prayers.
> Would ye, rebellious mutineers,
> Entirely change your name and nature,
> And be the very envy'd creature?

---

71 Addison, *The Spectator* (Nov. 10, 1711), reprinted in G. A. Aitken, *The Spectator* (1898), p. 245.

72 The great concern with this threat, and analyses of the sources of a possible chaos, were recurrent themes in a variety of moral, political, and periodical writings from this period. See, for instance, Anonymous, *The Mirrour* (1759); Anonymous, *The New Oeconomy of Human Life* (1766); E. Watkinson, *An Essay upon Oeconomy* (1763).

> What, silent all, and none content!
> Be happy then, and learn content:
> Not imitate the restless mind,
> And proud ambition of mankind.[73]

The hierarchical order in society should be maintained through œconomical means similar to the hierarchic order in nature.

Although, in sum, it would be wrong to argue that the zoological conceptualisation of nature's order defined the contemporary conceptualisation of society, or vice versa, there was still a significant exchange between social and zoological analysis at the level of examples and metaphors, and, more fundamentally, a shared ground of conceptions about the order of the universe and the hierarchical nature of that order.

But at a certain point, the homologies break down. Even though the two domains might unfold in the same kind of universe, and even though they might be structurally homologous, and even continuous, from another perspective, nature also differed fundamentally from culture, particularly as culture was embodied in civilised man: We get a clear indication of the source of the difference in the very notion of the progress of society, in the possibility of the transformation of the character of man through that progress, and in the different means through which œconomia had to work in the natural and social world, respectively. In contrast to nature which was created once and for all at the beginning of time and had simply continued to 'be,' culture, as we have seen, was man-made, and always in the process of 'becoming.' In the course of history, the line of distinction between nature and culture, animals and man, had migrated, as in the progress of history man had moved increasingly further away from nature, and had become increasingly absorbed by culture.

Given vs. man-made, being vs. becoming: Ultimately, the opposition between nature and culture can be reduced in substantial terms, to an opposition between a static nature and a transformative culture. Whereas nature, as we have seen, was essentially unchanging, species having remained invariably the same since the Creation, and the individual animals, as a result of their instincts and the natural œconomic laws guiding their actions, stayed in their preordained place and through their acts of procreation, preying, destruction, and death contributed to the reproduction of the same order, whereas nature, in brief, was essentially static and its order unchanging, it was in the human nature to change. The 'propensities' in man to barter, exchange, and gain, his passions for things, his strive to develop his understanding and faculty of reason, were presented as agents of change, and as agencies in the formation of what was quintessentially human in man. In the history of human society, these propensities had ushered man into accumulating property, to dividing into ranks, to forming civil governments to protect that property, and thereby, though not necessarily with

73 J. Gay, *Fables* (1750), pp. 12-3.

his own knowledge, they had led him to form societies, which were increasingly more complex and more perfect. Man's 'emblem', Ferguson concluded, 'is a passing stream, not a stagnating pool'.[74] True, the transformative power of culture was most clearly visible at the level of individuals or societies while the stasis of nature was invariably displayed at the level of species and above. But within the animal species, no transformation of individuals or populations was observed to take place, equivalent to that which the social thinkers found in their analyses of the history of man. The progress of society would, furthermore, be seen as an elevation of the entire species, even though it did not pertain to every individual, or even every human society:

> Nature [...] we shall presume, having given to every animal its mode of existence, its dispositions and manner of life, had dealt equally with those of the human race [...]. Yet one property by which man is distinguished, had been sometimes overlooked in the account of his nature, or had only served to mislead our attention. In other classes of animals, the individual advances from infancy to age or maturity; and he attains, in the compass of a single life, to all the perfection his nature can reach: but, in the human kind, the species has a progress as well as the individual; they built in every subsequent age on foundations formerly laid; and, in a succession of years, tend to a perfection in the application of their faculties, to which the aid of long experience is required, and to which many generations must have combined their endeavours.[75]

What, ultimately, distinguished mankind from the brutes was the transformative power of his culture, then. Whereas nature remained in stasis, man had a potential for change and, as we have seen, that change took as a rule, the shape of a movement away from nature – from the brute-like man in a natural state – towards an increasingly still more artificial and cultured, and for the man of learning, as we will see shortly, even spiritual state. In substantial terms, through the progress of human history, man came to differ from the brute creation, because the brutes, encapsulated by their preordained being, remained simple matter, whereas man in his least natural and most cultured state, had remade himself. When civilised man was made to represent men in the species definition, the brutes, entirely trapped in their nature, entirely determined by their instincts, became rather an inverted reflection than a model for the human kind.[76]

## Between Spirit and Matter

In a sense, it was exactly the space thus opened up through the progress of society between nature and culture, which allowed for the study of zoology in the shape it took in the eighteenth-century British context. This is not to say that the steadily increasing influx of animals in one form or another in one way or another during the seventeenth and eighteenth

74 A. Ferguson, *An Essay* (1767/1995), p. 10.

75 Ibid.

76 Also cf. M. Bloch and J. H. Bloch, 'Women and the Dialectics of Nature' (1980), p. 31.

centuries, the circulation of them between naturalists, and the meticulous studies of them did not also contribute decisively to making eighteenth-century study of zoology possible. The networks of communication within the Republic of Letters, the engaging of sailors and travellers as collectors in the service of knowledge, the accumulation of collections of animals under private or public aegis, the itinerant showmen with their lions and elephants, bears and tigers giving the zoologists a rare glimpse of exotic animals live, the servants and slaves sent into the field at home or abroad to procure specimens, the gentlemen and their wives going hunting themselves for specimens, the zoologists' scrupulous observations, descriptions and depictions of animals, the fashioning of facts, and their notions and practices of building taxonomic systems – all these ventures did, of course, decisively help to make the study of zoology possible as an investigation based on the examination of discrete and particular matters of facts, and aimed at uncovering nature's order, however imperfectly, with taxonomic means. But it was the terms of the relationship between nature and culture with all that implied which shaped both the ontological and epistemological dimension of the zoological endeavour, which shaped the way these animals were approached, studied and understood.

During the early modern period, nature had been reconfigurated, as we have seen. The Renaissance pipeline between nature and man in the shape of Ideas had been severed, and at the same time, to the eyes of man nature had been transformed into an autonomous empirical being, an assemblage of matters of facts that were only comprehensible as physical objects. Although the zoologists themselves never articulated it in this way, it could be said that nature thereby had become objectified, or maybe more accurately: objectifiable. But it had only become so to a certain extent and only to the eyes and minds of some particular men. Nature was, as we have seen, not only seen as a material, objectifiable being. Beneath the visible surface and concealed from the gaze and understanding of man, there was an ideational order, defining the essence of visible forms. As a mondo duplex, nature was only entirely comprehensible from the perspective of angels.

Even so, certain men were in a better position than others to observe and describe matters of fact, to compare and form taxonomic systems, to understand nature and produce knowledge about it. In the course of this study, in a more fragmentary fashion, we have seen how the zoologists established an epistemologically privileged position for themselves and their study of nature, and we have seen how this epistemological positioning drew on existing socio-cultural divides in most cases. In the introductory chapter, we saw how the zoologists, as generally learned men, positioned themselves at the margins of Polite Society as gentlemen, yes, but also distinguished from other gentlemen by virtue of their learning. In Part I, we have seen how in their encounter with animals, the zoologists distanced their mode of detachedly turning them into facts from both that of the 'vulgar people' – the servants, peasants, mechanics, blacks, Indians, slaves – who at the sight of curious animals all too easily responded with inappropriate wonder, and also from that of the affluent connoisseurs, whose fetishistic pleasure was equally at odds with the course of knowledge. We have, furthermore, in Part II seen how the zoologists as they turned the facts of matter into transcendent taxonomic categories again distinguished themselves from the vulgar and, hence, just as they had established an exclusive experiential space in the fashioning of facts, also established an exclusive cognitive space for analysing them. In the light of the indigenous theory of the close relationship between socio-economic position and personality, touched upon above, the demarcation of the zoologists' space of manoeuvring vis-à-vis the vulgar comes as no surprise: That the vulgar were deemed incapable of producing acceptable knowledge – of turning matter into facts, of transcending the world of empirical matter by help of reason – was only logical given the conception of them as cognitively almost brutes. Perhaps, it is more surprising that neither all of the zoologists' socio-economic brethren in Polite Society, nor all of their socio-economic superiors of the highest echelons, were readily accepted as reliable spokesmen for reality, as we have also seen. In order to understand the zoologist's positioning within the 'civilised' part of society, and hence to understand the exclusiveness of the zoologist's epistemological position vis-à-vis nature, we will have to inquire further into the formation of that man who was able to objectify nature to the greatest possible extent; who was able to approach nearest to the perspective of the angels.

In the account of human history it was, as we have seen, civilised society which made the study of nature or, indeed, the study of anything, possible: With the accumulation of property followed that leisure, which facilitated both the development of understanding and extensive, time-consuming studies. Indeed, studying would, especially by the scholars themselves, be highlighted as the supreme sign of civilisation: 'It is by such pursuits', Richard Kentish said with reference to natural history,

> that the human intellect asserts its native dignity, and claims the ascendancy which it possesses. Every subordinate species of the animal creation acts contended in a lesser sphere, and performs the part assigned it with instinctive quietude, but man contemplates on the things wound him, surveys, examines, and admires.[77]

Through the 'ARTS and SCIENCES' Ephraim Chambers likewise explained to the King in the dedication of his *Cyclopædia* to the majesty,

> the mind is reclaimed from its native wilderness, and enriched with sentiments which lead to virtue and glory. 'Tis they, in fine, that make the difference between Your Majesty's subjects, and the Savages of Canada, or the Cape of Good Hope.[78]

Civilised society, although providing the necessary context for the pursuit of knowledge, however, did not in itself turn every man, not even those among of the civilised ranks – the middle and upper echelons – into a man who could pursue studies with credibility. Indeed,

77 R. Kentish, *An Essay on the Method* (1787), pp. 9-10.

78 E. Chambers, *Cyclopædia* (1741), vol. I, Dedication (unpaged); cap. in org.

those passions and self-interests of the middle and higher echelons which made civilised society go round were perceived by the learned to be at odds with the pursuit of knowledge, however refined they might have become. We have already in seen Chapter 4, how, for instance, George Edwards declared 'these depraved times of pleasure, sensuality and dissipation' to be in discord with the 'spirit for the promotion of learning and arts'.[79] 'Reason and appetite are', Oliver Goldsmith also observed in his *Enquiry into the Present State of Polite Learning*, 'masters of our revels in turn; and as we incline to the one, or pursue the other, we rival angels, or imitate the brutes. In the pursuit of intellectual pleasure, lies every virtue; of sensual, every vice'.[80] Whereas passions and progress could be reconciled within the sociological understanding of society, passions and knowledge could not be reconciled within the epistemological context of learning.[81]

From an epistemological point of view, the problem with giving in to pleasure and sensuality was, ultimately, that the quest for the gratification of private prerogatives and self-interests limited a man's perspective. In the words of Dr Johnson:

> I have often amused myself with thinking how different a place London is to different people. They, whose narrow minds are contracted to the consideration of some one particular pursuit, view it only through that medium. A politician thinks of it merely as the seat of government in its different departments; a grazier, as a vast market for cattle; a mercantile man, as a place where a prodigious deal of business is done upon 'Change; a dramatic enthusiast, as the grand scene of theatrical entertainments; a man of pleasure, as an assemblage of taverns, and the great emporium for ladies of easy virtue. But the intellectual man is struck with it, as comprehending the whole of human life in all its variety, the contemplation of which is inexhaustible.[82]

Civilised man might have escaped the brute passions of the vulgar and the savages, but thereby he had not automatically gained an angel's perspective. In order to understand how this perspective might be approached we must take a closer look at the formation of man as a rational being.

As a homo duplex man might be an intersection of spirit and matter, but whereas his body, like the rest of nature, was cast as a necessary point of departure, an unavoidable *presentia*, his spiritual capacity was considered to be a matter of *potentia*. 'Their operations', Ferguson said with reference to reasoning and thinking, 'alone discover them: when un-applied, they lie hid even from the person to whom they pertain.'[83] It took not only culture, but culture in the form of education to bring reason to the fore. In comparing the infant child to the brutes, Lord Monboddo explained in more detail how such education would work:

---

79 G. Edwards, *Gleanings of Natural History* (1758-64), vol. II, pp. vi-vii.

80 O. Goldsmith, 'An Enquiry' (1759/1966), p. 337.

81 And, indeed, passions and civil government were also hard to reconcile. Hence, John Brown, for instance, seeing idleness and self-interests as the primary characteristics of the highest echelons, that is of the people in government, argued in the middle of the eighteenth century that the country was in a 'miserable state', because the politicians only thought of gratifying their own interests. J. Brown, *An Estimate of the Manners* (1758), vol. I-II.

82 Samuel Johnson quoted in J. Boswell, *Life of Samuel Johnson* (1791/1999), p. 215.

83 A. Ferguson, *An Essay* (1767/1995), p. 30.

[M]an, we know, may, by education and culture continued for many years, be transformed almost into an animal of another species. Thus, with respect to his body, though he is undoubtedly by nature a terrestrial animal, yet he may be so accustomed to the water, as to become as perfectly amphibious as a seal or an otter. – And, with respect to the mind, it is impossible to say how far science and philosophy may carry it.[84]

It was through education of the mind that a man could be prepared for the pursuit of knowledge:

Of all animals capable of culture man is the most ductile. By instruction, imitation, and habit, his mind may be moulded into any form. It may be exalted by science and art to a degree of knowledge, of which the vulgar and uninformed have not the most distant conception. The reverse is melancholy. When the human mind is left to its own operations, and deprived of almost every opportunity of social information, it sinks so low, that it is nearly rivalled by the most sagacious brutes.[85]

With reason conceptualised as a *potentia* which had to be educated to surface and work, education became, at least from the scholars' perspective, the difference which made the difference between men. As Goldsmith put it:

It is this difference of pursuit, which marks the morals and characters of mankind; which lays the line between the enlightened philosopher, and the half-taught citizen; between the civil citizen and the illiterate peasant; between the law-obeying peasant, and the wandering savage of Africa, an animal less mischievous indeed, than the tyger, because endued with fewer powers of doing mischief. The man, the nation, must therefore be good, whose chiefest luxuries consist in refinement of reason[.][86]

When it came to learning, the potential for change was, again seen from the point of view of the scholars themselves, thought to be vast:

It is a calling, which being duly followed will most sever us from the vulgar sort of men, and advance us above the common pitch; endewing us with light to see farther than other men, disposing us to affect better things, and to slight those meaner objects of human desire, on which men commonly dote: freeing us from the erroneous conceits, and from the perverse affections of common people. [... I]f a man by serious study doth acquire a clear and solid judgment of things [...] he thereby becometh another kind of thing, much different from those brutish men (beasts of the people) who blindly follow the motions of their sensual appetite or the suggestions of their fancy, or their mistaken prejudice.[87]

It was the education of the mind, then, which elevated the learned above other men, and, potentially, propelled him on his way towards the angels:

there is no doubt but the human nature may, by such culture, be so exalted, as to come near to what we conceive of superior natures, and perhaps even to possess the rank of such as are immediately above us in the chain of being.[88]

On this account, the scholars, though not necessarily the richest or of aristocratic breed, had moved the furthest away from the brute creation and the nearest towards the next link on the Great Chain of Being, the angels. Although the King and the Lords would occupy the highest rank on the human hierarchy, when that was conceptualised as ranging between nature and culture, in the social thinkers' analyses, by substituting 'spirit,' or, which was the same, 'reason' with culture and bringing the angels into the picture, the men of learning constructed a somewhat different hierarchy in which it became possible for the learned to transgress the

84 L. Monboddo, *Of the Origin* (1774), vol. I, p. 22
85 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 287.
86 O. Goldsmith, 'An Enquiry' (1759/1966), p. 337.
87 I. Barrow, *Of Industry* (1693), pp. 163-4.
88 L. Monboddo, *Of the Origin* (1774), vol. I, pp. 22-3.

position of aristocratic gentlemen: '[T]his at least is worth the consideration of those who call themselves gentlemen,' John Locke thus observed,

> that however they may think credit, respect, power, and authority the concomitants of their birth and fortune, yet they will find all these still carried away from them, by men of lower condition who surpass them in knowledge. They who are blind, will always be led by those that see, or else fall into the ditch: and he is certainly the most subjected, the most enslaved, who is so in his understanding.[89]

'How many gradations may be traced between a stupid Huron, or a Hottentot, and a profound philosopher?' William Smellie asked rhetorically, also instituting the philosopher as the paragon of mankind: 'Here the distance is immense';[90] 'From this lowest degree in the Hottentot,' Soame Jenyns likewise stated after he had described the Hottentots' link to the brutes, 'reason, with the assistance of learning and science, advances, through the various stages of human understanding, which rise above each other, till in a Bacon or a Newton it attains the summit.'[91] From this perspective, the superior link on the human scale, connecting man to the angels, as Pope in *Essay on Man* also indicated became – not the king, but – the wisest of the men of learning:

> Superior being, when of late they saw,
> A mortal man unfold all nature's law,
> Admired such wisdom in an earthly shape,
> And show'd a Newton as we show an ape.[92]

Learning, then, decisively helped to widen that gap between nature and culture, between ignorant brutes and rational man, which the progress of society had at first introduced. Although the accumulation of property and the formation of civilised society certainly provided the grand framework for the eighteenth-century understanding of the progress of learning, the conceptualisation of the privileged epistemological position of the learned within civilised society relied to a very large extent on education or *Bildung*, rather than on property.[93]

In this connection, the chain of associations linking education to credibility discussed in Chapter 3, is worth remembering: 'In the pursuit of intellectual pleasures, lies every virtue,' we saw Goldsmith note above. 'A habit of observation refines our feelings,' William Smellie likewise stressed, 'It [...] prevents idle or vicious propositions, and exalts the mind to a love of

89 J. Locke, *Essay* (1706/1997), pp. 626-7/IV,xx,6; editor's note excluded.

90 W. Smellie, *The Philosophy of Natural History* (1790), vol. II, p. 431.

91 Soame Jenyns, quoted in A. O. Lovejoy, *The Great Chain of Being* (1948), p. 197. On the common use of the 'Hottentots' as idioms of the lowest link at the human scale, see W. D. Jordan, *White over Black* (1968).

92 Pope, *Essay on Man*, quoted in S. J. Gould, 'Chimp on the Chain' (1983), p. 27.

93 The use of the German concept here is intentional. As also indicated in Ch. 1, the British scholars' use of learning, rather than primarily social or institutional position, to distinguish themselves from society, closely resembles the mode of positioning of scholars of the contemporary German intelligentsia, as described by Norbert Elias: 'What legitimised this eighteenth-century middle-class intelligentsia to itself, what supplied the foundation of its self-image and pride, was situated beyond economics and politics. It existed in what was called for precisely this reason *das rein Geistige* (the purely spiritual), in books, scholarship, religion, art, philosophy, in the inner enrichment, the intellectual formation (*Bildung*) of the individual, primary through the medium of books, in the personality.' N. Elias, *The Civilising Process* (2000), p. 24; emph. in org.

virtue, and of rational entertainment.'[94] Credibility and the epistemological ability to transcend oneself and take a perspective from nowhere merged in the almost angelic position of the learned by virtue of his education, including his disciplining of the mind.

Even though as stressed in Chapter 1, there were no clearly defined, institutionalised divides between the men of learning and Polite Society, even though, indeed, the men of learning were vaguely positioned at the margins of Polite Society, with the introduction of *Bildung* as the most important agent in the creation of the naturalists' epistemologically privileged position learning was becoming visible as a separate division within civilised society, as also both Ferguson and Smith took note of.[95]

Although learning and education itself might explain the epistemologically privileged position of the zoologists from the natives' point of view, as historians, we have to go one step further. Not only the ideas of the being of the scholar, but also his actions, the whole corpus of practices which has been traced in the present work, implicitly or explicitly, helped to distinguish the learned from the rest, by framing and reinforcing the zoologists' privileged stance, at the same time as zoology was produced. As the zoologist disciplined his gaze and curbed his passions he was – in contrast to the vulgar and the connoisseurs – enabled to treat the animals as senseless matter, and this, in turn, made it possible through representational means to transform them into matters of facts, zoologically standardised working objects, both in description and depiction. Distinguishing carefully between mental image and material object – and thus again delimiting an exclusive space for knowledge production – the zoologist could work further on these matters of facts. Comparing specimens, determining similarities and differences between them, and drawing on a whole cosmology of nature's order and way of working, he was able to form species and build up an entire taxonomic scheme. In conjunction, these techniques of observation, methods of representation, and modes of transcending matters of facts contributed to establishing the epistemologically privileged position of the zoologist both vis-à-vis society, by distinguishing the zoologists socio-epistemologically, and vis-à-vis nature, by placing him in a position external to nature from where knowledge could be produced.

Even for the most learned, taking up such an external stance to nature was only possible to a certain extent. However far from nature education might have brought the zoologist, nature was never entirely objectified in their works. Not only did man, however

94 W. Smellie, *The Philosophy of Natural History* (1790), vol. I, p. vii.

95 In Smith's partly prophetic words: 'In the progress of society, philosophy or speculation becomes, like every other employment, the principal or sole trade and occupation of a particular class of citizens. Like every other employment too, it is subdivided into a great number of different branches, each of which affords occupation to a peculiar tribe or class of philosophers; and this subdivision of employment in philosophy, as well as in every other businesses, improves dexterity, and saves time.' A. Smith, *Wealth of Nations* (1776/1999) vol. I, p. 115; cf. A. Ferguson, *An Essay* (1767/1995), p. 174.

civilised and educated he might have become, also always carry nature within him – in the shape of the embodied sense organs, passions and self-interests, and the humanly imperfect reason – which impeded him from fully taking up a perspective from beyond. But neither was nature itself, from the zoologists' point of view, entirely objectifiable. As a mondo duplex, the world of observable matter concealed cardinal secrets from the vision and understanding of man – the secret of life, the defining essence of beings, the divine order of the world. In the mondo duplex, only the surface was material and hence, accessible to man; its ideational, essential dimension remained principally unobjectifiable, and some of the questions put to this nature – such as the precise nature of species and their mutual relations – remained impossible for man to answer with certainty. Striving towards the position of the angels at the margins of Polite Society in the shape of, for the present, the perfection of the human kind in history, the zoologist remained still too much of an animal himself to fully comprehend the being of species and their divine order. The nature of nature made its complete objectification impossible because the being of man impeded him from entirely escaping the nature within him.

Through the study of animals the zoologist might be enabled to describe them with factual accuracy, to compare their physical traits and to establish taxonomic systems somewhat inaccurately displaying their visible interrelations, and on the basis of these studies he might see man, and in particular civilised and educated man, reflected in the mirror of nature as the most perfect being, the Lord of terrestrial creation.

But in his need for self-discipline, for critical strategies of reading, and for remaining vague and inaccurate in his building of taxonomic systems the British empiricist zoologist would also see his own imperfections reflected in his knowledge of nature, and see his own lowly position on the universal scale of beings displayed. 'To the great Creator of an universe, of orbs behind orbs, of suns beyond suns, through all the regions of unbound space,' a writer in *Monthly Review* observed in his review of John Hill's *Essays in Natural History* , 'we, who pride ourselves as lords of this creation, may be inconsiderable as the minutest worms.'[96] From the point of view of superior beings, it seemed likely that man would appear as a mere curiosity, not unlike the way that strange animals would appear to man:

> There is no doubt, that Beings of a superior order regard him as the greatest novelty and morace of all that is new and wonderful in earth or heaven. To them it must be a spectacle equally astonishing and ludicrous, to behold a little, pert, two-legged insect, not yet emerged from its aurelia state, or near so stout and alert as many of its kindred tribes, thus, by infinite address and perpetual intrigue, flyly acquiring the sovereignty of the world.[97]

Confronted with 'orbs immeasurably great,' also learned men became, as George Edwards observed after having dedicated his fourth volume of *A Natural History* to God, no less, 'Atoms

96 *Monthly Review*, no. 7 (July, 1752), p. 62.
97 Anonymous, *Beauties of Natural History* (1777), p. 336.

of Imperfection'.[98] With both man and nature stretched out between spirit and matter, zoological knowledge came to reflect not only man's terrestrial perfections but also his cosmological shortcomings. And this point of view had consequences for the knowledge the zoologist could have about the animal kingdom, and the way he could obtain it, as I have attempted to show in the present thesis.

Although the two histories, that of the zoologists and that of zoology, can be distinguished with reference both to their objectives and results – the first concerned with the epistemological space of manoeuvring of the zoologists and resulting in the establishing of a socio-epistemologically privileged position, the second concerned with the transformation of raw nature into knowledge and resulting in the description and classification of animals – they necessarily preconditioned each other. As nature was transformed into taxonomic knowledge in practice, the zoologist positioned himself epistemologically; as the zoologist from his epistemologically privileged position approached nature in practice, he was enabled to turn nature into knowledge of a particular kind. In the structuring practices, self and world were fashioned in tandem, and came to make sense from the same point of view.

## The End of Natural History's Zoology

Zoology in the natural history shape it had taken during the long eighteenth century did not, like neither the Renaissance mode of study had done, disappear from one day to another, or even from one decade to the next. The natural history study of animals, as a study of animals' perceptible traits, of species as static self-reproducing groups, defined by an ideational essence in an unchanging universe and classifiable in a taxonomy, lingered on for decades to come. Indeed, Charles Darwin could, without exaggeration, note in introduction to *The Origin of Species* in 1859 that, 'Until recently the great majority of naturalists believed that species were immutable productions, and had been separately created.'[99] Although most naturalists became more specialised in their field of study, many of them basically continued the work of their eighteenth-century predecessors well into the nineteenth century. But not only were such natural history studies of animals increasingly relegated to the margins of science, as it were to become, during the first half of the nineteenth century. As new approaches to the study of living beings emerged at the turn of the nineteenth-century – 1775 till 1825 are often given as

98 G. Edwards, *A Natural History of Birds* (1743-51), vol. iv, Preface (unpaged).

99 C. Darwin, *Origin of Species* (1859/1979), p. 53. See also P. F. Stevens, 'Metaphors and Typology' (1984) for a discussion of conceptual continuities in, especially, botanical classification, and G. McOuat, 'Cataloguing Power' (2001), for a discussion of the species concept, and the battles over it, at the British Museum in the nineteenth-century.

the dates of the transformation of the field[100] – new modes of investigation also came into being, new fields of investigation were opened up, new kinds of questions posed, and the conception of nature, the position of the scientist, as he soon became, and the study of nature were gradually reconfigured once again. This is not the place to trace those changes in depth, but let me, nevertheless, indicate more tentatively some of the major transformations which occurred during the first half of the nineteenth century both in the positioning of the naturalist and in their understanding and approach to nature, if only to account for the end of that type of zoological investigation which has been studied in the present thesis.[101]

At a first glance, the studies of nature emerging in the nineteenth century appear to have been characterised by an exuberant diversification. In contrast to natural history, which had presented a rather unified field for the study of nature, and in contrast to the zoologists who to a very large extent, as we have seen, were engaged in exploring the same kinds of questions, the study of nature became increasingly specialised as the nineteenth century progressed. An abundance of new disciplines arouse, each defined in some measure by their own distinct interests, their own methods of study, their own horizons; and new, specialised societies and journals come into existence, reflecting the new trends and interests in the research. This very diversification and specialisation can in itself be read as one sign of the field transformed. Not only did such specialisation, as we will see, allow the scientists to pursue their studies in new ways, but in some measure, it also indicated the coming into being of a new institutional setting for the pursuit of science. Though happening later in Britain than, in particular, in France and Germany, the new natural sciences were incorporated into the universities, especially from the 1830s onward. By the final decades of the nineteenth century, science had become a vocation everywhere,[102] and the education of the future scientist had been removed from the more vague terrain of *Bildung* to a well-defined university training.[103] By then, Ferguson and Smith's vision of establishing a special profession for the study of science had to a large extent been realised. In the process of institutionalisation, the 'right to control of the exercise' of studies was increasingly removed from the amorphous Republic of

100 Both Michel Foucault in *The Order of Things* (1970), p. 221, and, following him, Wolf Lepenies in *Das Ende der Naturgeschichte* (1976), p. 16, give this half century as the timeframe for the transformation of natural history into biology. Both, however, focus in their studies mainly on changes in a French and German context, where the new approaches were developed and more generally embraced earlier than in Britain; neither do any of these authors consider the continuation of the tradition of natural history studies. Though what they term biology, would certainly constitute the centre of the studies of animals and plants from the 1830s onward, also in Britain, it did not entirely conquer the field until much later.

101 The following outline will mainly be based on W. Lepenies, *Das Ende der Naturgeschichte* (1976); idem., 'De l'histoire naturelle à l'histoire de la nature' (1979); P. L. Farber, *Finding Order in Nature* (2000); W. Coleman, 'Llyell and the 'Reality' of Species' (1962); idem., *Biology in the Nineteenth Century* (1971); M. P. Winsor, *Starfish, Jellyfish* (1976); E. Mayr, *The Growth of Biological Thought* (1982).

102 As Max Weber puts it in his 'Science as a Vocation' (1970).

103 See E. Mendelsohn, 'The Emergence of Science' (1964), and J. Ben-David, *The Scientist's Role in Society* (1971), for a discussion of the professionalisation of science and the different tempi it took in different European countries.

Letters and learned societies, to a well-defined institutional setting and 'vested in the profession itself', as Joseph Ben-David has observed.[104] Even though the modes of 'control of the exercise' thereby did not necessarily become more transparent, the very idea of science as an autonomous field helped to position the scientist and validate his claims to truth. In contrast to the eighteenth-century naturalists, who had socio-epistemologically demarcating their space of manoeuvring through comparisons with the ignorant vulgar and the partially blinded sensual men of Polite Society, and cosmologically through comparisons with animals and angels, in the basic demarcation of his space of manoeuvring, the scientist of the late nineteenth-century relied on a more simple distinction between science and non-science: the world of the universities and the rest. Science was becoming enclosed, and to a greater extent the scientist's claim to truth would be defined by parameters shaped, implicitly or explicitly, within the boundaries of that enclosure. However, in Britain it would take the whole of the nineteenth century these borders to consolidate. It is worth recalling here, that Darwin, for instance, was a man of independent means who, although having been educated at universities, did not write *The Origin of Species* as a university scientist. Though science was closing in on itself, until the end of the nineteenth century, there was no necessary contradiction between being an 'amateur' and being a 'scientist.' The gradual professionalisation of science helped to augment its specialisation, however there was no simple relation between professionalisation and specialisation, and the institutional setting of nineteenth-century science might best be characterised as a mixture of the older tradition of Learned Societies, the Republic of Letters and, with increasing force, the universities.

If we turn to the studies pursued within this complex institutional setting, although they appear confusingly diversified at a first glance, it is still possible to find unifying themes at both an empirical and an explanatory level. Empirically, we might identify two general trends, breaking with the main concern of the eighteenth-century naturalists with physical, perceptible characteristics of living beings: one, as Foucault has pointed out,[105] opening up an internal space for study, the other an external space. In the following, I shall review these two general trends in turn in order to indicate the changes taking place in the conceptionalisation of both living beings and nature during the first half of the nineteenth century. Continuing my history of classification in European thought, my primary focus will be on those changes, which paved the way for evolutionary theory, and I shall end with a discussion of Darwin, and his idea of species, higher-level taxa and natural classification.

The internal space was mainly investigated in physiological studies, and in close connection with this – the two terms were virtually synonymous in the nineteenth-century[106] –

104 Idem., 'The Profession of Science' (1972), p. 363.
105 M. Foucault, *The Order of Things* (1970), esp. pp. 263ff.
106 W. Coleman, *Biology in the Nineteenth Century* (1971), p. 18.

anatomical studies. The main interest of physiology lay in the investigation of the vital functions of the 'organism,' as living beings would be known as, and when coupled with anatomy, in the examination of the relationship between the structure of the organs and their functions. Though we might find antecedents for such physiological investigations in an embryonic form in some late eighteenth-century British studies, and especially in the work on animal œconomia by John Hunter,[107] it was in the writings of George Cuvier that the conception of an animal as a functional whole, as an organism, was first most forcibly given shape.

As is well known, Cuvier's main thesis was that an animal constitutes a functional unit whose anatomy is determined by its relationship to its 'conditions of existence,' by which was meant that the anatomy of an animal was predicated upon its overall relationship to its general place in nature. 'The carnivore', as Coleman sums up Cuvier's argument was, for instance, 'perfectly constructed for his place in the economy of nature. Keen senses, great speed, and fearsome claws and teeth were nicely suited to the pursuit, capture, and consumption of animal prey. The carnivore was created to fill such a role and thereby his construction and behaviour determined.'[108] There was nothing new in this idea in itself. Indeed, we can see this idea as an elaboration of the eighteenth-century zoologists' conception of the divinely ordained construction of animals to occupy every place in nature, which I touched upon in Chapter 6. But whereas this adaptionistic perspective only played a secondary role in the eighteenth-century zoologists' explanation of the œconomy of nature, in the writings of Cuvier, as well as in many of his contemporaries', it was brought to the fore. And it was, moreover and more crucially, coupled here with the new conception of the animal as a functional unit. Approaching the different anatomical parts of an animal as interrelated and interdependent, the animal was transformed into a functionally defined entity whose individual parts could not be understood and described independently. The idea of function had altered the conception of form.

With this conception of the animal as a functional whole, the animal was turned into an organism. No longer to be understood as an assemblage of morphological and anatomical traits, the organisation of the particular assembly of traits was in itself to become crucial, and the particular relations between form and function to be investigated in increasingly diversified physiological fields. Although most of the physiological studies of the nineteenth century, in contrast to Cuvier, did not take the entire animal (or man or plant) as its object, but merely a more restricted part of it – the digestive system, the respiratory system, cell structure etc. – they were generally based on the same conception of the animal (or plant) as an

107 See, especially, Stephen Cross's convincing argument for this in S. J. Cross, 'John Hunter' (1981), esp. pp. 28ff.
108 W. Coleman, *Biology in the Nineteenth Century* (1971), p. 18.

integrated organism. As Henry Huxley said in common terms, organisms were 'living machines in action',[109] and as J. S. Henslow specified, it was now 'the construction of the machinery by means of which life is enabled to act, and to produce its effect' which lay at the core of the physiological investigations.[110]

As is indicated in Henslow's statement, the transformation of animals and plants into organisms allowed the scientists to pursue a new set of questions, all centring on the grand question of life. 'Physiology' became, as Coleman concludes, 'the science whose special responsibility it is to study functions, the separate vital mechanisms of the organism as well as their collective effect, life itself.'[111] By reshaping the focus, and by redefining animals and plants as organisms, it hence, became possible to address that question of life, which had been, principally, inscrutable to the eighteenth-century zoologist. The 'object of our researches is physical life,' Treviranus hence observed, 'The first step towards meeting that objective must therefore be to answer the question, What is life? But just this question is the most difficult of all to answer.'[112]

Answers to this question were sought within numerous specialised studies of the organism and its vital functions. The sites of respiration, the interrelations between, and the respiratory functions of lungs or gills, the blood and heart were investigated, and the cardiac movement and blood flow were explored. The complex production of heat and energy within the body would be examined in studies of how food was transformed to energy, how it was carried around and transmitted to the muscles, and how metabolism worked. Coupling physiological studies with chemistry, the study of the chemistry of foodstuff was initiated – by 1854 food would be divided into carbohydrate, fat, and protein, and the levels of energy in different kinds of foodstuff would be counted in joules and tabulated – and the chemistry of digestion would enter into the physiological studies. The nervous transmissions and the glandular secretion would gain increasing attention, and so would studies of embryological development and of the structure of cells.

Within these specialised physiological studies, two fields in particular are of interest to us here because they entailed a redefinition of living beings and became of importance in classification: cellular and embryological studies, respectively. Starting with Xávier Bichat's studies of the tissue of pathological organs in the first decade of the nineteenth century, and acquiring a sharp expression in cellular studies in the 1840s, the organism was resolved into small, constitutional parts – 'tissue' in the words of Bichat and many of his contemporaries, and in later studies 'cells' and its parts – 'nucleus,' 'membrane,' 'cytoplasm,' and, designated in

109 Henry Huxley, quoted in ibid., p. 143.
110 J. S. Henslow, quoted in P. R. Sloan, 'Darwin, Vital Matter' (1986), p. 376.
111 W. Coleman, *Biology in the Nineteenth Century* (1971), p. 144.
112 Treviranus, quoted in ibid., p. 12

1888, 'chromosomes.' Facilitated by technological improvements of the microscope, cellular physiology would gain increasing importance in the search for an answer to the question of 'what is life,' as, in the words of the German physician and cellular pathologist Rudolf Virchow, the cell came to be seen as 'the last constant link in the great chain of mutually subordinated formations that form tissues, organs, systems, the individual.'[113] By the middle of the century, the cell had become the essential structural unit in the organism, and the body could now be understood and studied, as Farber says, as an 'organised system of cells,' where the vital functions could be related to 'chemical reactions occurring in cells.'[114]

What is of crucial importance for the reconfiguration of the study of nature – for that field which only towards the end of the nineteenth-century was to become known as 'biology'[115] – was that at a cellular level, there was no significant distinction between plants and animals. The structure and formation of cells was found to be parallel in plants and animals, and the cell thus came to provide a unifying ground for the study of all living organisms. The previous distinction between mineral, vegetable, and animal kingdom, and as a result between mineralogy, botany, and zoology, was superseded by a distinction between inorganic and organic matter, with life now becoming the distinguishing criteria. A further consequence of this redefinition of the field of study was that also man could now be included unproblematically into the field of study. As a biological being, just like the plants and animals, composed of cells upon cells man, in principle, did not differ from other living organisms. Although civil history and sociological studies would not thereby necessarily be subsumed into the life sciences, the inclusion of man into the field of organic matter, nevertheless, opened up new avenues for the biological study of man, and the differences between men. It was, of course, during the latter part of the nineteenth century, following this redefinition of man as an organic being, that phrenology, craniology, anthropometrics, etc. came into being.[116]

Within cellular studies special attention was given to generation, the constitution of the eggs and sperm in animals and their fusion and multiplication in the production of new individuals, and as the nineteenth century progressed, these studies were to influence the second branch of physiology I would like to call attention to here, namely embryology. Long before the embryo would be studied at a cellular level from the middle of the nineteenth century, at first, developed through more traditional physiological means, embryology had gained importance within the life science. In studies of the development of individual embryos, and comparative studies of different species of embryos, the developmental stages of

113 Rudolf Virchow, quoted in ibid., p. 32.

114 P. L. Farber, *Finding Order in Nature* (2000), p. 78.

115 On the emergence and slow acceptance of 'biology' as a general designation for the life science, see J. A. Caron, ''Biology' in the Life Sciences' (1988).

116 For a discussion of these new natural scientific approaches and their implications for the conceptualisation of man, see S. J. Gould, *The Mismeasure of Man* (1981).

organisms were examined. Embryological studies are especially of interest to us here because they influenced taxonomic classification in two ways. Firstly, as Karl Ernst von Baer argued in the 1820s, the comparative embryological studies could assist the taxonomist in distinguishing characters that adult individuals truly had in common – as these would develop from the same embryological parts – from random similarities, which would originate from different embryological parts. More specifically, it was argued that individuals sharing structural similarities for a long period of time in their embryological development would be closely related taxonomically.

Secondly, the studies of embryological development might, but would in the first half of the nineteenth-century not necessarily be related to proto-evolutionary theories of the development of species. Most clearly formulated in the 'recapitulation doctrine,' as designated in the 1820s, it was argued that the individual development of an embryo recapitulated the progressive developmental stages of the adult forms; that ontogeny reflected phylogeny. In the words of Johann Friedrich Meckel:

The development of the individual organism obeys the same laws as the development of the whole animal series; that is to say, the higher animal, in its gradual evolution, essentially passes through the permanent organic stages which lie below it.[117]

I shall consider the full implications of this doctrine for the classification of organisms when I turn to the theory of Darwin. For now, it suffices to observe that with the emergence of embryological studies, the adult, perfect animal was no longer a natural and obvious prototype for the species as such. Bringing the development of the individual organism into focus facilitated a redefinition of the differences that made a difference within taxonomic classification. The organism was now not only to be understood as a 'whole' in a functional sense, but also in a developmental sense.

Before pursuing the implications of this reconceptualisation of animals and plants as organisms for the classification of both, especially in the writings of Darwin, let me first take note of the other general trend in nineteenth-century studies of nature: the inquiries into the external space of the relationship between an organism and its environment. We have already seen above how Cuvier, drawing on an older, more marginal tradition, gave attention to the general relationship between an organism and its 'condition of existence.' More specialised studies of local flora and fauna, such as Edward Bancroft's on South American Guiana, Gilbert White's study on Selborne, Thomas Pennant's on Britain, Hindustan, and Arctic respectively, had also been pursued, especially during the second half of the eighteenth century. However, in general, these would be carried out without any attempt being made to explain the existence of particular plants and animals in relation to the local environment. From the final decades of the eighteenth century onwards, what we might term bio-geographical studies were pursued

117 J. F. Meckel, quoted in W. Coleman, *Biology in the Nineteenth Century* (1971), p. 50.

more systematically, gaining force not least through the studies of Alexander von Humboldt. Regional patterns of distribution of animals and plants were described and related to the special environmental conditions of their life – the quality of the earth, the climate, altitude, moisture, geographical location etc. The question of the conditions of possibility of life was thereby also pursued in environmental terms. As Lyell explained in 1832:

> The possibility of the existence of a certain species in a given locality or of it thriving more or less therein, is determined not merely by temperatures, humidity, soil, elevation, or other circumstances of the like kind, but also by the existence or non-existence, the abundance or scarcity of a particular assemblage of other plants and animals.[118]

Such bio-geographical studies helped to undermine the status of the transcendent Great Chain of Being as the primary point of reference for understanding living beings, by siuating animals and plants in a historically and geographically specific and specified nature: New and observable relations between animals and plants, cutting through their eighteenth-century taxonomic relations, gained an unprecedented importance. In some accounts, the bio-geographical patterns were, furthermore, linked to theories of adaptation and, through adaptation, to a transformation of species. While neither Cuvier nor Lyell's accounts were amongst these – both authors adhered to a static conception of nature and both stressed the immutable nature of species[119] – Buffon had already foreshadowed the doctrine of transformation through adaptation with his claim that the species of the New World were degenerated species of the Old World. This theory was to be more fully elaborated by Lamarck, and later, after the doctrine had been further transformed during the first half of the nineteenth century, it was incorporated into the evolutionary theory of Darwin. Indeed, it was with a reference to Buffon's theory of the transformation of species, and Lamarck's idea of the modification of species, that Darwin opened his introductory 'Historical Sketch' in *The Origin of Species*.

Darwin's *The Origin of Species* has often been described as a synthesis of nineteenth-century biological studies. And this is not incorrect in the double sense that Darwin both united the two major trends, which have been outlined above, in his theory of evolution, and that Darwin, furthermore, gave a coherent explanation to an overwhelming mass of those matters which had been established as facts through the studies of physiology and bio-geography, as well as, as we will see, through palaeontological and geological studies by the middle of the century.[120]

118 Lyell, quoted in ibid., p. 68.

119 Lyell only doing so, however, until the publication of *The Origin of Species*; on his species concept, see W. Coleman, 'Llyell and the 'Reality' of Species' (1962).

120 In the following account, I shall omit the historical complications brought about by Alfred Russel Wallace's formulation of a theory of evolution simultaneously with Darwin, and simply treat Darwin as a metonym for – as well as an important contributor to – the transformation of the conception of nature which took place in the middle of the seventeenth century and dealt a final deathblow to the natural history conception of nature. For a

As we saw Darwin take note of earlier, by 1859, there were still naturalists who, despite the new focus in biological research, continued to believe in the immutability of species. In his first two chapters, drawing on numerous studies already made, as well as on his own observations made both on his voyage with the Beagle and, later, on experiments with breeding of domesticated animals and plants, Darwin set out to show that numerous variations between individual specimens could be observed. Highlighting all those variations which had been backgrounded by the natural historians in their search for such common characteristics which could be used to unite individuals in a species, Darwin argued that it was impossible to determine the difference which made the difference between varieties of species: 'the amount of difference considered necessary to give to two forms the rank of species is quite indefinite.'[121] Indeed, and a bit ironically given the title of the work, Darwin found it 'immaterial for us whether a multitude of doubtful forms be called species or sub-species or varieties.'[122]

It was, of course, exactly these individual variations that were to make the basis for Darwin's claim of 'modification through descent.' Referring to T. R. Malthus' calculation of 'a geometrical ratio' of increase in human populations,[123] Darwin argued that similar geometrical ratios could be found among all organisms, and hence that there would be a continuous over-production, so to say, of plants and animals. Consequently, each individual would have to 'struggle for existence' – to fight against other individuals in its locality in order to survive. In this struggle, any variation in the individual, which gave it an advantage over other organisms, would help to ensure its survival:

> Owing to this struggle for life, any variation, however slight and from whatever cause proceeding, if it be in any degree profitable to an individual of any species, in its infinitely complex relations to other organic beings and to external nature, will tend to the preservation of that individual, and will generally be inherited by its offspring. The offspring also, will thus have a better chance of surviving, for, of the many individuals of any species which are periodically born, but a small number can survive.[124]

Now, the eighteenth-century naturalists had also, as we have seen, observed that there was a 'perpetual war' going on in nature. However, in contrast to Darwin, their war was waged under providentially instituted, and thus also partly inexplicable œconomical laws, which ensured the continuation of the same order of species. By seeing the war as a struggle for existence, simply brought about by an inevitable over-production of individuals, and by relating the organisms to their complex environmental context of 'other organic beings and external nature' Darwin could give an entirely different explanation to the logic of war. In his

---

more thorough treatment of the coming into being of the theory of evolution, see P. R. Sloan, 'Darwin, Vital Matter' (1986); T. H. Eriksen, *Charles Darwin* (2000); D. Ospovat, *The Development of Darwin's Theory* (1981).

121 C. Darwin, *Origin of Species* (1859/1979), p. 113.

122 Ibid., p. 114.

123 Ibid., p. 118. Cf. T. R. Malthus, *An Essay* (1803/1992), Ch. 1, esp. p. 17.

124 C. Darwin, *Origin of Species* (1859/1979), p. 115.

scheme, what determined the course of the war was 'natural selection': Only those varieties best fitted, as Herbert Spencer was later to put the matter, to the overall environment survived.

As we saw Darwin note above, the individual variations that would thus have helped an individual to survive in the struggle for life tended to be inherited by its offspring, and it was in this observation that the basis for Darwin's explanation of the origin and development of species lay. Drawing especially on geological studies, Darwin, like many other authors in the first half of the nineteenth century, argued that the earth was much older than the 5700-some years the eighteenth-century naturalists had taken for granted – tentatively Darwin suggested 3 millions years.[125] By this extension of world history, Darwin was enabled to give a historical explanation to the origin of species. Through generation after generation, thousands or tens of thousands such, the variations would accumulate in a given group of organisms, and this group would gradually come to differ so much from its progenitor that it would form a new species. The same process would repeat itself with regard to offspring of the same original species with varying results because different variations would be selected in different environmental contexts, and consequently, an array of divergent, but related species would be formed which would agree in some measure in their structure because they originated from the same parent. The group of such related species was what was commonly known as a genus. The same process would repeat itself over time with regard to the species of this genus, whereby an array of new species and of new genera would gradually be created, and so on. The relations of resemblance in structure between taxa were, then, genealogically determined: 'that fundamental agreement in structure, which we see in organic beings of the same type [...] is explained by unity of descent.'[126] Ultimately, Darwin argued, it was likely that all organisms on the earth had thus descended from only one organism.[127]

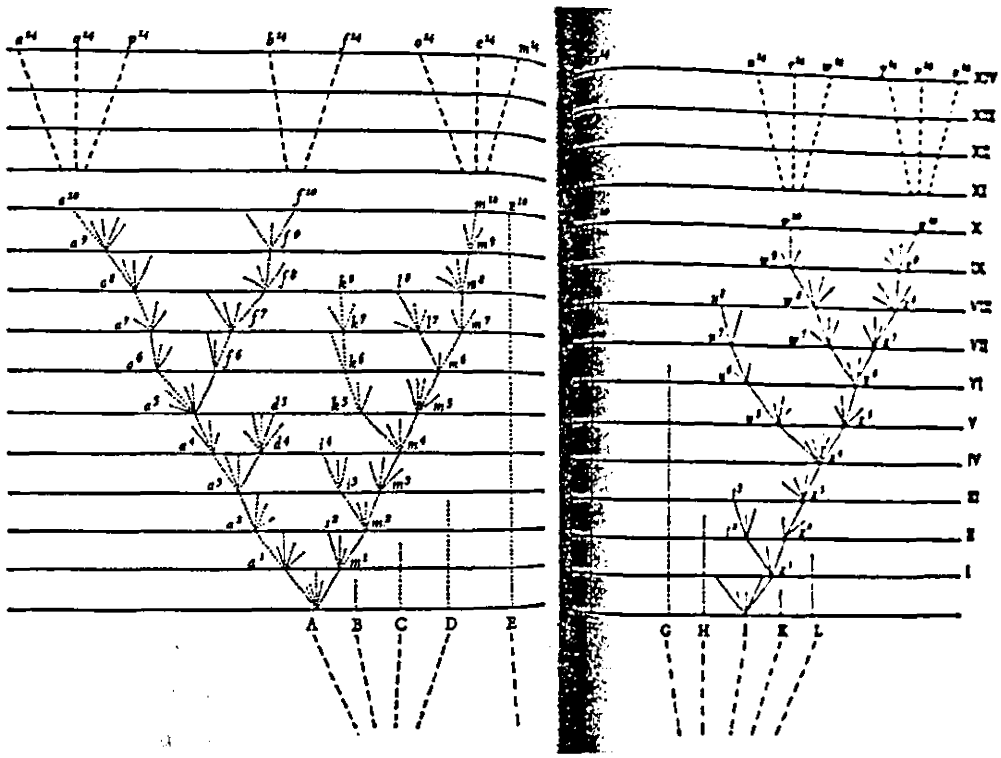
It was, however, not possible to actually show this genealogy of species. In the struggle for existence, many species would have become extinct and the traces of their genealogical relations would have been to some extent erased with them. Hence, the organisms to be observed at Darwin's time only constituted a minor selection of the total number of species, which had existed. Through the study of fossils, now taken to represent extinct species, within palaeontology, and through the help of embryological studies of the embryo's recapitulation of phylogeny through its development, Darwin was, however, enabled to fill in some of the

---

125 Ibid., p. 297, cf. pp. 291-7. As Wolf Lepenies has argued, already in the latter decades of the eighteenth century ideas of the earth having a much longer history than usually assumed had already emerged, most notably voiced by Buffon who argued in his late works for an age of ca. 180,000 years. The tendency to prolong the age of the earth was further intensified during the first half of the nineteenth century, especially in geological studies. On the transformation of the idea of the age of the earth, see W. Lepenies, *Das Ende der Naturgeschichte* (1976), esp. chs. 1, 6 and 7. On geology's contribution to this transformation, see also C. C. Gillespie, *Genesis and Geology* (1969).

126 C. Darwin, *Origin of Species* (1859/1979), p. 233.

127 Ibid., p. 455.



Ill. 8.3 DARWIN'S DIAGRAM OF THE DECENT OF SPECIES (C. Dawrin, *The Origin of Species*, 1859/1979)

missing links in the genealogical tree. Incomplete as the genealogical reconstruction might have been, Darwin felt certain that his theory successfully explained the nature of the similarities and differences between taxa (in the wake of the publication of *The Origin* a lot of other, though far from all students of the life science came to agree with him on this point[128]):

[T]he natural system [in classification] is founded on descent with modification; [and] the characters which naturalists consider as showing true affinity between any two or more species, are those which have been inherited from a common parent, and, in so far, all true classification is genealogical; [and the] community of descent is the hidden bound which naturalists have been unconsciously seeking, and not some unknown plan of creation, or the enunciation of general propositions, and the mere putting together and separating objects more or less alike.[129]

At a structural level, the similarities between the classificatory schemes of Darwin and the eighteenth-century zoologists are striking, both branching out alike into a tree structure (see Ill. 8.3). But at a conceptual and explanatory level, it was an entirely different kind of nature, and an entirely different kind of species, that Darwin presumed to exist. Substituting the unknowable essences and the divine Plan with a historical account of modification through descent as the *raison d'être* of the taxonomic relations, Darwin had, in principle, made nature and the processes it was produced by entirely explicable, also from the point of view of man. Being emptied of its divine content, nature had become entirely natural, so to say.

The process that had been under way since the final decades of the eighteenth century of transforming natural history into a history of nature, as Wolf Lepenies has termed it, has here fully conquered the mode of explanation. The idea of a transformation over time, which had only been thinkable within human history for the better part of the eighteenth century, and here only in a limited form and linked to an idea of an eternal human nature, was – with the widening of the time span of the earth's history, with the idea of a struggle for life and of the survival of the fittest, with the idea of variations as hereditary, and with the idea of the mutability of species – offered as *the* explanation. The transformation of natural history to a history of nature, we might say, opened up entirely new ways of explaining and understanding nature, and, more specifically, for understanding and explaining those patterns of similarities and differences between different groups of animals and plants which had been portrayed in the natural historians' works as, ultimately, the product of a divine intelligence, to be represented in a static transcendental scheme. Darwin himself indicated the differences between his approach and that of the natural historians, underscoring that his theory of evolution would cause 'a considerable revolution in natural history', because what previously had been taken as inexplicable essences, defining the nature of species, could now be explained by descent:

Systematists will be able to pursue their labours as at present; but they will not be incessantly haunted by the shadowy doubt whether this or that form be in essence a species. [...] Systematists will have only to decide (not that

128 On the reception of Darwin's evolutionary theory, see T. H. Eriksen, *Charles Darwin* (2000), pp. 144ff.
129 C. Darwin, *Origin of Species* (1859/1979), p. 404.

this will be easy) whether any form be sufficiently constant and distinct from other forms, to be capable of definition; and if definable, whether the differences be sufficiently important to deserve a specific name.[130]

Indeed, the natural historians' references to 'essences,' to a 'plan of creation,' or 'unity of design' in order to account for the existence of structural patterns in the world of living beings, would now be seen as mere 'ignorance'.[131] What the natural historians had thought to be inexplicable because it was divinely instituted and thus beyond the comprehension of man was, Darwin concluded, entirely explainable if only one took the work of evolution into account. It was in thus explaining his new approach to living beings that Darwin in the passage quoted in part at the beginning of this thesis, compared the eighteenth-century natural historians to savages looking at a ship:

When we no longer look at an organic being as a savage looks at a ship, as at something wholly beyond comprehension; when we regard every production of nature as one which has had a history; when we contemplate every complex structure and instinct as the summing up of many contrivances, each useful to the possessor [...]; when we thus view each organic being, how far more interesting, I speak from experience, will the study of natural history become![132]

In a sense, the topics that had been placed outside the reach of man by the natural historians during the eighteenth century – the nature of species, the precise nature and structure of their interrelations, the question of life – were brought to the centre of scientific inquiry during the nineteenth century. If we return to the figure of the Great Unknown and the line of distinction between what man, in principle, could obtain knowledge about, and what was situated beyond his reach, which had played such a significant role in eighteenth-century zoology, we might say that the line of distinction was vanishing during the nineteenth century. God might still loom in the background – for instance, it was still hard to explain the creation of the earth itself, regardless of when that might have taken place, and the coming into being of the first organism from which all the rest descended, without taking a divine creator into account. However, God and his inexplicable actions were being pushed to the background. Not only the observable part of nature, but also the forces and processes by which it came into being had become objectifiable through the course of the first half of the nineteenth century because they had been redefined, at the same time as nature had been reconceptualised as nothing but nature. Thereby it had become possible to open up new avenues and pose new types of questions in the studies of nature – the most important and leading of these being, of course, 'what is life?' Though there certainly was a lot of things about nature that the scientists on their own account did still not know – Darwin himself frequently pointed out such blind spots in the course of his work – they were no longer referred to a Great and in principle Unknown, but to the inquiries of future studies. By opening up both an internal and external space for inquiry and by introducing historical and functional explanation as the guiding modes of elucidation,

130 Ibid., p. 455.
131 Ibid., p. 453.
132 Ibid., p. 456.

the nature of nature had been redefined in such a way that it, in principle, became entirely 'knowable.' At the same time, the premises of knowledge about nature had, of course, also changed. To their nineteenth-century descendants the zoologists of the eighteenth century might have appeared like savages looking at a ship for the first time, which they could not comprehend. However, this image only becomes possible if one fails to acknowledge the fundamentally different kind of nature, ranged between spirit and matter, between the divine and the material, between the non-objectifiable and the objectifiable, between the unknowable and the knowable, which the zoologists of the eighteenth century had pursued their studies within. As I have attempted to show in the present thesis, their endeavour made perfectly good sense, even though it did so from a point of view differing from both Darwin's and ours.

# Bibliography

## PRIMARY LITERATURE

### Manuscript Sources


Albin, Eleazar. 19 January 1711 - 5 January 17?? Letters to James Petiver. British Library, Sloane 4,065, ff. 15, 75; Sloane 4,066, f. 254.

Arderon, William. 1745-1760. Manuscript Remains. British Library, Add. 27,966, ff. 24-188.

_____. 12-16 December 1745. Letters to Henry Baker. Royal Society, London, L&P.I.433, 435.

B., W. 13 March 1745/6. Letter to Martin Folkes. Royal Society, London, L&P.I.466.

Badenach, James. 10 May 1769 - 8 July 1771. Letters to John Ellis. Linnean Society, London, Ellis Correspondence, vol. I.14-17.

Baker, Henry. 17 April 1760. Letter to Dr. Birch. Royal Society, London, L&P.IV.5.

Baster, Job. 1757. Observations upon Corallines and the Polyps that adhere to them, with other Marine Animalcula; presented to the Royal Society of London by Job Baster. Royal Society, London, L&P.III.247.

Blair, Patrick. 10 September 1705 – 17 February 1707. Letters to Hans Sloane. British Library, Sloane 4,040, ff. 66, 90, 92, 150, 169, 174, 270, 310.

_____. 1708. [Account of the Dissection of a Seal]. British Library, Sloane 3,812, ff. 60-4.

_____. 15 March 1712. Letter to Hans Sloane (?). British Library, Sloane 3,812, f. 69.

_____. 31 March 1712. Letter to Hans Sloane. Royal Society, London, LBO.supp.2.211.

_____. 1724. Dedication of his Phytozoo ... to Hans Sloane. British Library, Sloane 4,020, ff. 6-15.

_____. 28 March 1726 - 9 May 1726. Letters to Dr. Turin. Royal Society, London, LBC.18.301, 328.

_____. n.d. The Explanation of the Figures of a Porpoise. British Library, Sloane 4,025, ff. 45-48.

_____. n.d. Stenographia Elephantina. A full and exact Description of all the Bones of an Elephant which Died near Dundee April 27, 1706 with their several Dimensions. British Library, Sloane 3,812, ff. 1-59.

Borlase, Rev. William. 15 February 1752 - 22 February 1764. Letters to John Ellis. Linnean Society, London, Ellis Correspondence, vol.I.28-41.

British Museum. Directions Respecting the Reading Room of the British Museum, 17??, British Library, Add. 36,269, f. 193.

_____. Regulations for General Admission into the British Museum, 17??, British Library, Add. 36,269, f. 194.

Brownrigg, William. 15 June 1753 - 26 December 1771. Letters to John Ellis. Linnean Society, London, Ellis Correspondence, vol. I.46-57.

Canvane, Dr. Peter. 1 December 1766. Letter to Emanuel Mendes da Costa. British Library, Add. 28.536.

Catesby, Mark. 5 May 1722 - 10 January 1724/5. Letters to William Sherard. Royal Society, London, Sh.163-184.

_____. 10 May 1723 - 5 January 1724/5. Letters to Hans Sloane. British Library, Sloane 4,046, ff. 352-3; Sloane 4,047, ff. 90, 147, 213, 290.

_____. n.d. [Drawings of Insects]. British Library, Add. 5,271, 5,267, 5,283.

Cook, Dr. John. 11 July 1744. Letter to Dr. Sanches. Royal Society, London, L&P.I.438.

Costa, Emanuel Mendes da. 5 July 1746 - 16 February 1779. Letters to Dr. John Fothergill. British Library, Add. 28,537, ff. 121-160.

______. 4 February 1756. Letter to the Lord Chancellor. British Library, Add. 36,269, ff. 100-1.

______. 5 March 1761. Letter to George Edwards. British Library, Add. 28,536, f. 250.

______. 1 (?) September 1762. Letter to Thomas Pennant. British Library, Add. 35,230, f. 19.

______. 6 January 1767. Letter to Dr. Peter Canvane. British Library, Add. 28,536.

Cunningham, T. 23 April 1760. Letter to Dr. Morton. Royal Society, London, L&P.IV.73.

Douglas, James. n.d. Letters to Hans Sloane. British Library, Sloane 4,058, ff. 254, 260, 261, 262.

Edwards, George. 11 September 1749 -11 September 1762. Letters to Thomas Birch. British Library, Add. 4,305, ff. 114-26.

______. 3 February 1752. Letter to Thomas Birch. Royal Society, London, L&P.II.260.

______. 10 May 1759. Letter to Lord Willoughby. Royal Society, London, L&P.III.383.

______. 27 March 1760. Letter to the Royal Society. Royal Society, London, L&P.IV.3.

______. 14 May 1760 - 15 June 1763. Letters to Thomas Birch. Royal Society, London, L&P.IV.14, 125, 162.

______. n.d. Letter to Emanuel Mendes da Costa. British Library, Add. 28,536, f. 251

Ellis, John. 26 July 1760 - 2 March 1763. Letter to Daniel Solander. British Library, Add. 29,533, ff. 1-52.

______. 18 June 1761. Letter to Royal Society. Royal Society, London, MM.3.18.

______. 11 February 1764 - 12 February 1764. Draft of letters to William Brownrigg. Linnean Society, London, Ellis Notebook 2.42R-2.42V.

______. 3 March 1764. Draft of letter to William Borlase. Linnean Society, London, Ellis Notebook 2.44R.

______. 11 July 1767. Draft of letter to David Skene. Linnean Society, London, Ellis Notebook 2.51R.

______. 26 November 1768. Draft of letter to David Skene. Linnean Society, London, Ellis Notebook 2.74R-2.75R.

______. 26 December 1770. Draft of letter to David Skene. Linnean Society, London, Ellis Notebook 2.100V-101R.

Fothergill, Dr. John. 26 ?? 1774 (?) - 14/7 ?? 1776 (?). Letters to John Ellis. Linnean Society, London, Ellis Correspondence, vol. I.122-128.

Francillon, John. 28 December 1783. Letter to John Leigh Philips. British Library, Add. 29,533, f. 60.

Grew, Nehemiah. ? September 1698. Letter to Hans Sloane. British Library, Sloane 4,037, f. 116.

Hill, John. 7 January 1754 - 14 March 1756. Letters to the Right Honourable, the Earl Hardwich Lord High Chancellor. British Library, Add. 36,269, ff. 8, 16, 37-8, 110.

Hoffmann, John Frederick. 12 August 1757. Letter to John Ellis. Linnean Society, London, Ellis Correspondence, vol.I.169.

Knowlton, Thomas. 13 March 1745/6. Letter to Mark Catesby. Royal Society, London, L&P.I.466.

Lawson, John. 12 April 1701 - 20 February (?) 1711/2. Letters to James Petiver. British Library, Sloane 4,063, f. 79, Sloane 4,064, ff. 214, 249, 267, 271.

Lister, Martin. January 1670 - 15 (?) January 1670/1. Letters to Henry Oldenburg. Royal Society, London, LBC.4.196, 214, 258.

Mackenzie, Mordach. 2 June 1756 - 3 January 1758. Letters to John Ellis. Linnean Society, London, Ellis Correspondence, vol.II.13-15.

Merrett, Christian. 28 August 1668 - 8 May 1669. Letters to Thomas Browne. British Library, Sloane 1,830.

Morton, Charles. 1751. Observations & Experiments on Animal Bodies, digested in a Philospphical Analysis or Enquiry into the Case, of voluntary Muscular Motion. Royal Society, London, L&P.II.260.

Oeder, Dr. 15 November 1754. Letter to John Ellis. Linnean Society, London, Ellis Correspondence, vol. II.36.

Oldenburg, Henry. 18 and 20 January 1670. Letters to Martin Lister. Royal Society, London, LBC.4.250.

______. 21 January 1670/1. Letter to Francis Willughby. Royal Society, London, LBC.4.252.

Owen, Charles. 24 November 1741. Letter to Hans Sloane. British Library, Sloane 4,057, f. 90.

Pennant, Thomas. 5 June 1768 - 21 October 1768. Letters to Lord Lyttleton. British Library, Stowe 754, ff. 233-4, 247, 266-72.

______. 14 September 1769 - 29 October 1770. Letters to John Ellis. Linnean Society, London, Ellis Correspondence, vol. II.40-3.

______. 25 November 1769 - 3 November 1778. Letters to John Strange. British Library, Egerton 2,001, ff. 3-5, 31-2, 208-10, 215-6.

______. 11 November 1783. Letter to Bishop Douglas. British Library, Egerton 2,180, f. 92.

______. 11 June 1791 - 27 October 1798. Letters to Sir James Edward Smith. Linnean Society, London, The Smith Papers, 8.29-58

______. 6 January 1794 - 19 May 1795. Letters to Sir James Edward Smith. Linnean Society, London, The Smith Papers, Additional Letters 24.81-2.

______. [1798?]. Of the Shaul Wool. Additions to the Account given in The View of Hindoostan I, p. 50. Linnean Society, London, The Smith Papers, 8.59.

Raspe, Rudolf Erich. 30 September 1763. Letter to the Earl of Macclesfield P.R.S., Royal Society, London, L&P.IV.132.

Ray, John. 13 January 1670/1. Letter to Francis Willughby, forwarded to Henry Oldenburg. Royal Society, London, LBC.4.239.

______. 3 May 1686. Letter to Dr. Gale. Royal Society, London, LBC.10.397.

Shaw, Thomas. 15 April 1729 - 30 October 1736. Letters to Hans Sloane. Royal Society, London, LBC.19.307, RBC.15.144, LBC.23.13.

Skene, David. 15 March 1765 - 16 December 1768. Letters to John Ellis. Linnean Society, London, Ellis Correspondence, vol. II.92-104.

Sloane, Sir Hans. 1753. Authentic Copies of the Codicils Belonging to the Last Will and Testament of Sir Hans Sloane, Bart. deceased, Which relate to his Collection of Books and Curiosities. British Library, Add. 36,269, ff. 39-54.

Solander, Daniel. 1764-1768. Reports and Diary of Occurrences in the Natural History Department [of the British Museum], by Dr. Solander. Sept. 1764 to Feb. 12th, 1768. British Lirary, Add. 45,874.

______. 1773-1782. Diary + [sic] Occurrence-Book of the British Museum, April 2nd 1773 to April 1782. British Library, Add. 45,874.

Tyson, Edward. n.d. [ca. 1687] Observations of what did preternaturally occur in the opening of the Body of M^r^ Smith at Highgate, July 8. 1687. Communicated by that Learned Physician Edward Tyson, M.D. and R. Sor. Royal Society, London, L&P.VI.95.

______. n.d. [ca. 1698]. Letters to Hans Sloane. British Library, Sloane 4,061, ff. 212-3.

Ward, John. 1758. Three different Draughts of a Device for a Seal to the British Museum, humbly Offered to the Commitee of Lords and Gentlemen Appointed by the Trustees to Consider that Affair. British Library, Add. 36,269, ff. 159-60.

White, Gilbert. 10 August 1767 - 8 July 1773. Letters to Thomas Pennant. British Library, Add. 35,138, ff. 1-56.

______. 1768. Annotated copy of Thomas Pennant's *British Zoology* (2nd ed.). British Library, Add. 46,471 [= vol. I], Add. 46,472 [= vol. II].

______. 1768-1773. Annotated copy of The Naturalist's Journal, vol. I. British Library, Add. 31,846.

______. 4 November 1774. Letter to Royal Society. Royal Society, London, L&P.VI.95.

Willughby, Francis. 13 January 1670/1. Letter to Henry Oldenburg. Royal Society, London, LBC.4.238.

## Printed Sources

### *Books and Articles*

Albin, Eleazar. 1720. *A Natural History of English Insects. Illustrated With a Hundred Copper Plates, Curiously Engraved From the Life: And (for Those Who Desire It) Exactly Coloured by the Author.* London.

Anonymous. 1752. *An Essay on the Rationality of Brutes. With a Philosophical Comparison Between Dr. Codgill, Inspector General of Town-Island, and Mango, the Great Monkey, Director General of the Pantomie Performers in the Haymarket.* London.

Anonymous. 1754. *An Introduction to the Art of Lying. Laid Down in Infallible RULES, and Exemplify'd in Various INSTANCES, Applicable to Practice. Being a WORK Universally Useful and Entertaining to All Persons, in All Degrees and Stations of Life, of what Denomination soever.* London.

Anonymous. 1759. *The Mirrour: or, a Chain of Reflections, Founded on True Moral Principles; Wherein Are Rules Laid Down for the Conduct and Œconomy of Life, for Promoting True Happiness by the Regulation of the Passions, and the Practice of Every Social Virtue. Extracted Partly From the Most Celebrated Authors, Joined to a Series of Observations on Mankind. Being a Compleat System of Ethicks. Wherein the Many, Exceptions, so Justly Censured in the Maxims of that Celebrated French Moralist the Duke of Rochefoucault, Are Carefully Avoided.* London.

Anonymous. 1759. *Populousness with Œconomy, the Wealth and Strength of a Kingdom. Most Humbly Addressed to Both Houses of Parliament on Behalf of the Poor.* London.

Anonymous. 1760. *Memoirs of the Revolution in Bengal, Anno. Dom. 1757. By Which MEER JAFFIER Was Raised to the Government of That Province, Together With Those of Bahar and Orixa.* London.

Anonymous. 1760. *The Polite Philosopher, or, an Essay on that Art which Makes a Man Happy in Himself, and Agreeable to*

*Others*, 6th ed. (org. publ. 1734). Edinburgh.

Anonymous. 1766. *The New Œconomy of Human Life. In Three Parts. Part. I. Of the Imperfections and Folly of Man Considered as a Relative and Social Being. Part II. Of the Duties of Man As a Member of the Community and an Individual. Part III. Of the Lesser Duties of Life Incumbent on Man as a Dependant Creature.* London.

Anonymous. 1775. *An Historic Epistle, From Omiah, to the Queen of Otaheite; Being His Remarks on the English Nation.* London.

Anonymous. 1776. *Some Memoirs of the Life and Works of George Edwards. Fellow of the Royal and Antiquarian Societies.* London.

Anonymous. 1777. *Beauties of Natural History; or, Elements of Zoography, Being a Short and Pleasant Introduction to an Acquaintance With the Nature and Qualities of the Animal World: Divested of All Fabulous Absurdities. — Selected From the Most Celebrated Naturalists, and Arranged Under the General Heads of Quadrupeds, Fowls, Fishes, Lizards, Insects, &c. Describing All the Capital Characteristicks of the Most Distinguished Individuals, in Every Separate Class; Their Discriminating Habits of Life; Their Social, Savage, Active, or Indolent Dispositions; the Regular Economy and Government of Some, the Singular Sagacity of Others, and the Wonderful Instincts of All. With a Preliminary Essay, On the Pleasure and Advantage of This Science. The Whole Illustrated by a Great Variety of Copper-Plates, Engraved From Nature.* London.

Anonymous. 1790. *The Beauties of the Creation; Or, a New Moral System of Natural History; Displayed in the Most Singular, Curious, and Beautiful Quadrupeds, Birds, Insects, Trees, and Flowers: Designed to Inspire Youth With Humanity Towards the Brute Creation, and Bring Them Early Acquainted With the Wonderful Works of the Divine Creation.* Vol. I-II. London.

Anonymous. 1799-1802. *The Naturalist's Pocket Magazine; or, Compleat Cabinet of the Curiosities and Beauties of Nature. Containing Elegant Coloured Prints of Birds, Fishes, Flowers, Insects, Quadrupeds, Shells, and Other Natural Productions. With Descriptions.* Vol. I-VI. London.

Anonymous. 1814. *Descriptive Catalogue of the Different Subjects Represented in the Large Water Colour Drawings, by the Chevalier De Barde; Now Exhibiting at Mr. Bullock's Museum, The Egyptian Hall, Piccadilly, London.* London.

Aristotle. 1963. *Generation of Animals.* Loeb Classical Library, Aristotle, vol. XIII. (Trans., A. L. Peck). London.

______. 1965-91. *History of Animals.* Loeb Classical Library, Aristotle, vol. IX- XI. (Trans., A. L. Peck and D. M. Balme). London.

______. 1968. *Parts of Animals.* Loeb Classical Library, Aristotle, vol. XII. (Trans., A. L. Peck). London.

______. 1968-69. *Metaphysics.* Loeb Classical Library, Aristotle, vol. XVII-XVIII. (Trans., Hugh Tredennick). London.

Bacon, Francis. 1620/1962. *The New Organon, or True Directions Concerning the Interpretation of Nature* (Novum Organum Scientiarum; facsimile Print of The Works of Francis Bacon, Vol. IV, London 1860, eds., James Spedding, Robert Leslie Ellis, and Douglas Denon Heath). Stuttgart-Bad Cannstatt: Friedrich Frommann Verlag.

______. 1620/1962. Preface. In: *The Great Instauration.* (Prefatio; facsimile Print of The Works of Francis Bacon, Vol. IV, London 1860, eds., James Spedding, Robert Leslie Ellis, and Douglas Denon Heath). Stuttgart-Bad Cannstatt: Friedrich Frommann Verlag.

______. 1620/1962. Plan of the Work. In: *The Great Instauration.* (Distributio Operis; facsimile Print of The Works of Francis Bacon, Vol. IV, London 1860, eds., James Spedding, Robert Leslie Ellis, and Douglas Denon Heath). Stuttgart-Bad Cannstatt: Friedrich Frommann Verlag.

______. 1620/1962. Preparative. In: *Towards a Natural and Experimental History.* (Parasceve ad Historiam Naturalem et Experimentalem; facsimile Print of The Works of Francis Bacon, Vol. IV, London 1860, eds., James Spedding, Robert Leslie Ellis, and Douglas Denon Heath). Stuttgart-Bad Cannstatt: Friedrich Frommann Verlag.

______. 1623/1962. *The Dignity and Advancement of Learning.* (De Dignitate et Augmentis Scientiarum; facsimile Print of The Works of Francis Bacon, Vol. IV, London 1860, eds., James Spedding, Robert Leslie Ellis, and Douglas Denon Heath). Stuttgart-Bad Cannstatt: Friedrich Frommann Verlag.

Bancroft, Edward. 1769. *An Essay on the Natural History of Guiana, in South America. Containing a Description of Many Curious Productions in the Animal and Vegetable Systems of That Country. Together With an Account of the Religion, Manners, and Customs of Several Tribes of Its Indian Inhabitants. Interspersed With a Variety of Literary and Medical Observations. In Several Letters From a Gentleman of the Medical Faculty, During His Residence in That Country.* London.

Barrow, Isaac. 1693. *Of Industry in Five Discourses: Viz. In General. In Our General Calling, as Christians. In Our Particular Calling as Gentlemen. In Our Particular Calling, as Scholars.* London.

Barrow, John. 1801-04. *An Account of Travels into the Interior of Southern Africa, in the Years 1797 and 1798: Including Observations on the Geology and Geography of the Southern Part of That Continent; the Natural History of Such Objects as Occurred in the Animal, Vegetable, and Mineral Kingdoms; and Sketches of the Physical and Moral*

*Character of the Various Tribes of Inhabitants Surrounding the Settlement of the Cape of Good Hope. To which Is Annexed, a Description of the Present State, Population, and Produce of that Extensive Colony; With a Map Constructed entirely from actual Observations Made in the Course of the Travels.* Vol. I-II. London.

Beattie, James. 1776. *Essays. On the Nature and Immutability of Truth, in Opposition to Sophistry and Scepticism. On Poetry and Music, as They Affect the Mind. On Laughter, and Ludicrous Composition. On the Utility of Classical Learning.* Vol. I. Edinburgh.

______.1797. *The Minstrel; or, The Progress of Genius: In Two Books. With Some Other Poems.* London.

Bell, John. 1763. *Travels From S[t] Petersburg in Russia, to Diverse Parts of Asia. In Two Volumes.* Vol. I-II. Glasgow.

Berkenhout, John. 1769-72. *Outlines of the Natural History of Great Britain and Ireland. Containing a Systematic Arrangement and Concise Description of All the Animals, Vegetables, and Fossils which Have Hitherto Been Discovered in These Kingdoms.* Vol. I-III. London.

Biberg, Isac J. 1750. *Œconomia Naturæ eller Skaparens Allvisa Inrättning på vår Jord, i Agttagen vid de Skapae Tingens Betraktande i de tra Naturens Riken, till deras Forplantning, Vidmagthållande och Undergång; med Medicinske Facultetens Bifall, Under Kongl. Archiaterns, Herr. Doct. Carl Linnæi Præsidio, Utgifven uti ett Academisk Snille-Prof på Latin Vid Kongl. Academien i Upsala år 1749. D. 4. Martii. Och nu med någon Tillökning på Svenska Översatt,* (org. publ. 1749). Uppsala.

Blair, Patrick. 1713. *Osteographia Elephantina: Or, A Full and Exact Description of all the Bones of an Elephant, which Died Near Dundee, April the 27[th] 1706. With Their Several Dimensions. To which Are Premis'd, 1. An Historical Account of the Natural Endowments, and Several Wonderful Performances of Elephants, with the Manner of Taking and Taming Them. 2. A Short Anatomical Account of Their Parts. And Added, 1. An Exact Account of the Weights of all the Bones of This Elephant. 2. The Method Us'd in Preparing and Mounting the Skeleton. 3. Four Large Copper Plates, wherein Are Represented the Figures of the Stuff'd Skin, and Prepared Skeleton, as They Now Stand in the Publick Hall of Rarities at Dundee; With the Separated Bones in Several Views and Other Parts of This Elephant. In a Letter to Dr. Hans Sloane, Fellow of the College of Physicians and Secr. R. S.* London.

Blount, Sir Thomas Pope. 1693. *A Natural History: Containing Many Not Common Observations: Extracted Out of the Best Modern Writers.* London.

Boswell, James. 1791/1999. *The Life of Samuel Johnson.* Hertfordshire: Wordsworth.

Boyle, Robert. 1686/1996. *A Free Enquiry into the Vulgarly Received Notion of Nature.* (eds., Edward B. Davies and Michael Hunter). Cambridge: Cambridge University Press.

Bradley, Richard. 1721. *A Philosophical Account of the Works of Nature, Endeavouring to Set Forth the Several Gradations Remarkable in the Mineral, Vegetable, and Animal Parts of the Creations, Tending to the Composition of a Scale of Life. To Which Is Added an Account of the State of Gardening as It Is Now in Great-Britain and Other Parts of Europe: Together with Several New Experiments Relating to the Improvement of Barren Ground, and the Propagation of Timber-Trees, Fruit-Trees, &c. With Many Curious Cuts.* London.

Brookes, R. 1763-72. *A New and Accurate System of Natural History; Containing I. The History of Quadrupeds, Including Amphibious Animals, Frogs, and Lizards, with Their Properties and Uses in Medicine. II. The History of Birds, with the Method of Bringing up Those of the Singing Kind. III. The History of Fishes and Serpents, Including Sea-Turtles, Crustaceous and Shell-Fishes; with Their Medical Uses. IV. The History of Insects, with Their Properties and Uses in Medicine. V. The History of Waters, Earths, Stones, Fossils, and Minerals; with Their Virtues, Properties, and Medical Uses: To which Is Added, the Method in which Linnæus Has Treated These Subjects. VI. The History of Vegetables, as well Foreign as Indigenous, Including an Account of the Roots, Gums, and Concrete Juices; as also Their Properties, Virtues, and Uses in Medicine; Together with the Method of Cultivating Those Planted in Gardens.* Vol. 1-6 [vol. 5-6 = 2nd ed., publ., 1772]. London.

Brown, John. 1758. *An Estimate of the Manners and Principles of the Times,* 7th ed. Vol. I-II. London.

Brown, Peter. 1776. *Novelles Illustrationes de Zoologie, contenant Cinquante Planches enluminées d'Oiseaux Curieux, et qui non été jamias decrites, et quelques unes de Quandrupedes, de Reptiles et d'insectes, avec de courtes Descriptions systematiques./New Illustrations of Zoology, Containing Fifty Coloured Plates of New, Curious, and Non-Descript Birds, With a Few Quadrupeds, Reptiles and Insects. Together with a Short and Scientific Description of the Same.* London.

Browne, Thomas. 1646. *Pseudodoxia Epidemica: or, Enquiries into Very Many Received Tenets, and Commonly Presumed Truths.* London.

Buffon, George-Louis Leclerc. 1749/1954. Premier Discours. De la manière d'étudier et de traiter l'Histoire naturelle. In: *Oeuvers Philosophiques de Buffon* (ed. Jean Piveteau). Paris: PUF. Pp. 7-26.

______. 1777-1789. *Histoire Naturelle, Générale et Particulière.* Vol. I-VIII. Paris: L'Imprimerie Royale.

Catesby, Mark. 1731-43. *The Natural History of Carolina, Florida and the Bahama Island: Containing the Figures of Birds, Beasts, Fishes, Serpents, Insects, and Plants: Particularly, the Forest-Trees, Shrubs, and Other Plants, Not hitherto Described, or Very Incorrectly Figured by Authors. Together with Their Descriptions in English and French. To*

*Which, Are Added Observations on the Air, Soil, and Waters: With Remarks Upon Agriculture, Grain, Pulse, Roots, &c. To the Whole, Is Prefixed a New and Correct Map of the Countries Treated of./Histoire Naturelle de la Caroline, la Floride, & les Isles Bahama: Contenant les Dessins d'Oiseaux, Animaux, Poissons, Serpents, Insectes, & Plantes. Et en Particulier, d'Arbres des Forêts, Arbrisseaux, & autres Plantes, qui n'ont point été decrits jusques a present par auteurs, ou peu exactement Dessinés. Avec leur Descriptions en Français & en Anglais. A quoi on a ajouté, des Observations sur l'Air, le Sol, & les Eaux, avec des Remarques sur l'Agriculture, les Grains, les Legumes, les Graines, &c. le tout est precedé d'une Carte nouvellle & exacte des Païs dont ils s'agit.* London.

Cesalpino, Andrea. 1583. *De Plantis Libri XVI.* Firenze.

Chambers, Ephraim. 1741. *Cyclopædia: or, an Universal Dictionary of Arts and Sciences; Containing an Explication of the Terms, and an Account of the Things Signified Thereby, in the Several Arts, both Liberal and Mechanical; and the Several Sciences, Human and Divine: The Figures, Kinds, Properties, Productions, Preparations, and Uses of Things Natural and Artificial: The Rise, Progress, and State of Things Ecclesiastical, Civil, Military, and Commercial: With the Several Systems, Sects, Opinions, &c. among Philosophers, Divines, Mathematicians, Physicians, Antiquaries, Critiques, &c. The Whole Intended as a Course of Ancient and Modern Learning, Extracted From the Best Authors, Dictionaries, Journals, Memoirs, Transactions, Ephemerides, &c. in Several Languages.* Vol. 1-2, 5th ed. (org. publ. 1728.) London.

Collins, Richard. 1727. *Nature Display'd. A Poem.* London.

Cooper, John Gilbert. 1745. *The Power of Harmony: A Poem.* In Two Books. London.

Copley, Stephen (ed.). 1984. *Literature and the Social Order in Eighteenth-Century England* (reprints). London: Croom Helm.

Cowley, A. 1722. To the Royal Society. In: Thomas Sprat, *The History of the Royal Society of London, for the Improving of Natural Knowledge.* London

Crabbe, George. 1788. *The Library. A Poem,* 2nd ed. London.

Darwin, Charles. 1859/1979. *The Origin of Species.* New York: Gramercy Books.

Denman, Thomas. 1787. *A Collection of Engravings, Tending to Illustrate the Generation and Parturition of Animals, and the Human Species.* London.

Dodsley, Robert. 1767. *The Œconomy of Human Life. Translated From an Indian Manuscript, Written by an Ancient Bramin. To which Is Prefixed an Account of the Manner in which the Said Manuscript Was Discovered. In a Letter From an English Gentleman, Now Residing in China, to the Earl of ****,* 11th ed. London.

Douglas, James. 1707. *Myographiæ Comparatæ Specimen: Or, a Comparative Description of All the Muscles in a Man and in a Quadruped. Shewing Their Discoverer, Origin, Progress, Insertion, Use, and Difference. To Which Is Added, An Account of the Muscles Peculiar to a Woman. With an Etymological Table, and Several Useful Index's.* London.

Edwards, George. 1743-51. *A Natural History of Birds. Most of which Have Not Been Figur'd or Describ'd, and Others Very Little Known from Obscure or to Brief Descriptions without Figures, or From Figures Very Ill Design'd. Containing The Figures of Sixty Birds and Two Quadrupedes, Engrav'd on Fifty-Two Copper Plates, after Curious Original Drawings from Life, and Exactly Colour'd. With Full and Accurate Descriptions.* [Title also given as: A Natural History of Uncommon Birds, and of Some Other Rare and Undescribed Animals, Quadrupeds, Reptiles, Fishes, Insects, &c. Exhibited in Two Hundred and Ten Copper-Plates, From Designs Copied Immediately From Nature, and Curiously Coloured after Life. With a Full and Accurate Description of Each Figure. To Which Is Added, a Brief and General Idea of Drawing and Painting in Water-Colours; With Instructions for Etching on Copper With Aqua Fortis: Likewise Some Thoughts on the Passage of Birds; and Additions to Many of the Subjects Described in This Work]. Vol. I-IV. London.

______. 1757. An Account of a New-Discovered Species of the Snipe or Tringa. In a Letter to the Rev. Tho. Birch, D.D.[,] F.R.S. From Mr. George Edwards, Librarian of the College of Physicians. *Philosophical Transactions,* vol. 50, pp. 255-7.

______. 1758-64. *Gleanings of Natural History, Exhibiting Figures of Quadrupeds, Birds, Insects, Plants, &c. Most of which Have Not, till now, Been Either Figured or Described. With Descriptions of Seventy Different Subjects, Designed, Engraved, and Coloured after Nature, on Fifty Copper-Plate Prints/Ganures d'Histoire Naturelle, contient des Figures de Quadrupèdes, d'Oiseaux, d'Insectes et de Plantes, &c. dont on n'avait Point Encore eu, pour la plus part, de dessins, ou d'explications; avec les Descriptions de soixante et dix différents Sujets, dessinés, gravés, et colorés d'après Nature, en cinquante Planches.* Vol. I-III. London.

Ellis, John. 1755. *An Essay towards a Natural History of the Corallines, and Other Marine Productions of the Like Kind, Commonly Found on the Coasts of Great Britain and Ireland. To which Is Added the Description of a Large Marine Polype Taken near the North Pole, by the Whale-Fishers, in the Summer 1753.* London.

______.1757. Remarks on Dr. Job Baster's Observationes De Corralinis, &c. Printed Above, P. 258. In a Letter to the Right Honourable George Earl of Macclesfield, President of the R.S. From Mr. John Ellis, F.R.S. *Philosophical Transactions,* vol. 50, pp. 280-87.

______.1767. Extract of a Letter From John Ellis, Esquire, F.R.S. to Dr. Linnæus, of Upsal, F.R.S. on the Animal Nature of the Genus of Zoophytes, Called Carollina. *Philosophical Transactions*, vol. LVII, no. ii, pp. 404-27.

______.1770. *Directions for Bringing Seeds and Plants, From the East-Indies and Other Distant Countries, in a State of Vegetation: Together With a Catalogue of Such Foreign Plants As Are Worthy of Being Encouraged in Our American Colonies, for the Purposes of Medicines, Agriculture, and Commerce. To Which Is Added, the Figure and Botanical Description of a New Sensitive Plant, Callled Dionæa Muscipula: or, Venus's Fly-Trap* [In a Letter to Sir Charles Linnæus]. London.

______. 1775. *A Description of the Mangostan and the Bread-Fruit: The First, Esteemed One of the Most Delicious; the Other, the Most Useful of All the Fruits in the East Indies. To which Are Added, Directions for Voyagers, for Bringing Over these and Other Vegetable Productions, which Would Be Extremely Beneficial to the Inhabitants of Our West India Islands.* With Figures. London.

Ellis, John and Daniel Solander. 1768. *The Natural History of Many Curious and Uncommon Zoophytes, Collected From Various Parts of the Globe. Systematically Arranged and Described by the Late Daniel Solander.* London.

Ferguson, Adam. 1767/1995. *An Essay on the History of Civil Society* (ed., Fania Oz-Salzberger). Cambridge: Cambridge University Press.

Fielding, Henry. 1749/1994. *Tom Jones.* London: Penguin Books.

Forster, John Reinhold. 1771. *A Catalogue of the Animals of North America. Containing, An Enumeration of the Known Quadrupeds, Birds, Reptiles, Fish, Insects, Crustaceous and Testaceous Animals; Many of which Are New, and Never Described Before. To which Are Added, Short Directions for Collecting, Preserving, and Transporting, all Kinds of Natural Curiosities.* London.

______. 1781. Natural History and Description of the Tyger-Cat of the Cape of Good Hope. *Philosophical Transactions*, vol. LXXI, no. 1, pp. 1-6.

Gay, John. 1750. *Fables. In Two Parts.*

Gibbon, Edward. 1776-88/1998. *The Decline and Fall of the Roman Empire* (eds., Anthony Lentin and Brian Norman). Hertfordshire: Wordsworth.

Gilpin, William. 1792. *Three Essays on Picturesque Beauty; on Picturesque Travels; and on Sketching Landscape: To which Is Added a Poem in Landscape Painting.* London.

Glanvill, Joseph. 1676. *Essays on Several Important Subjects in Philosophy and Religion.* London.

Goldsmith, Oliver. 1759/1966. An Enquiry into the Present State of Polite Learning in Europe. In: *Collected Works of Oliver Goldsmith.* Vol. I (ed., Arthur Friedman). Oxford: The Clarendon Press. Pp. 253-341.

Graves, Richard. 1773. *The Love of Order: A Poetical Essay. In Three Cantos.* London.

Grew, Nehemiah. 1681. *Museum Regalis Societas, or a Catalogue and Description of the Natural and Artificial Rarities Belonging to the Royal Society and Preserved at Gresham College. whereonto Is Subjoyned the Comparative Anatomy of Stomach and Guts.* London.

Handley, James. 1721. *Mechanical Essays on the Animal Œconomy: Wherein, Not Only the Conduct of Nature, in Animal Secretion, but Sensation, and Human Generation, Are Distinctly Consider'd and Anatomically Explain'd: As Also The Particular Manner of the Operation of a Medicine Is Accounted for, and Many Other Curious and Uncommon Subjects Are Treated of. Necessary for All That Study Nature, and Particularly Those That Make Physick or Surgery Their Practice. With a Catalogue of the Author's Consulted Thro' the Whole.* London.

Harrington, James. 1977 (posthumously published). A System of Politics. Delineated in Short and Easy Aphorisms. In: *The Political Works of James Harrington*, (ed., J. G. A. Pocock). Cambridge: Cambridge University Press.

Harris, James. 1751. *Hermes: Or, a Philosophical Inquiry Concerning Language and Universal Grammar.* London.

Harris, Moses. 1766. *The Aurelian: or, Natural History of English Insects; Namely, Moths and Butterflies; Together with the Plants on which They Feed, a Faithful Account of Their Respective Changes, Their Usual Haunts when in the Winged State, and Their Standard Names, ws Given and Established by the Worthy and Ingenious Society of Aurelians. Drawn, Engraved and Coloured from the Natural Subjects Themselves.* London.

______. 1782. *An Exposition of English Insects, Including the Several Classes of Neuroptera, Hymenoptera, and Diptera, or Bees, Flies, and Libellullae. Exhibiting on 51 Copper Plates Near 500 Figures, Accurately Drawn, and Highly Finished in Colour, from Nature. Minutely Described, Arranged according to the Linnaean System, with Remarks. The Figures of a Great Number of Moths, not in the Aurelian Collection, Formerly Published by the same Author, and a Plate with an Explanation of Colours, Are Likewise Given in the Work/Exposition des Insectes qui se Trouve en Angleterre; Comprenant les différentes Classes de Neuroptera, Hymenoptera, et Diptera, ou d'Abeilles, Mouches, et Libellulæ. representès sur 51 Planches qui contiennent près de 500 Figures. Correctement dessinées, et Coloriées d'après Nature. Le tout conforme à l'explication, l'arrangement, et la Nomenclature du Systeme de Linnée: Avec Remarques. On trouve aussi, dans cet ouvrage, les dessins d'un grand nombre de tignes, non compris dans la Collection publiée dans l'Aurélian, ainsi qu'une Planche qui en explique le Couleurs.* London.

Harte, Walter. 1735. *An Essay on Reason.* London.

______.1737. *The Union and Harmony of Reason, Morality, and Revealed Religion. A Sermon Preach'd Before the University of Oxford, At St. Mary's n Sunday, February 27. 1736-7*, 2nd. ed. London.

Harwood, Busick. 1796. *A System of Comparative Anatomy and Physiology*. Cambridge

Hill, John. 1751-58. *A General Natural History: Or, New and Accurate Descriptions of the Animals, Vegetables, and Minerals, of the Different Parts of the World; With Their Virtues and Uses, as far as Hitherto Certainly Known, in Medicine and Mechanics: Illustrated by a General Review of the Knowledge of the Ancients, and the Discoveries and Improvement of later Ages in these Studies. Including the History of the Materia Medica, Pictoria, and Tinctoria of the Present and Earlier Ages. As also Observations on the Neglected Properties of Many Valuable Substances Known at Present; and Attempts to Discover the Lost Medicines, &c of Former Ages, in a Series of Critical Enquiries into the Materia Medica of the Ancient Greeks. With a Great Number of Figures Elegantly Engraved*. Vol. I-III. London

______. 1752. *Essays in Natural History and Philosophy. Continuing a Series of Discoveries, by the Assistance of Microscope*. London.

Homer (1967-71). *Iliad*. Loeb Classical Library, vol. 170-1 (trans. A. T. Murray). Cambridge, Mass.: Harvard University Press.

Hume, David. 1739-40/1978. *A Treatise of Human Nature: Being an Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects*, 2nd ed. (eds., L. A. Selby-Bigge and P. H. Nidditch). Oxford: Clarendon Press.

______. 1748/1988. *An Enquiry Concerning Human Understanding*. New York: Prometheus Books.

Hunter, John. 1786. *Observations on Certain Parts of the Animal Œconomy*. London.

Hutchinson, Thomas. 1796. *The Natural History of the Frog Fish of Surinam. Illustrated With Plates*. York.

Ives, Edward. 1773. *A Voyage From England to India in the Year MDCCLIV, and a Historical Narrative of the Operations of the Squadron and Army in India, Under the Command of Vice-Admiral Watson and Colonel Clive, in the Years 1755, 1756, 1757; Including a Correspondence between the Admiral and the Nabob Serajah Dowlah. Interspersed with Some Interesting Passages Relative to the Manners, Customs, &c. of Several Nations in Indostan. Also a Journey from Persia to England, by an Unusual Route With an Appendix &c., &c.* London.

Johnson, Samuel. 1755. *A Dictionary of the English Language: In Which the Words Are Deduced from their Originals, and Illustrated in their Different Significations by Examples From the Best Writers. To which Are Prefixed, a History of the Language, and an English Grammar*. Vol. I-II. London.

______. 1763. *The Philosophic Mirrour, or a General View of Human Œconomy. Containing, A General System of the Natural and Revealed Laws; the Branches of Man's [Sic] Œconomy in their Several Station of Publick and Private Life, and Proper Reflections for their Due Discharge thereof*. Dublin.

Jones, Sir William. 1784/1993. A Discourse on the Institution of a Society, for Inquiring into the History, Civil and Natural, the Antiquities, Arts, Sciences, and Literature of Asia. By the President. In: *The Collected Works of Sir William Jones*. Vol. III (ed., Garland Cannon). New York: New York University Press. Pp. 1-9.

______. 1793/1993. The Tenth Anniversary Discourse, Delivered 28 February, 1792. By the President. On Asiatic History, Civil and Natural. In: *The Collected Works of Sir William Jones*. Vol. III (ed., Garland Cannon). New York: New York University Press. Pp. 205-28.

Jones, William. 1785. *Considerations on the Nature and Œconomy of Beasts and Cattle. A Sermon Preached at the Church of St. Leonard, Shoreditch, on the Tuesday in Whitsun Week, May 17, 1785. Being a Sequel to a Discourse on the Religious Use of Botanical Philosophy*. London.

Keill, James. 1717. *Essays on Several Parts of the Animal Œconomy*, 2nd ed. London.

Kentish, Richard. 1787. *An Essay on the Method of Studying Natural History: Being an Oration Delivered to the Societas Naturæ Studiosorum, at Edinburgh, in the Year 1782*. London.

Kerr, Robert. 1792. To the Public. In: *Carl von Linné: The Animal Kingdom, or Zoological System, of the Celebrated Sir Charles Linnæus; Class I. Mammalia: Containing a Complete Systematic Description, Arrangement, and Nomenclature, of all the Known Species and Varieties of the Mammalia, or Animals which Give Suck to Their Young. Being a Translation of that Part of the Systema Naturæ, As Lately Published, With Great Improvements*, (trans. and ed. Robert Kerr. London). Pp. v-xii.

La Roche, Sophie von. 1933 (posthumously published). *Sophie in London 1786: Being the Diary of Sophie La Roche*. (trans., Clare Williams). London: Jonathan Cape.

Lettsom, John Coakley. 1772. *Naturalist's and Traveller's Companion, Containing Instructions for Collecting and Preserving Objects of Natural History, Under the Following Heads: I. The Method of Catching and Preserving Insects for Collections, Illustrated With a Copper-Plate. II: The Method of Preserving Birds and other Animals. III Directions for Bringing over Seed and Plants from Distant Countries. IV. Method of Analysing Medical or Mineral Waters. V. Experiments for Discovering the Contents of the Air. VI. Directions for Collecting Fossils, Including Earths, Stones, Salts, Inflammables, Minerals, and Metals. VII. Directions for Taking off Impressions from Medals and Coins*. London.

Lindroth, P. G. 1796. *Underrättelse om rätta sättet at bereda, förvara och öfversända DJURS huder eller skinn, at de sedan* *kunna upstopppas til prydnad för Naturalie-Samlingar.*

Linné, Carl von. 1735/1964. Systema Naturæ, 1st ed. (Facsimile copy). Nieuwkoop: B. de Graaf.

______. 1748/1962. *De Curiositate Naturali/Om Undran inför Naturen. In: Carl von Linné Om Undran inför Naturen och Andra Latinska Skrifter. Originaltexter Jämte Svensk Översättning,* (trans. Th. M. Fries). Stockholm: Bokförlaget Natur och Kultur. Pp. 12-59.

______. 1758/1939. *Systema Naturæ.* 10th ed., vol. I (Facsimile copy). London: British Museum (Natural History).

______. 1766-68. *Systema Naturæ per Regna Tria Naturæ, Secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis,* 12th ed. Vol. I-III. Holmiæ.

______. 1792. *The Animal Kingdom, or Zoological System, of the Celebrated Sir Charles Linnæus; Class I. Mammalia: Containing a Complete Systematic Description, Arrangement, and Nomenclature, of all the Known Species and Varieties of the Mammalia, or Animals which Give Suck to Their Young; Being a Translation of that Part of the Systema Naturæ, As Lately Published, with Great Improvements,* (trans. and ed., Robert Kerr). London.

Locke, John. 1690/1988. *Two Treatises of Government,* (ed., Peter Laslett). Cambridge: Cambridge University Press.

______. 1706/1997. *An Essay Concerning Human Understanding,* 5th ed. (org. publ. 1690; ed., Roger Woolhouse). London: Penguin Books.

Malthus, T. R. 1803/1992. *An Essay on the Principle of Population; or a View of Its Past and Present Effects on Human Happiness; With an Inquiry into Our Prospects Respecting the Future Removal or Mitigation of the Evils which It Occasions,* 2nd ed. (ed., Donald Winch). Cambridge: Cambridge University Press.

Martyn, Thomas. 1791. Observations on the Language of Botany. *Transactions of the Linnean Society,* vol. 1, pp. 147-54.

Martyn, William Frederick. 1785. *A New Dictionary of Natural History; or, Compleat Universal Display of Animated Nature. With Accurate Representations of the Most Curious and Beautiful Animals, Elegantly Coloured.* Vol. I-II. London.

Merian, Maria Sibilla. 1705. *Metamorphosis Insectorum Surinamentium.* Amsterdam.

Millar, John. 1771. *Observations Concerning the Distinction of Ranks in Society.* London.

Milton, John. 1667/1952. Paradise Lost. In: *Poetical Works* (ed. Helen Darshire), vol. I. Oxford: Clarendon.

Monboddo, Lord. 1774. *Of the Origin and Progress of Language,* 2nd ed. Vol. I. Edinburgh.

Mullen, Allan. 1682. *An Anatomical Account of the Elephant Accidentally Burnt in Dublin, on Friday, June 17, in the Year 1681. Sent in a Letter to Sir Will. Petty, Fellow of The Royal Society. Together With a Relation of New Anatomical Observations in the Eyes of Animals: Communicated in another Letter to the Honourable R. Boyle, Esq., Fellow of the Same Society.* London.

Needham, Turbervill. 1749. *Observations Upon the Generation, Composition and Decomposition of Animal and Vegetable Substances. Communicated in a Letter to Martin Folkes Esq; President of the Royal Society.* London.

Owen, Charles. 1742. *An Essay Towards a Natural History of Serpents: In Two Parts: I. The First Exihibits a General View of SERPENTS, in Their Various Aspects; Such as tTheir Kinds, Bulk, Food, Motion, Propagation, Coverture, Colours. In which Is Inserted a Short Account of Vegetable, Mineral, and Animal Poison, Particularly that of the SERPENT; and Its Cure in Various Nations; Where also the SERPENT Is Used as Food and Physick. II. The Second Gives a View of Most SERPENTS that Are Known in the Several Parts of the World; Described by Their Various Names, Different Countries, and Qualities. Illustrated With COPPER-PLATES, Engraved by the BEST HANDS. III. To which Is Added a Third Part; Containing Six DISSERTATIONS upon the Following Articles, As Collateral to the Subject. 1. Upon the PRIMEVAL SERPENT in PARADISE. 2. The FIERY SERPENT that Infested the Camp of ISRAEL. 3. The BRAZEN SERPENT Erected by Moses. 4. The DIVINE WORSHIP Given to SERPENTS by the NATIONS. 5. The ORIGIN and REASON of that MONSTROUS WORSHIP. 6. Upon the ADORATION of Different Kinds of BEASTS by the EGYPTIANS, with divers Instances of the Same Stupidity in other Nations. The Whole Intermix'd With a Variety of ENTERTAINING DIGRESSIONS, PHILOSOPHICAL and HISTORICAL.* London.

Paterson, William. 1789. *A Narrative of Four Journeys into the Country of the Hottentots, and Caffraria. In the Year One Thousand Seven Hundred and Seventy-Seven, Eight, and Nine. Illustrated With a Map, and Seventeen Copper-Plates.* London.

Pennant, Thomas. 1768. Account of the Different Species of the Birds, Called PINGUINS. *Philosophical Transactions,* vol. 58, pp. 91-9.

______. 1768-77. *British Zoology.* Vol. I-IV (vol. I-II = 2nd ed., III & IV = 4th ed). London.

______. 1771. *Synopsis of Quadrupeds.* Chester.

______. 1772. *A Tour in Scotland. MDCCLXIX.* London.

______. 1784-85. *Arctic Zoology.* Vol. I-II. London.

______. 1798-1800. *The View of Hindoostan.* Vol. I-II. London.

______. 1948 (posthumously published). *Tour on the Continent 1765,* (ed., G. R. de Beer). London: The Ray Society.

Petiver, James. 1698. Remarks by Mr. James Petiver, Apothecary, and Fellow of the Royal Society, on Some Animals, Plants,, &c. Sent to Him From Maryland, by the Reverend Mr. Hugh Jones. *Philosophical Transactions*, no. 246, pp. 393-406.

______.1701. An Account of Mr Sam. Brown, His Third Book of East India Plants, With Their Names, Virtues, Descriptions, &c. By James Petiver, Apothecary, and Fellow of the Royal Society. To Which Are Added Some Animals Sent Him From Those Parts. *Philosophical Transactions*, no. 271, pp. 843-62.

Plato. 1961. The Statesman. In: *The Collected Dialogues of Plato, Including the Letters*, (eds. Edith Hamilton and Huntington Cairns). Princeton: Princeton University Press.

Pulteney, Richard. 1781. *A General View of the Writings of Linnæus*. London.

Ray, John. 1671. The Extract of a Letter Written by Mr. John Ray to the Publisher From Midleton, July 3. 1671. Concerning Spontaneous Generation; As Also Some Insects Smelling of Musks. *Philosophical Transactions*, vol. VI, pp. 2219-21.

______. 1693. *Synopsis Methodica Animalium Quadrupedum et Serpentini Generis. Vulgarium Notas Characteristicas, Rariorum Descriptiones Integras Exhibens: Cum Historiis & Observationibus Anatomicis perquam Curiosis. Præmittuntur nonnullla de Animalium in Genere, Sensu, Generatione, Divisione, &c.* London.

______. 1728. The Preface. In: Francis Willughby and John Ray, *The Ornithology of Francis Willughby of Middleton in the County of Warwick Esq.: Fellow of the Royal Society. In Three Books. Wherein all the Birds Hitherto Known, Being Reduced into a Method Suitable to their Natures, Are Accurately Described. The Descriptions Illustrated by most Elegant Figures, Nearly Resembling the Live Birds, Engraved in LXXVIII Copper Plates. Translated into English, and Enlarged with many Additions throughout the Whole Work. To which Are Added, Three Considerable Discourses, I. Of the Arts of Fowling: With a Description of Several Nests in Two Large Copper Plates. II. Of the Ordering of Singing Birds. III: Of Falconry. By John Ray, Fellow of the Royal Society*. London.

______. 1732. *Three Physico-Theological Discourses, Concerning I. The Primitive Chaos, and Creation of the World. II. The General Deluge, Its Causes and Effects. III: The Dissolution of the World, and Future Conflagration. Wherein Are largely Discussed, The Production and Use of Mountains; the Original of Fountains, of Formed Stones, and Sea-Fishes, Bones and Shells Found in the Earth; the Effects of Particular Floods, and Inudations of the Sea; the Eruptions of Vulcanos; the Nature and Causes of Earthquakes. Also an Historical Account of those Two late Remarkable Ones in Jamaica and England. With Practical Inferences*. 4th ed. (ed., W. Derham). London.

Richardson, Jonathan. 1725. *An Essay on the Theory of Painting*, 2nd ed. London.

Rotheram, John. 1790. *The Sexes of Plants Vindicated: In a Letter to Mr William Smellie, Member of the Antiquarian and Royal Societies of Edinburgh; Containing a Refutation of His Arguments Against the Sexes of Plants. And Remarks on Certain Passages of His Philosophy of Natural History*. Edinburgh/London.

Royal Society. 1665. Directions for Sea-Men, Bound for Far Voyages. *Philosophical Transactions*, vol. I, pp. 140-3.

Russel, Alexander. 1756. An Account of Four Undescribed Fishes of Aleppo; in a Letter to Mr. Collinson, F.R.S., *Philosophical Transactions*, vol. XLIX, no. 2, pp. 445-9.

Shaw, George. 1790. *Speculum Linnæanum: Or Linnæan Zoology; Containing a Complete Illustration of the Zoological Part of the Systema Naturæ of Linnæus: With Figured Elegantly Engraved and Accurately Coloured, Representing the most Remarkable Species of each Genus. With Descriptions at Large*. London.

______. 1792. *Museum Leveriani Explicatio, Anglica Et Latina./Museum Leverianum, Containing Select Specimens From the Museum of the Late Sir Ashton Lever, Kt, With Descriptions in Latin and English*. London.

______. 1794. *Zoology of New Holland*. The Figures by James Sowerby. London.

Shaw, Thomas. 1738. *Travels, or Observations relating to Several Parts of Barbary and the Levant*. Oxford.

______. 1746. *A Supplement to a Book Entituled [Sic] Travels, or Observations, &c. Wherein some Objections, lately Made Against It, Are fully Considered and Answered: With Several Additional Remarks and Dissertations*. Oxford.

Smeathman, Henry. 1781. Some Account of the Termites, which Are Found in Africa and Other Hot Climates. In a Letter From Mr. Henry Smeathman, of Clement's Inn, to Sir Joseph Bank, Bart. P.R.S. *Philosophical Transactions*, vol. LXXI, no. 1, pp. 139-94.

Smellie, William. 1780. Preface by the Translator. In: George-Louis Leclerc Buffon, *Natural History, General and Particular, by the Count De Buffon, Translated into English. Illustrated With 260 Copper-Plates, and Occasional Notes and Observations by the Translator*, vol. I (trans. and ed., William Smellie). Edinburgh. Pp. v-xxi.

______. 1790. *The Philosophy of Natural History*. Vol. I-II. Dublin.

Smith, Adam. 1776/1999. *The Wealth of Nations*. Vol. I-II, (ed., Andrew Skinner). London: Penguin.

Smith, James Edward. 1791. Introductory Discourse on the Rise and Progress of Natural History. *Transactions of the Linnean Society*, vol. I, pp. 1-55.

Sprat, Thomas. 1667/1722. *The History of the Royal Society of London, for the Improving of Natural Knowledge*, 3rd ed. London.

Stillingfleet, Benjamin. 1762. *Miscellaneous Tracts Relating to Natural History, Husbandry, and Physicks. To which Is Added the Calendar of Flora*, 2nd ed. London.

Swift, Jonathan. 1735/1998. *Gulliver's Travels*. Oxford & New York: Oxford University Press.

Taylor, John. 1799. *Travels From England to India, in the Year 1789, by the Way of the Tyrol, Venice, Scandaroon, Aleppo, and over the Great Desart to Bussora; With Instructions for Travellers; and an Account of the Expense of Travelling, &c., &c.* Vol. I-II. London.

Tench, Captain Watkin. 1789. *A Narrative of the Expedition to Botany Bay; With an Account of New South Wales, Its Productions, Inhabitants, &c. To which Is Subjoined, a List of the Civil and Military Establishments at Port Jackson*, 2nd ed. London.

Thompson, Edward. 1766. *Sailor's Letters. Written to His Select Friends in England, during His Voyages and Travels in Europe, Asia, Africa, and America.* Vol. I-II. London.

Topsell, Edward. 1607/1973. *The Historie of the Foure-Footed Beastes. Describing the True and Liuely Figure of Euery Beast, With a Discourse of Their Seuerall Names, Conditions, Kindes, Uertues (Both Naturall and Medicinall) Countries of Their Breed, Their Loue and Hate to Mankinde, and the Wonderfull Worke of God in Their Creation, Preseruation, and Destruction. Necessary for All Diuines and Students, Because the Story of Euery Beast Is Amplified with Narrations out of Scriptures, Fathers, Phylosophers, Physicians, and Poets: Wherein Are Declared Diuers Hyerogliphicks, Emblems, Epigrams, and Other Good Histories, Collected Out of all the Volumes of CONRADUS GESNER, and all other Writers to This Present Day*, (facsimile copy). New York: Da Capo Press Inc.

Trusler, John. 1784. *Principles of Politeness, and of Knowing the World in Two Parts. Containing every Instruction Necessary to Complete the Gentleman and Man of Fashion, to Teach Him a Knowledge of Life, and Make Him well Received in all Companies. For the Improvement of Youth, yet not beneath the Attention of Any*. Berlin.

Tyson, Edward. 1698. *Carigueya, Seu Marsupiale Americanum. Or, the Anatomy of an Opossum, Dissected at Gresham-College*. London.

______. 1699. *Orang-Outang, Sive Homo Sylvestris. Or, the Anatomy of a Pygmie, Compared with what of a Monkey, and Ape, and a Man. To which Is Added, A Philological Essay Concerning the Pygmies, the Cynocephali, the Satyrs, and Sphiges of the Antients. Wherein It Will Appear that They Are All Either Apes or Monkeys, and Not Men, As Formerly Pretended*. London.

______. 1704. Carigueya, Seu Marsupiale Americanum Masculum. Or The Anatomy of a Male Opossum: In a Letter to Dr. Edward Tyson, From Mr. William Cowper, Chirurgeon, and Fellow of the Royal Society, London. To which Are Premised some further Observations on the Opossum; and a New Division of Terrestrial Brute Animals, Particularly of Those that Have Their Feet Formed like Hands. Where an Account Is Given of some Animals not yet Described. By Edward Tyson, M.D. Fellow of the College of Physicians and of the Royal Society. *Philosophical Transactions*, vol. XXIV, no. [= Numb. 289], pp. 1565.

Wagstaff, Simon (aka Jonathan Swift). 1738/1892. *Polite Conversation in Three Dialogues*, (ed., George Sanitsbury). London.

Watkinson, Edward. 1763. *An Essay Upon Œconomy*, 4th ed. London.

Watson, Frederick. 1754. *The Animal World Display'd: Or, the Nature and Qualities of Living Creatures Described, Under the Denominations of I. Birds, II. Beasts, III. Fishes, IV. Serpents. In which all the Necessary and Useful Knowledge, Contained in the many Learned Works, Written on this Subject, in Different Languages, Is Familiarly Conveyed to the English Reader; and the Gross Errors of Ignorant Compilers Are Carefully Avoided. Illustrated with Copper-Plates, Elegantly Engraved after Original Drawings, Many of Them Taken from the Life.* London.

White, Gilbert. 1789/1974. *The Natural History of Selborne*, (ed., R. M. Lockley). London: Dent.

White, John. 1790. *Journal of a Voyage to New South Wales With Sixty-Five Plates of Non Descript Animals, Birds, Lizards, Serpents, Curious Cones of Trees and Other Natural Productions*. London.

Wilkins, John. 1638/1973. *The Discovery of a World in the Moone*, (facsimile copy). New York: Scholars' Facsimiles & Reprints.

______. 1668. *An Essay Towards a Real Character and a Philosophical Language*. London.

Willughby, Francis and John Ray. 1678/1972. *The Ornithology of Francis Willughby of Middleton*, (facsimile copy). Menston: The Scholar Press Limited.

Wilson, Alexander. 1780. *Some Observations Relative to the Influence of Climate on Vegetable and Animal Bodies*. London.

Wilson, Thomas. 1790. Appendix. In: John White, *Journal of a Voyage to New South Wales with Sixty-Five Plates of Non Descript Animals, Birds, Lizards, Serpents, Curious Cones of Trees and Other Natural Productions*. London.

Woodward, John. 1696. *Brief Instructions for Making Observations in all Parts of the World: As also for Collecting, Preserving, and Sending over Natural Things. Being an Attempt to Settle an Universal Correspondence for the Advancement of Knowledge both Natural and Civil*. London.

Yeats, Thomas P. 1773. *Institutions of Entomology; Being a Translation of Linnæus's Ordines et Genera Insectorum; or, Systematic Arrangement of Insects. Collated with the Different Systems of Geoffroy, Schæffer and Scopoli; Together with Observations of the Translator*. London.

Young, Arthur. 1770. *Rural Œconomy: or Essays on the Practical Parts of Husbandry. Designed to Explain Several of the*

*Most Important Methods of Conducting Farms of Various Kinds; Including many Useful Hints to Gentlemen Farmers relative to the Œconomical Management of their Business. Containing, among Other Enquiries, of that Proportioned Farm, which Is of all others the Most Profitable. Of the Best Method of Conducting Farms that Consist all of Grass, or all of Arable Land. Of the Means of Keeping the Year Round the Most Cattle on a Given Quantity of Land. Considerations on the Œconomical Conduct of Gentlemen Farmers. Of the Cheapest Way of Manuring Land. Of the Comparative Profit of Farming Different Soils. Of the New Husbandry. Of Periodical Publications Concerning Rural Œconomics.* London.

### *Periodicals*

Aitken, George A. (ed.). 1898. *The Spectator* . Vol. I-XVIII. London/New York: John C. Nimmo/ Longmans, Greens, & Co.

Allen, Robert J. (ed.). 1970. *Addison and Steele. Selections From the Tatler and the Spectator*, 2nd ed. New York: Holt, Reinhart and Winston, Inc.

*Critical Review: Or, Annals of Literature.* 1762-1763. Vol. XIV-XVI. London.

*The Daily Courant.* 1706 and 1719. London.

*The London Gazette.* 1706. London

*Monthly Review. 1751-53. Vol. 4-8. London*

*Post Boy.* 1706. London.

*The Spectator.* 1711. London

## SECONDARY LITERATURE

1989. *The Oxford English Dictionary*, 2nd ed. Oxford: Clarendon Press.

Abenius, Margit. 1971. Allt Är Viktigt. In: Sigurd Fries (ed.), *Linnés Språk och Stil. Studier i Linnés Svenska Forfatterskap.* Stockholm: Bokförlaget Prisma. Pp. 56-73.

Abu-Lughod, Lila. 1993. Introduction. In: Lila Abu-Lughod (ed.), *Writing Women's Worlds.* Berkeley, Los Angeles, Oxford: University of California Press. Pp. 1-42.

Allen, David Elliston. 1983. Life Sciences: Natural History. In: Pietro Corsi and Weindling Paul (eds.), *Information Sources in the History of Science and Medicine.* London: Butterworth Scientific. Pp. 349-60.

———. 1994. *The Naturalist in Britain: A Social History*, 2nd ed. (org. publ. 1976). Princeton: Princeton University Press.

Altick, Richard. 1978. *The Shows of London.* Cambridge, Mass.: Harvard University Press.

Anderson, Benedict. 1983. *Imagined Communities. Reflections on the Origin and Spread of Nationalism.* London: Verso Press.

Andrews, Malcolm. 1989. *The Search for the Picturesque. Landscape Aesthetics and Tourism in Britain, 1760-1800.* Aldershot: Scholar Press.

Appadurai, Arjun. 1986. Introduction: Commodities and the Politics of Value. In: Arjun Appadurai (ed.), *The Social Life of Things. Commodities in Social Perspective.* Cambridge: Cambridge University Press. Pp. 3-63.

Ardener, Edwin. 1989. *The Voice of Prophecy and Other Essays*, (ed., Malcolm Chapman). Oxford: Blackwell.

Ashmore, Malcolm. 1988. The Life and Opinions of a Replication Claim: Reflexivity and Symmetry in the Sociology of Scientific Knowledge. In: Steve Woolgar (ed.), *Knowledge and Reflexivity. New Frontiers in the Sociology of Knowledge.* London: Sage Publications.

Atran, Scott. 1990. *Cognitive Foundations of Natural History. Towards an Anthropology of Science.* Cambridge/Paris: Cambridge University Press/Editions de la maison des sciences de l'homme.

Augé, Marc. 1998. *A Sense for the Other: The Timeliness and Relevance of Anthropology.* (Le Sense Des Autres: Actualité de L'lnthropologie, org. pub. 1994; trans., Amy Jacobs). Stanford: Stanford University Press.

Aylmer, G. E. 1980. From Office-Holding to Civil Service: The Genesis of Modern Bureaucracy. *Transactions of the Royal Historical Society*, vol. 30 (fifth series), pp. 91-108.

Baillie, Laureen and Sieveking, Paul (eds.). n.d. *British Biographical Archive*, (microfiche ed.). München, New York, London, Paris: K. G. Saur.

Balme, D. M. 1970. Aristotle and the Beginnings of Zoology. *Journal of the Society for the Bibliography of Natural History*, vol. 5, no. 4, pp. 272-85.

Balsiger, Barbara Jeanne. 1971. *The Kunst- und Wunderkammern: A Catalogue Raisonné of Collecting in Germany, France and England, 1565-1750*, vol. 1-2. Ph.D. dissertation. Pittsburgh: University of Pittsburgh.

Barnes, Barry and David Bloor. 1982. Relativism, Rationality and the Sociology of Knowledge. In: Martin Hollis and Steven Lukes (eds.), *Rationality and Relativism*. Oxford: Basil Blackwell. Pp. 19-47.

Baron, Hans. 1959. The *Querelle* of the Ancients and Moderns as a Problem for Renaissance Scholarship. *Journal of the History of Ideas*, vol. XX, no. 1, pp. 3-22.

Barrell, John. 1986. *The Political Theory of Painting From Reynolds to Hazlitt*. New Haven & London: Yale University Press.

______. 1990. The Public Prospect and the Private View: The Political Taste in Eighteenth-Century Britain. In: S. Pugh (ed.), *Reading Landscape: Country - City - Capital*. Manchester & New York: Manchester University Press.

Barsanti, Giulio. 1990. Storia Naturale Della Scimmie. *Nuncus. Annali di Storia della Scienza*, vol. V, pp. 99-165.

Batten, Charles L. 1978. *Pleasurable Instructions. Form and Convention in Eighteenth-Century Travel Literature*. Berkeley, Los Angeles, London: University of California Press.

Baugh, Daniel A. 1990. Seapower and Science: The Motives for Pacific Exploration. In: Derek House (ed.), *Background to Discovery: Pacific Exploration From Dampier to Cook*. Los Angeles: The University of California Press. Pp. 1-55.

Becker, Carl L. 1977. *The Heavenly City of the Eighteenth-Century Philosophers*, (org. publ. 1932). New Haven & London: Yale University Press.

Beer, Gilliam. 1990. Science and Literature. In: R. C. Olby, G. N. Cantor, J. R. R. Christie, and M. J. S. Hodge (eds.), *Companion to the History of Modern Science*. London & New York: Routledge. Pp. 783-98.

Belanger, Terry. 1982. Publishers and Writers in Eighteenth-Century England. In: Isabel Rivers (ed.), *Books and their Readers in Eighteenth-Century England*. Leicester: Leicester University Press. Pp. 5-25.

Bell, George H. and Diane B. Rhodes. 1994. *A Guide to the Zoological Literature. The Animal Kingdom*. Englewood, Colorado: Libraries Unlimited, Inc.

Ben-David, Joseph. 1971. *The Scientist's Role in Society. A Comparative Study*. Englewood Cliffs: Prentice-Hall.

______. 1972. The Profession of Science and Its Powers. *Minerva*, vol. 10, pp. 362-83.

Berlin, Brent. 1978. Ethnobiological Classification. In: Eleanor Rosch and Barbara B. Lloyd (eds.), *Cognition and Categorization*. Hillsdale: Lawrence Erlbaum Associates, Publishers. Pp. 9-26.

Berlin, Brent, Dennis Breedlove, and Peter H. Raven. 1968. Covert Categories and Folk Taxonomies. *American Anthropologist*, vol. 79, pp. 290-9.

Bermingham, Ann. 1993. Elegant Females and Gentlemen Connoisseur. The Commerce in Culture and Self-Image in Eighteenth-Century England. In: Ann Bermingham and John Brewer (eds.), *The Consumption of Culture 1600-1800*. London & New York: Routledge. Pp. 489-53.

Bewell, Alan. 1989. "Jacobin Plants": Botany As Social Theory in the 1790s. *Wordsworth Circle*, vol. 20, pp. 132-9.

Biagioli, Mario. 1990. The Anthropology of Incommensurability. *Studies in History and Philosophy of Science*, vol. 21, no. 2, pp. 183-209.

______. 1990. Galileo's System of Patronage. *History of Science*, vol. 28, no. 1, pp. 1-62.

______. 1992. Scientific Revolutions, Social Bricolage, and Etiquette. In: Roy Porter and Mikulas Teich (eds.), *The Scientific Revolutions in National Context*. Cambridge: Cambridge University Press. Pp. 11-54.

Black, Jeremy. 1985. *The British and the Grand Tour*. London, Sydney, Dover, New Hampshire: Croom Helm.

Bloch, Maurice and Jean H. Bloch. 1980. Women and the Dialectics of Nature in Eighteenth-Century French Thought. In: Marilyn Strathern and Carol P. MacCormack (eds.), *Nature, Culture, Gender*. Cambridge: Cambridge University Press. Pp. 25-41.

Bloor, David. 1975. Psychology or Epistemology? *Studies in the History and Philosophy of Science*, vol. 6, pp. 382-95.

______. 1982. Durkheim and Mauss Revisited: Classification and the Sociology of Knowledge. *Studies in History and Philosophy of Science*, vol. 13, no. 4, pp. 267-92.

______. 1991. *Knowledge and Social Imagery*, 2nd ed. (org. publ. 1976). Chicago & London: The University of Chicago Press.

Blunt, Wilfrid. 1971. *The Complete Naturalist: A Life of Linnaeus*. London: Collins.

Boon, James. 1982. *Other Tribes, Other Scribes. Symbolic Anthropology in the Comparative Study of Cultures, Histories, Religions, and Texts*. Cambridge: Cambridge University Press.

______. 1986. Symbols, Sylphs, and Siwa: Allegorical Machineries in the Text of Balinese Culture. In: Victor W. Turner and Edward M. Bruner (eds.), *The Anthropology of Experience*. Urbana: University of Illinois Press.

Bourdieu, Pierre. 1977. *Outline of a Theory of Practice*, (Esquisse d'une Théorie de la Pratique, Précédé de trois Études d'éthnologie Kabyle, org. publ. 1972; trans., Richard Nice). Cambridge: Cambridge University Press.

Bremekamp, C. E. B. 1953. A Re-Examination of Cesalpino's Classification. *Acta Botanica Neerlandica*, vol. I, pp. 580-

93.

______. 1953. Linné's Views on the Hierarchy of the Taxonomic Groups. *Acta botanica nederlandica*, vol. 2, no. 2, pp. 242-53.

Brewer, John. 1993. 'The Most Polite Age and the Most Vicious.' Attitudes Towards Culture as a Commodity, 1660-1800. In: Ann Bermingham and John Brewer (eds.), *The Consumption of Culture 1600-1800*. London & New York: Routledge. Pp. 341-60.

______. 1997. *The Pleasures of Imagination. English Culture in the Eighteenth-Century*. London: Harper Collins Publishers.

Brewer, S. M. 1963. The Design. In: *Design for a Gentleman*. London: Chapman & Hall.

British Museum (Natural History). 1906. *Separate Historical Account of the Several Collections Included in the Department of Zoology* [= Vol. II in History of the Collections Contained in the Natural History Departments in the British Museum]. London.

Broberg, Gunnar. 1994. Homo Sapiens. Linnaeus' Classification of Man. In: Tore Frängsmyr (ed.), *Linnaeus: The Man and His Work* (org. pub. 1983). Canton: Science History Productions. Pp. 156-194.

Brock, C. H. 1980. Dr William Hunter's Museum, Glasgow University. *Journal of the Society for the Bibliography of Natural History*, vol. 9, no. 4, pp. 403-12.

Brown, Theodore M. 1974. From Mechanism to Vitalism in Eighteenth-Century English Physiology. *Journal of the History of Biology*, vol. 7, no. 2, pp. 179-216.

Browne, Janet. 1996. Botany in the Boudoir and Garden: The Banksian Context. In: David Phillip Miller and Peter Hanns Reill (eds.), *Visions of Empire. Voyages, Botany, and Representations of Nature*. Cambridge: Cambridge University Press. Pp. 153-72.

Bryson, Anna. 1998. *From Courtesy to Civility. Changing Codes of Conduct in Early Modern England*. Oxford: Clarendon Press.

Bulmer, Ralph and M. Tyler. 1968. Karam Classification of Birds. *Journal of the Polynesian Society*, vol. 77, pp. 333-85.

Bulmer, Ralph. 1967. Why Is the Cassowary Not a Bird? A Problem of Zoological Taxonomy Among the Karam of the New Guinea Highlands. *Man (N.S)*, vol. 2, no. 1, pp. 5-25.

Cain, Arthur. 1958. Logic and Memory in Linnaeus' System of Taxonomy. *Proceedings of Linnaen Society London*, vol. 169, pp. 144-63.

______. 1959. Taxonomic Concepts. *Ibis*, vol. 101, pp. 302-18.

Carey, Daniel. 1997. Compiling Nature's History: Travellers and Travel Narratives in the Early Royal Society. *Annals of Science*, vol. 54, no. 3, pp. 269-92.

Caron, J. A. 1988. 'Biology' in the Life Sciences. A Historiographical Contribution. *History of Science*, vol. 26, no. 3, pp. 223-68.

Carter, Paul. 1989. *The Road to Botany Bay. An Exploration of Landscape and History*, (org. publ. 1987). Chicago: Chicago University Press.

Carter, Philip. 2001. *Men and the Emergence of Polite Society, 1660-1800*. Harlow: Longman.

Carus, Victor J. and Wilhelm Engelmann. 1861. *Bibliotheca Zoologica. Verzeichniss der Schriften über Zoologie, welche in den Periodischen werken enthalten und vom Jahre 1846-1860 selbständig erschienen eind. Mit Einschluss der Allgemein-Naturgeschichtlichen, Periodischen und palaeontologischen Schriften*. Vol. I-II. Leipzig: Verlag von Wilhelm Engelmann.

Chandler, James, Davidson, Arnold, and Harootunian, Harry (eds.). 1994. *Questions of Evidence. Proof, Practice, and Persuasion across the Disciplines*. Chicago & London: The University of Chicago Press.

Chartier, Roger. 1985. Texts, Printing, Readings. In: Lynn Hunt (ed.), *The New Cultural History*. Berkeley, Los Angeles, London: University of California Press.

Chitnis, Amand C. 1970. The University of Edinburgh's Natural History Museum and the Huttonian-Wernerian Controversy. *Annals of Science*, vol. 26, no. 2, pp. 85-94.

Christensen, Søren. 1994. *Fakticitetens Ironi. Facetter af Kulturrelativismens Idéhistorie*. Aarhus: Aarhus Universitetsforlag.

Clarke, Michael and Nicholas Penny (eds.). 1982. *The Arrogant Connoisseur: Richard Payne Knight, 1751-1824. Essays on Richard Payne Knight together with a Catalogue of Works Exhibited at the Whentworth Art Gallery*. Manchester: Manchester University Press.

Cleal, Bryan. 2001. Censurerende Kontekster. At Finde en Virtuel Samlings Værdi. *Tidskriftet Antropologi, Samlinger*, no. 43-4, pp. 123-38.

Clifford, James and George E. Marcus (eds.). 1986. *Writing Culture. The Poetics and Politics of Ethnography*. Berkeley, Los Angeles, London: University of California Press.

Cloître, Michel and Terry Shinn. 1985. Expository Practice. Social, Cognitive and Epistemological Linkage. In: Terry Shinn and Richard Whitley (eds.), *Expository Science: Forms and Functions of Popularisation*. Dordrecht, Boston, Lancaster: D. Reidel Publshing Company. Pp. 31-60.

Cohen, Bernard I. 1976. The Eighteenth-Century Origins of the Concept of Scientific Revolutions. *Journal of the History of Ideas*, vol. 37, pp. 257-88.

Cole, F. J. 1944. *History of Comparative Anatomy from Aristotle to the Eighteenth Century.* London: Macmillan & Co.

Coleman, William. 1962. Lyell and the 'Reality' of Species. *Isis*, vol. 53, no. 3, pp. 325-38.

______. 1971. *Biology in the Nineteenth Century: Problems of Form, Function, and Transformation.* New York: John Wiley & Sons.

Colley, Linda. 1996. *Britons. Forging the Nation, 1707-1835*, (org. publ. 1992). London: Vintage.

Collingwood, R. G. 1945. *The Idea of Nature.* Oxford: Clarendon Press.

Collins, Harry M. 1981. What Is TRASP? The Radical Programme as a Methodological Imperative. *Philosophy of the Social Sciences*, vol. 11, no. 2, pp. 215-24.

______. 1983. An Empirical Relativist Programme in the Sociology of Scientific Knowledge. In: Karin D. Knorr-Cetina and Michael Mulkay (eds.), *Science Observed. Perspectives on the Social Study of Science.* London: Sage Publications. Pp. 85-113.

______. 1992. *Changing Order. Replication and Induction in Scientific Practice*, 2nd ed. (org. publ. 1985). Chicago & London: The University of Chicago Press.

Copley, Stephen. 1984. Introduction. In: *Literature and the Social Order in Eighteenth-Century England.* London: Croom Helm.

Corfield, P. J. 1987. Class by Name and Number in Eighteenth-Century Britain. *History*, vol. 72, no. 234, pp. 38-61.

Cottingham, John. 1988. *Descartes. Descartes' Filosofi om Sjælen* (Descartes, trans. Henrik Mossin). København: Sesam.

Cranberg, Lawrence. 1968. Law - Scientific and Juridical. *American Scientist*, vol. 56, no. 3, pp. 244-53.

Crary, Jonathan. 1990. *Techniques of the Observer. On Vision and Modernity in the Nineteenth Century.* Cambridge, Mass. & London: MIT Press.

Cressy, David. 1981. Levels of Illiteracy in England 1530-1730. In: H. J. Graff (ed.), *Literacy and Social Development in the West.* Cambridge.

______. 1993. Literacy in Context: Meaning and Measurement in Early Modern England. In: John Brewer and Roy Porter (eds.), *Consumption and the World of Goods.* London: Routledge. Pp. 335-77.

Crook, J. Mordaunt. 1972. *The British Museum* . London: Allen Lane, the Penguin Press.

Cross, Stephen J. 1981. John Hunter, the Animal Œconomy, and Late-Eighteenth-Century Physiological Discourse. *Studies in History of Biology*, vol. 5, pp. 1-110.

Cummings, A. J. G. and Larry Stewart. 1991. The Case of the Eighteenth-Century Projector: Entrepreneurs, Engineers, and Legitimacy at the Hanoverian Court in Britain. In: Bruce T. Moran (ed.), *Patronage and Institutions: Science, Technology, and Medicine at the European Court, 1500-1700.* Rochester, N. Y. & Woodbridge, Suffolk: The Boydell Press. Pp. 235-61.

Dal, Björn. 1996. *Sveriges zoologiska litteratur. En berättande översikt om svenska zoologer och deras tryckta verk, 1483-1920.* Fjälhinge: Orbis Pictus.

Daniel, E. Valentine and Jeffrey M. Peck 1996. Culture/Contexture: An Introduction. In: Daniel E. Valentine and Jeffrey M. Peck (eds.), *Culture/Contexture: Explorations in Anthropology and Literary Studies.* Berkeley: The University of California Press. Pp. 1-33.

Darnton, R. C. 1984. Readers Respond to Rousseau. In: R. C. Darnton, *The Great Cat Massacre and other Episodes in French Cultural History.* New York.

Daston, Lorraine. 1994. Historical Epistemology. In: James Chandler, Arnold Davidson, and Harry Harootunian (eds.), *Questions of Evidence. Proof, Practice, and Persuasion Across the Disciplines.* Chicago & London: The University of Chicago Press. Pp. 282-9.

______. 1994. Baconian Facts, Academic Civility, and the Prehistory of Objectivity. *Annals of Scholarship*, vol. 8, no. 3, pp. 337-63.

______. 1994. Marvelous Facts and Miraculous Evidence in Early Modern Europe. In: James Chandler, Arnold Davidson, and Harry Harootunian (eds.), *Questions of Evidence. Proof, Practice, and Persuasion across the Disciplines.* Chicago & London: The University of Chicago Press. Pp. 243-89.

______. 1997. The Cold Light of Facts and the Facts of Cold Light: Luminescence and the Transformation of the Scientific Fact, 1600-1750. *EMF: Studies in Early Modern France*, vol. 3, pp. 17-44.

Daston, Lorraine and Peter Gallison. 1992. The Image of Objectivity. *Representations*, vol. 40, no. Fall, pp. 81-128.

Daston, Lorraine and Katharine Park. 1998. *Wonders and the Order of Nature 1150-1750.* New York: Zone Books.

Dear, Peter. 1985. *Totius in Verba*: Rhetoric and Authority in the Early Royal Society. *Isis*, vol. 76, pp. 145-61.

______ (ed.). 1991. *The Literary Structure of Scientific Argument: Historical Studies.* Philadelphia, PA: University of Pennsylvania Press.

______. 1995. *Discipline and Experience. The Mathematical Way in the Scientific Revolution.* Chicago: The University of

Chicago Press.

Denning, Greg. 1988. *History's Anthropology: The Death of William Gooch.* Washington, DC: University Press of America.

Dobson, Jessie. 1970. Curiosities of Natural History as Illustrated in John Hunter's Museum. *Annals of the Royal College of Surgeons of England*, vol. 47, pp. 233-42.

Douglas, Mary. 1966. *Purity and Danger. An Analysis of the Concepts of Pollution and Taboo.* London & New York: Routledge.

______. 1975. *Implicit Meanings. Essays in Anthropology.* London & New York: Routledge.

Dunn, John. 1983. From Applied Theology to Social Analysis: The Break between John Locke and the Scottish Enlightenment. In: Istvan Hont and Michael Ignatieff (eds.), *Wealth and Virtue. The Shaping of Political Economy in the Scottish Enlightenment.* Cambridge: Cambridge University Press. Pp. 119-135.

Durkheim, Émile. 1976. *The Elementary Forms of the Religious Life*, (Formes Élémentaires De La Vie Religieuse, org. publ. 1912; trans., Joseph Ward Swain). London, Boston, Sidney: George Allen & Unwin.

Earle, Peter. 1989. *The Making of the English Middle Class: Business, Society and Family Life in London, 1660-1730.* London: Methuen.

Eco, Umerto. 2000. *Kant og Næbdyret. Sprog og Erkendelse.* (Kant e L'Ornitorinco, org. publ. 1997, trans., Thomas Harder). København: Forum.

Elias, Norbert. 2000. *The Civilising Process. Sociogenetic and Psychogenetic Investigations*, rev. ed., E. Dunning, J. Goudsblom, and S. Mennell, eds. (Über den Prozess der Zivilisation, org. publ. 1939, trans., Edmund Jephcott). Oxford: Blackwell Publishers.

Ellen, Roy. 1979. Introductory Essay. In: Roy Ellen and David Reason (eds.), *Classifications in Their Social Context.* London, New York, San Francisco: Academic Press. Pp. 1-32.

Ellis, A. 1956. *The Penny Universities: A History of the Coffee Houses.* London: Secker and Warburg.

Elshtain, Jean Bethke. 1981. *Public Man, Private Woman. Women in Social and Political Thought.* Princeton: Princeton University Press.

Eriksen, Thomas Hylland. 2000. *Charles Darwin.* (Charles Darwin, org. publ. 1997, trans.; Kamilla Jørgensen). København: Tiderne Skifter.

Evans-Pritchard, E. E. 1962. Social Anthropology: Past and Present. In: E. E. Evans-Pritchard, *Essays in Social Anthropology.* London: Farber & Farber. Pp. 13-28.

Fabian, Johannes. 1983. *Time and the Other. How Anthropology Makes Its Object.* New York: Columbia University Press.

Fairclough, Norman. 1992. *Discourse and Social Change.* Cambridge: Polity Press.

______. 1992. Discourse and Text: Linguistic and Intertextual Analysis Within Discourse Analysis. *Discourse and Society*, vol. 3, no. 2, pp. 193-217.

Farber, Paul Lawrence. 1972. Buffon and the Concept of Species. *Journal of the History of Biology*, vol. 5, no. 2, pp. 259-84.

______. 1975. Buffon and Daubenton: Divergent Traditions Within the Histoire Naturelle. *Isis*, vol. 66, pp. 63-74.

______. 1977. The Development of Taxidermy and the History of Ornithology. *Isis*, vol. 68, no. 244, pp. 550-66.

______. 1980. The Development of Ornithological Collections in the late Eighteenth and early Nineteenth Centuries and Their Relationship to the Emergence of Ornithology as a Scientific Discipline. *Journal of the Society for the Bibliography of Natural History*, vol. 9, no. 4, pp. 391-4.

______. 1982. *The Emergence of Ornithology As a Scientific Discipline.* Dordretch: D. Reidel.

______. 2000. *Finding Order in Nature. The Naturalist Tradition From Linnaeus to E. O. Wilson.* Baltimore and London: The Johns Hopskins University Press.

Fearing, F. 1954. An Examination of the Conceptions of Benjamin Whorf. *Memoir no. 79 of the American Anthropological Association: Language in Culture*, (ed., Hoijer, H.) Vol. 56, no. 6,

Findlen, Paula. 1990. Empty Signs? Reading the Book of Nature on Renaissance Science. *Studies in the History and Philosophy of Science*, vol. 21, no. 3, pp. 511-8.

______. 1994. *Possessing Nature: Museums, Collecting, and Scientific Culture in Early Modern Italy.* Berkeley: University of California Press.

Fleck, Ludwik. 1997. *Uppkomsten och Utvecklingen av et Vetenskapligt Faktum. Inledning till Läran om Tankestil och Tankekollektiv.* (Entstehung und Entwicklung einer Wissenschaftlichen Tatsache, org. publ. 1935; trans., Bengt Liliequist). Stockholm/Stehag: Brutus Östlings Bokförlag Symposion.

Foucault, Michel. 1970. *The Order of Things. An Archaeology of the Human Sciences*, (Les Mots et les Choses, org. publ. 1966). London: Routledge.

______. 1972. *The Archaeology of Knowledge.* (L'Archéologie du Savoir, org. publ. 1969; trans., A. M. Sheridan Smith). London: Routledge.

______. 1973. *The Birth of the Clinic: An Archaeology of Medical Perception.* (Naissace de la Clinique, org. publ. 1963;

trans., A. M. Sheridan Smith). London: Tavistock.

______. 1977. *Overvågning og Straf: Det Moderne Fængselsvæsens Historie.* (Surveiller et Punir: Naissance de la Prison, org. publ. 1976; trans., Dag Østerberg). København: Rhodos.

Fries, Sigurd (ed.). 1971. *Linnés Språk och Stil. Studier i Linnés Svenska Forfatterskap.* Stockholm: Bokförlaget Prima.

Frost, Alan. 1988. Science for Political Purposes: European Explorations of the Pacific Ocean, 1704-1806. In: Ray MacLeod and Philip F. Rehbock (eds.), *Nature in Its Greatest Extent: Western Science in the Pacific.* Honolulu: University of Hawaii Press. Pp. 27-44.

______. 1996. The Antipodean Exchange: European Horticulture and Imperial Designs. In: David P. Miller and Peter H. Reill (eds.), *Visions of Empire. Voyages, Botany, and Representations of Nature.* Cambridge: Cambridge University Press.

Frängsmyr, Tore. 1974. Drömmen om det Exakta Språket. In: Gunnar Eriksson, Tore Frängsmyr, and Magnus von Platen (eds.), *Vetenskapens Träd. Idéhistoriska Studier Tillägnade Sten Lindroth.* Stockholm: Wahlström & Widstrand.

Frängsmyr, Tore, J. L. Heilbron and Robin E. Rider (eds.). 1990. *The Quantifying Spirit in the Eighteenth-Century.* Berkeley, Los Angeles, Oxford: The University of California Press.

Gascoigne, John. 1984. Politics, Patronage and Newtonianism: The Cambridge Example. *The Historical Journal,* vol. 27, no. 1, pp. 1-24.

______. 1985. The Universities and the Scientific Revolution: The Case of Newton and Restoration Cambridge. *History of Science,* vol. XXIII, pp. 391-434.

______. 1998. *Science in the Service of Empire. Joseph Banks, the British State and the Uses of Science in the Age of Revolution.* Cambridge: Cambridge University Press.

Gates, Barbara T. and Ann B. Shteir. 1997. Introduction. Charting the Tradition. In: Barbara Gates and Ann B. Shteir (eds.), *Natural Eloquence. Women Reinscribe Science.* Wisconsin: University of Wisconsin Press. Pp. 3-24.

Geertz, Clifford. 1973. *The Interpretation of Cultures.* London: Fortuna Press.

______. 1980. *Negara: The Theatre State in Nineteenth-Century Bali.* Princeton: Princeton University Press.

George, Wilma. 1985. Alive or Dead: Zoological Collections in the Seventeenth Century. In: Oliver Impey and Arthur MacGregor (eds.), *The Origin of Museums: The Cabinets of Curiosities in Sixteenth- and Seventeenth-Century Europe.* Oxford: Clarendon Press. Pp. 179-87.

Gieryn, Thomas. 1988. Distancing Science from Religion in Seventeenth-Century England. *Isis,* vol. 79, no. 299, pp. 582-93.

Gill, Theodor. 1902. The Story of a Word – Mammal. *Popular Science Monthly,* vol. 61, pp. 434-8.

Gillespie, Charles Coulston. 1969. *Genesis and Geology. A Study in the Relations of Scientific Thought, Natural Theology, and Social Opinion in Great Britain, 1790-1850.* Cambridge, Mass.: Harvard University Press.

______. (editor in chief). 1981. *Dictionary of Scientific Biography.* Vol. I-XVIII. New York: Charles Scribner's Sons, Macmillian Library Preference USA, Simon & Schuster Macmillian.

Gillespie, Neal C. 1987. Natural History, Natural Theology, and Social Order: John Ray and the 'Newtonian Ideology'. *Journal of the History of Biology,* vol. 20, pp. 1-49.

Ginsberg, Robert. 1987. Introduction to Eighteenth-Century Philosophic Writing. In: Robert Ginsberg (ed.), *The Philosopher as Writer. The Eighteenth Century.* Selinsgrove/London & Toronto: Susquehanna University Press/Associated University Presses. Pp. 7-11.

Goldgar, Anne. 1995. *Impolite Learning. Conduct and Community in the Republic of Letters, 1680-1750.* New Haven & London: Yale University Press.

Gould, Stephen Jay. 1981. *The Mismeasure of Man.* New York & London: W. W. Norton & Company.

______. 1983. Chimp on the Chain. *Natural History,* vol. 12, pp. 18-26.

Grafton, Anthony. 1994. The Footnote from De Thou to Ranke. *History and Theory. Studies in the Philosophy of History,* vol. 33 (theme issue), pp. 53-76.

Greenblatt, Stephen. 1991. *Marvellous Possessions. The Wonder of the New World.* Chicago: Chicago University Press.

Grieco, Allen J. 1992. The Social Politics of Pre-Linnaean Botanical Classification. *I Tatti Studies: Essays in the Renaissance,* vol. 4, pp. 131-49.

Guyénot, Émile. 1941. *Les Sciences de la Vie aux XVII$^{e}$ et XVIII$^{e}$ Siècles. L'idée d'évolution.* Paris: Éditions Albin Michel.

Hacking, Ian. 1975. *The Emergence of Probability. A Philosophical Study of Early Ideas About Probability, Induction and Statistical Inference.* Cambridge: Cambridge University Press.

______. 1982. Language, Truth and Reason. In: Martin Hollis and Steven Luke (eds.), *Rationality and Relativism.* Oxford: Basil Blackwell. Pp. 48-66.

______. 1992. 'Style' for Historians and Philosophers. *Studies in History and Philosophy of Science,* vol. 23, no. 1, pp. 1-20.

Hall, Rupert. 1963. Merton Revisited, or Science and Society in the Seventeenth Century. *History of Science. An*

*Annual Review of Literature, Research and Teaching*, vol. II, pp. 1-16.
Hallberg, Margaret. 1997. *Symmetri och Reflexivitet*. Göteborg: Forskningens villkor Skriftserie.
Halliday, M. A. K. 1987. Language and the Order of Nature. In: Nigel Fabb, Derek Attridge, Alan Durant, and Colin MacCabe (eds.), *The Linguistics of Writing. Arguments between Language and Literature*. Manchester: Manchester University Press. Pp. 135-54.
Hanks, William F. 1986. Authenticity and Ambivalence in the Text: A Colonial Maya Case. *American Ethnologist*, vol. 13, no. 4, pp. 721-44.
______. 1987. Discourse Genres in a Theory of Practice. *American Ethnologist*, vol. 14, no. 4, pp. 668-92.
______. 1989. Text and Textuality. *Annual Review of Anthropology*, vol. 18, pp. 95-127.
Hannaway, Owen. 1986. Laboratory Design and the Aim of Science: Andreas Libavius versus Tycho Brahe. *Isis*, vol. 77, pp. 585-610.
Hannerz, Ulf. 1987. The World in Creolisation. *Africa*, vol. 57, no. 4, pp. 546-57.
Hans, Nicholas. 1951. *New Trends in Education in the Eighteenth Century*. London: Routledge & Kegan Paul.
Haraway, Donna. 1989. *Primate Visions. Gender, Race, and Nature in the World of Modern Science*. New York & London: Routledge.
Harbsmeier, Michael. 1994. *Wilde Völkerkunde. Andere Welten in Deutschen Reiseberichten der Frühen Neuzeit*. Frankfurt & New York: Cambus Verlag.
Harrison, Peter. 2001. Curiosity, Forbidden Knowledge, and the Reformation of Natural Philosophy in Early Modern England. *Isis*, vol. 92, pp. 265-90.
Hastrup, Kirsten. 1975. Fransk Strukturalisme. In: Kirsten Hastrup et al. (eds.), *Den Ny Antropologi*. København: Borgen/Basis. Pp. 24-88.
______. 1985. *Culture and History in Medieval Iceland. An Anthropological Analysis of Structure and Change*. Oxford: Clarendon Press.
______. 1990. *Nature and Policy in Iceland 1400-1800. An Anthropological Analysis of History and Mentality*. Oxford: Clarendon.
______. 1990. Sandheden i den Historiske Antropologi. *Den Jyske Historiker*, vol. 50, pp. 81-93.
______. 1995. *A Passage to Anthropology. Between Experience and Theory*. London & New York: Routledge.
Heesen, Anke te. 2000. Boxes in Nature. *Studies in the History and Philosophy of Science*, vol. 31, no. 3, pp. 381-403.
Heilbron, J. L. 2000. Domesticating Science in the Eighteenth Century. In: William R. Shea (ed.), *Science and the Visual Image in the Enlightenment*. Canton, MA: Science History Publications. Pp. 1-24.
Hein, Hilde. 1972. The Endurance of the Mechanism-Vitalism Controversy. *Journal of the History of Biology*, vol. 5, no. 1, pp. 159-88.
Hertzfeld, Michael. 1987. *Anthropology Through the Looking Glass. Critical Ethnography at the Margins of Europe*. Cambridge: Cambridge University Press.
Hirsch, Eric. 1995. Introduction. Landscape: Between Place and Space. In: E. Hirsch and M. O'Hanlon (eds.), *The Anthropology of Landscape. Perspectives on Place and Space*. Oxford: Clarendon Press.
Hollis, Martin. 1982. The Social Destruction of Reality. In: Martin Hollis and Steven Lukes (eds.), *Rationality and Relativism*. Oxford: Basil Blackwell. Pp. 67-86.
Holmes, Geoffrey. 1979. The Professions and Social Change in England, 1680-1730. *Proceedings of the British Academy*, vol. LXV, pp. 312-54.
Hooper-Greenhill, Eilean. 1992. *Museums and the Shaping of Knowledge*. London & New York: Routledge.
Hopwood, A. Tindell. 1958. The Development of Pre-Linnaean Taxonomy. *Proceedings of the Linnean Society*, vol. 170, pp. 230-4.
Houghton, Walter E. 1942. The English Virtuoso in the Seventeenth Century. *Journal of the History of Ideas*, vol. 3, no. 1, pp. 51-73.
Houston, Robert Allen. 1986. British Society in the Eighteenth Century. *Journal of British Studies*, vol. 25, (October), pp. 436-66.
Hudson, Nicholas. 1994. *Writing and European Thought, 1600-1830*. Cambridge: Cambridge University Press.
Hull, D. 1965. The Effect of Essentialism on Taxonomy – Two Thousand Years of Stasis (Part I). *The British Journal for the Philosophy of Science*, vol. 15, pp. 314-26.
Hunn, E. 1977. *Tzeltal Folk Zoology*. New York: Academic Press.
Hunt, Margaret. 1996. *The Middling Sort: Commerce, Gender, and the Family in England, 1680-1780*. Berkeley & London: University of California Press.
Hunter, Michael. 1976. The Social Basis and Changing Fortunes of an Early Scientific Institution: An Analysis of the Membership of the Royal Society, 1660-1685. *Notes and Records*, vol. 31, pp. 9-114.
______. 1981. *Science and Society in Restoration England*. Cambridge: Cambridge University Press.
______. 1985. The Cabinet Institutionalised: The Royal Society's 'Repository' and Its Background. In: Oliver Impey

and Arthur MacGregor (eds.), *The Origin of Museums: The Cabinets of Curiosities in Sixteenth- and Seventeenth-Century Europe*. Oxford: Clarendon Press. Pp. 159-68.

______. 1995. *Science and the Shape of Orthodoxy. Intellectual Change in Late Seventeenth-Century Britain*. Woodbridge: The Boydell Press.

Haaning, Aksel. 1998. *Naturens Lys. Vestens Naturfilosofi i Højmiddelalder og Renæssance, 1250-1650*. København: C. A. Reitzels Forlag.

Jackson, Christine Elisabeth. 1998. *Sarah Stone. Natural Curiosities From the New Worlds*. London: Merrell Holberton Publisher & The Natural History Museum.

Jacob, James R. and Margaret C. Jacob 1980. The Anglican Origins of Modern Science: The Metaphysical Foundations of the Whig Constitution. *Isis*, vol. 71, pp. 251-67.

Jacob, Margaret C. 1976. *The Newtonians and the English Revolution*. Hassocks: The Harvester Press.

Jardine, Lisa and Anthony Grafton. 1990. "Studies for Action": How Gabriel Harvey Read His Livy. *Past & Present*, no. 129, pp. 30-78.

Jayawardene, S. A. 1996. *The Scientific Revolution. An Annotated Bibliography*. West Cornwall, CT: Locust Hill Press.

Johns, Adrian. 1996. The Physiology of Reading in Restoration England. In: James Raven, Helen Smalll, and Naomi Tadmor (eds.), *The Practice and Representation of Reading in England*. Cambridge: Cambridge University Press. Pp. 138-61.

______. 1998. *The Nature of the Book. Print and Knowledge in the Making*. Chicago and London: The University of Chicago University.

______. 2000. Miscellaneous Methods: Authors, Societies and Journals in Early Modern England. *British Journal for the History of Science*, vol. 33, no. 2, pp. 159-86.

Jones, William Powell. 1966. *The Rhetoric of Science. A Study of Scientific Ideas and Imagery in Eighteenth-Century English Poetry*. Berkeley & Los Angeles: University of California Press.

Jordan, Winthrop D. 1968. *White over Black: American Attitudes towards the Negro*. Chapel Hill: University of North Carolina Press.

Jordanova, Ludmilla. 1980. Natural Facts: A Historical Perspective on Science and Sexuality. In: Marilyn Strathern and Coral P. MacCormack (eds.), *Nature, Culture, Gender*. Cambridge: Cambridge University Press. Pp. 42-69.

______. 1986. Introduction. In: Ludmilla Jordanova (ed.), *Languages of Nature: Critical Essays on Science and Literature*. London: Free Association Books. Pp. 15-47.

______. 1986. Naturalizing the Family: Literature and the Bio-Medical Science in the Late Eighteenth Century. In: Ludmilla Jordanova (ed.), *Languages of Nature: Critical Essays on Science and Literature*. London: Free Association Books. Pp. 90-116.

Jørgensen, Bent. 1998. Paradisfuglene – Fra Fantasi til Virkelighed. *Naturens Verden*, pp. 1-14.

Jørgensen, Kirsten Winther. 1997. Pittoreske Prospekter. Landskab ifølge Gentlemen anno 1800. *Tidsskriftet Antropologi, Felter*, vol. 35-36, pp. 137-58.

Kearney, Hugh. 1970. *Scholars and Gentlemen. Universities and Society in Pre-Industrial Britain 1500-1700*. London: Faber & Faber.

Kemp, Martin. 1990. 'Taking It on Trust': Form and Meaning in Naturalistic Representation. *Archives of Natural History*, vol. 17, no. 2, pp. 127-88.

______. 1993. 'The Mark of Truth': Looking and Learning in Some Anatomical Illustrations From the Renaissance to the Nineteenth Century. In: W. F. Bynum and Roy Porter (eds.), *Medicine and the Five Senses*. New York: Cambridge University Press. Pp. 85-121.

Klein, Lawrence. 1993. Shaftesbury, Politeness and the Politics of Religion. In: W. Phillipson and Q. Skinner (eds.), *Political Discourse in Early Modern Britain*. Cambridge: Cambridge University Press. Pp. 283-301.

______. 1997. Coffee-House Civility, 1660-1714: An Aspect of Post-Courtly Culture in England. *Huntington Library Quarterly*, vol. 59, no. 1, pp. 31-51.

Knorr-Cetina, Karin. 1981. *The Manufacture of Knowledge. An Essay on the Constructivist and Contextual Nature of Science*. Oxford: Pergamon Press.

______. 1993. Strong Constructivism – From a Sociologist's Point of View: A Personal Addendum to Sismondo's Paper. *Social Studies of Science*, vol. 23, no. 3, pp. 555-63.

Knudsen, Anne. 1989. *En Ø i Historien. Korsika. Historisk Antropologi 1730-1914*. Basilisk.

Koerner, Lisbet. 1996. Purposes of a Linnaean Travel: A Preliminary Research Report. In: David Phillip Miller and Peter Hanns Reill (eds.), *Visions of Empire. Voyages, Botany, and Representations of Nature*. Cambridge, UK: Cambridge University Press. Pp. 117-52.

______. 1999. *Linnaeus: Nature and Nation*. Cambridge, Mass. & London: Harvard University Press.

Kohlstedt, Sally Gregory (ed.). 1999. *History of Women in the Sciences. Readings From Isis*. Chicago & London: The

University of Chicago Press.

Kopf, David. 1969. *British Orientalism and the Bengal Renaissance. The Dynamics of Indian Modernization 1773-1835* Berkeley and Los Angeles: University of California Press.

Kristensen, Jens Erik. 1993. Det Kuriøse og det Klassificerende Blik – Naturens samling og Forandring fra Renæssancens Samlere til det Moderne Naturhistoriske Museum med *Museum Wormianum* som Udgangspunkt. *Den Jyske Historker. Museum Europa. Om Tingenes Orden*, no. 64, pp. 31-44

Kuhn, Thomas S. 1996. *The Structure of Scientific Revolutions*, 3rd ed. (org. publ. 1962). Chicago & London Chicago University Press.

LaCapra, Dominick. 1985/1998. Rhetoric and History. In: Victor E. Taylor and Charles E. Winquist (eds.), *Postmodernism. Critical Concepts*. Vol. III. London & New York: Routledge. Pp. 69-90.

Laclau, Ernesto. 1988. Politics and the Limits of Modernity. In: Ross (ed.), *Universal Abandon*. Edinburgh: Edinburgh University Press. Pp. 63-82.

______. 1990. New Reflections on the Revolutions of Our Time. In: Ernesto Laclau, *New Reflections on the Revolutions of Our Time*. London: Verso. Pp. 3-84.

Lakoff, George. 1987. *Women, Fire and Dangerous Things. What Categories Reveal About the Mind*. Chicago University of Chicago Press.

Langford, Paul. 1989. *A Polite and Commercial People. England, 1727-1783*. Oxford: Clarendon Press.

Larson, James L. 1967. Linnæus and the Natural Method. *Isis*, vol. 58, pp. 304-20.

Latour, Bruno. 1983. Give Me a Laboratory and I Will Raise the World. In: Karin D. Knorr-Cetina and Michael Mulkay (eds.), *Science Observed. Perspectives on the Social Study of Science*. London: Sage Publications. Pp 141-70.

______. 1987. *Science in Action*. Milton Keynes: Open University Press.

Leach, Edmund. 1970. *Lévi-Strauss*. London: Fontana Modern Masters.

Lepenies, Wolf. 1976. *Das Ende der Naturgeschichte*. Munich: C. Hanser.

______. 1979. De l'Histoire naturelle à l'Histoire de la Nature. *Dix-huit siècle*, vol. 11, pp. 175-84.

Lévi-Strauss, Claude. 1962. *La Pensée Sauvage*. Paris: Librarie Plon.

______. 1964. *Totemism*. (Le totémisme aujourd'hui, org. publ. 1962; trans., Rodney Needham). London. Merlin Press.

______. 1969. *The Elementary Structures of Kinship*. (Les Structures Élémentaires De La Parenté, org publ 1949, trans., Harle James Bell, John Richard von Sturmer, and Rodney Needham). Boston: Beacon Press

______. 1971. The Deduction of the Crane. In: Pierre Maranda and Elli Köngäs Maranda (eds.), *Structural Analysis of Oral Tradition*. Philadelphia. Pp. 3-21.

Levine, George. 1994. Why Science Isn't Literature: The Importance of Differences. In: Allan Megill (ed.), *Rethinking Objectivity*. Durham & London: Duke University Press. Pp. 65-79.

Levine, Joseph M. 1977. *Dr.Woodward's Shield: History, Science and Satire in Augustan England*. Berkely, Los Angeles, London: University of California Press.

______. 1981-82. Ancients and Moderns Reconsidered. *Eighteenth-Century Studies*, vol. 15, pp. 72-89.

Lewontin, R. C. 1994. Facts and the Factitious in Natural Sciences. In: James Chandler, Arnold I. Davidson, and Harry Harootunian (eds.), *Questions of Evidence. Proof, Practice, and Persuasion Across the Disciplines* Chicago & London: The University of Chicago Press. Pp. 478-91.

Lindert, Peter H. and Jeffrey G. Williamson 1982. Revising England's Social Tables 1688-1812. *Explorations in Economic History*, vol. 19, pp. 385-408.

Lindroth, Sten. 1994. The Two Faces of Linnaeus. In: Tore Frängsmyr (ed.), *Linnaeus: The Man and His Work*, (org pub. 1983). Canton: Science History Productions. Pp. 1-62.

Lloyd, G. E. R. 1961. The Development of Aristotle's Theory of the Classification of Animals. *Phronesis*, vol. 6, pp 59-81.

Lovejoy, Arthur O. 1948. *The Great Chain of Being. A Study of the History of an Idea*. Cambridge, Mass.: Harvard University Press.

Lux, David S. 1991. The Reorganization of Science, 1450-1700. In: Bruce T. Moran (ed.), *Science, Technology, and Medicine at the European Court 1500-1750*. Rochester, N.Y & Woodbridge, Suffolk: The Boydell Press. Pp 185-94.

Lynch, Michael, Eric Livingston, and Harold Garfinkel. 1983. Temporal Order in Laboratory Work. In: Karin D Knorr-Cetina and Michael Mulkay (eds.), *Science Observed. Perspectives on the Social Study of Science*. London Sage Publications. Pp. 205-38.

Macgillivray, W. 1834. *Lives of Eminent Zoologists, From Aristotle to Linnæus: With Introductory Remarks on the Study of Natural History, and Occasional Observations on the Progress of Zoology*, 2nd ed. Edinburgh/London. Oliver & Boyd, Tweedale Court/Simpkin & Marshall.

MacGregor, Arthur. 1985. The Cabinet of Curiosities in Seventeenth-Century Britain. In: Oliver Impey and Arthur MacGregor (eds.), *The Origin of Museums: The Cabinets of Curiosities in Sixteenth- and Seventeenth-Century Europe*. Oxford: Clarendon Press. Pp. 147-58.

Mackay, David. 1996. Agents of Empire: The Banksian Collectors and Evaluation of New Lands. In: David P. Miller and Peter H. Reill (eds.), *Visions of Empire. Voyages, Botany, and Representations of Nature*. Cambridge: Cambridge University Press. Pp. 38-57.

Malinowski, Bronislaw. 1964. *Argonauts of the Western Pacific. An Account of Native Enterprise and Adventure in Archipelagoes of Melanesian*, (org. publ. 1922). London: Routledge & Kegan Paul LTD.

Mannheim, Karl. 1966. *Ideology and Utopia. An Introduction to the Sociology of Knowledge*. (Ideologie und Utopie, org. publ. 1929; trans., Louis Wirth and Edward Shils). London & Henley: Routledge & Kegan Paul.

Markley, Robert. 1987. Style As Philosophical Structure: The Contexts of Shaftesbury's Characteristicks. In: Robert Ginsberg (ed.), *The Philosopher As Writer: The Eighteenth Century*. Selinsgrove/London & Toronto: Susquehanna University Press/Associated University Presses. Pp. 140-54.

Marshall, P. J. and Glydwr Williams. 1982. *The Great Map of Mankind. British Perceptions of the World in the Age of Enlightenment*. London, Melboune, Toronto: J. M. Dent and Son Ltd.

Martin, Edward A. 1897/1970. *A Bibliography of Gilbert White, the Naturalist and Antiquarian of Selborne. With a Biography and a Descriptive Account of the Village of Selborne*. Folkestone and London: Dawsons of Pall Mall.

Martin, Julian. 1992. *Francis Bacon, the State, and the Reform of Natural Philosophy*. Cambridge: Cambridge University Press.

Mauss, Marcel. 1969. *The Gift. Forms and Functions of Exchange in Archaic Societies*. (Essai sur le don, Forme archaïque de l'echange, org. publ. 1925; trans., Ian Cunnison). London: Cohen & Weat LTD.

Mayr, Ernst. 1982. *The Growth of Biological Thought, Diversity, Evolution, and Inheritance*. Cambridge, Mass. & London: The Belknap Press of Harvard University Press.

McClellan III, James E. 1985. *Science Reorganized. Scientific Societies in the Eighteenth Century*. New York: Columbia University Press.

McIntosh, Carey. 1986. *Common and Courtly Language: The Stylistics of Social Class in Eighteenth-Century English Literature*. Philadelphia: University of Pennsylvania Press.

McOuat, Gordon. 2001. Cataloguing Power: Delineating 'Competent Naturalists' and the Meaning of Species in the British Museum. *British Journal for the History of Science*, vol. 34, no. 1, pp. 1-28.

Megill, Allan (ed.). 1994. *Rethinking Objectivity*. Durham & London: Duke University Press.

Mendelsohn, Everett. 1964. The Emergence of Science as a Profession in Nineteenth-Century Europe. In: Karl Hill (ed.), *The Management of Scientists*. Boston: Beacon Press. Pp. 3-48.

Merchant, Carolyn. 1980. *The Death of Nature. Women, Ecology, and the Scientific Revolution*. San Francisco: Harper & Row, Publishers.

Merton, Robert K. 1938. Science, Technology and Society in Seventeenth-Century England. *Oriris*, vol. IV, pp. 360-632.

______. 1973. The Puritan Spur to Science. In: Robert K. Merton *The Sociology of Science. Theoretical and Empirical Investigations* (org. pub. 1938). Chicago & London: The University of Chicago Press.

Miller, David Philip. 1996. Joseph Banks, Empire, and "Centres of Calculation" in Late Hanoveian London. In: David Philip Miller and Peter Hanns Reill (eds.), *Visions of Empire. Voyages, Botany, and Representations of Nature*. Cambridge, UK: Cambridge University Press. Pp. 21-37.

Miller, David Philip and Reill, Peter Hanns (eds.). 1996. *Visions of Empire. Voyages, Botany, and Representations of Nature*. Cambridge: Cambridge University Press.

Milton, John R. 1981. The Origin and Development of the Concept of the 'Laws of Nature'. *Archives Européennes de Sociologie*, vol. 22, no. 2, pp. 173-95.

Money, John. 1993. Teaching in the Market-Place, or 'Caesar Adsum Iam Forte: Pompey Aderat': The Retailing of Knowledge in Provincial England During the Eighteenth Century. In: John Brewer and Roy Porter (eds.), *Consumption and the World of Goods*. London: Routledge. Pp. 335-77.

Monfasani, John. 1995. The Pseudo-Aristotelian *Problemata* and Aristotle's *De Animalibus* in the Renaissance. In: Anthony Grafton and Nancy Siraisi (eds.), *Natural Particulars. Nature and Disciplines in Renaissance Europe*. Cambridge, Mass & London: The MIT Press. Pp. 205-47.

Mouthaan, Johanna. n.d. *A Comparative Study of the Belief in Miracles in Early Modern Italy and the Dutch Republic*. Thesis. Department of History and Civilisation, The European University Institute.

Mulkay, Michael. 1979. *Science and the Sociology of Knowledge*. London, Boston, Sidney: George Allen & Unwin.

Myers, Greg. 1990. *Writing Biology: Texts in the Social Construction of Scientific Knowledge*. Madison, WI: The University of Wisconsin Press.

Nagel, Thomas. 1986. *The View From Nowhere*. New York and Oxford: Oxford University Press.

Needham, Rodney. 1975. Polythetic Classification: Convergence and Consequences. *Man (N.S.)*, vol. 10, no. 3, pp. 349-69.

Newton-Smith, W. 1982. Relativism and the Possibility of Interpretation. In: Martin Hollis and Steven Lukes (eds.), *Rationality and Relativism*. Oxford: Basil Blackwell. Pp. 106-22.

______. 1990. Realism. In: R. C. Olby, G. N. Cantor, J. R. R. Christie, and M. J. S. Hodge (eds.), *Companion to the History of Modern Science*. London & New York: Routledge. Pp. 181-95.

Nissen, Claus. 1978. *Die Zoologische Buchillustration. Ihre Bibliographie und Geschichte*. Vol. I-II. Stuttgart: Anton Hiersmann.

O'Brien, Karen. 1997. *Narratives of Enlightenment. Cosmopolitan History From Voltaire to Gibbon*. Cambridge: Cambridge University Press.

O'Day, Rosemary. 2000. *The Professions in Early Modern England, 1450-1800*. London: Longman.

Ong, Walter J. 1983. *Ramus. Method and the Decay of Dialogue* (org. 1958). Cambridge, Mass. And London: Harvard University Press.

Ophir, Adi and Steven Shapin. 1991. The Place of Knowledge. A Methodological Survey. *Science in Context*, vol. 4, pp. 3-21.

Osler, Margaret J. 1970. John Locke and the Changing Ideal of Scientific Knowledge. *Journal of the History of Ideas*, vol. XXXI, no. 1, pp. 1-16.

Ospovat, Dov. 1981. *The Development of Darwin's Theory: Natural History, Natural Theology and Natural Selection, 1838-1859*. Cambridge: Cambridge University Press.

Ovenell, R. F. 1986. *The Ashmolean Museum, 1683-1894*. Oxford: Clarendon Press.

Peck, A. L. 1965. Introduction. In: Aristotle, *History of Animals*, Loeb Classical Library, Aristotle, vol. IX. Cambridge, Mass./London, Eng.: Harvard University Press. Pp. iii-lxi.

Peirce, Charles Sanders. 1994. *Semiotik og Pragmatisme*. (Selection of papers; trans. Lars Andersen). København: Gyldendal.

Pellegrin, Pierre. 1986. *Aristotle's Classification of Animals: Biology and the Conceptual Unity of the Aristotelian Corpus*, (La classification des Animaux chez Aristote: statut de la biologie et unité de l'aristotélisme, org. pub. 1982; trans., Anthony Preus). Berkeley and Los Angeles: University of California Press.

Petit, Georges and Jean Théodoridès. 1962. *Histoire de la Zoologie des Orgines à Linné*. Paris: Hermann.

Phillipson, N. T. 1975. Culture and Society in the Eighteenth-Century Province: The Case of Edinburgh and the Scottish Enlightenment. In: Lawrence Stone (ed.), *The University in Society*. Vol. II. Princeton: Princeton University Press. Pp. 407-48.

Pieters, Florence F. J. M. 1980. Notes on the Menagerie and Zoological Cabinet of Stadholder William V of Holland, Directed by Aernout Vosmaer. *Journal of the Society for the Bibliography of Natural History*, vol. 4, pp. 539-63.

Pilkington, A. E. 1986. 'Nature' As Ethical Norm in the Enlightenment. In: Ludmilla Jordanova (ed.), *Languages of Nature: Critical Essays on Science and Literature*. London: Free Association Books. Pp. 55-85.

Pocock, J. G. A. 1973. *Politics, Language and Time. Essays on Political Thought and History*. New York: Atheneum.

______. 1976. Between Machiavelli and Hume: Gibbon As Civic Humanist and Philosophical Historian. *Dædalus*, vol. 105 (Summer), pp. 153-69.

______. 1985. *Virtue, Commerce, and History. Essays on Political Thought and History, Chiefly in the Eighteenth Century*. Cambridge: Cambridge University Press.

Pomian, Krzysztof. 1990. *Collectors and Curiosities: Paris and Venice, 1500-1800*. (Collectionneurs, Amateurs et Curieux, org. publ. 1987; trans., Elizabeth Wiles-Portier). Cambridge: Polity Press.

______. 1993. Museet: Europas Kvintessens. *Den Jydske Historiker. Museum Europa. Om Tingenes Orden*, no. 64 (trans., Manni Crone), pp. 11-8.

Popper, Karl. 1973. *Kritisk Rationalisme. Udvalgte Essays om Videnskab og Samfund*. (Selection of essays, org. publ. 1945-72, trans., Knud Haakonssen and Niels Christian Stefansen). København: Nyt nordisk forlag, Arnold Busck.

Porter, Roy. 1982. *English Society in the Eighteenth Century*. Harmondsworth.

______. 2000. *Enlightenment. Britain and the Creation of the Modern World*. London: Penguin Books.

Porter, Roy and Miculas Teich (eds.). 1992. *The Scientific Revolution in National Context*. Cambridge: Cambridge University Press.

Pratt, Mary Louise. 1992. *Imperial Eyes. Travel Writing and Transculturation*. London & New York: Routledge.

Price, John Valdimir. 1982. The Reading of Philosophical Literature. In: Isabel Rivers (ed.), *Books and Their Readers in Eighteenth-Century England*. Leicester: Leicester University Press. Pp. 165-96.

Rappaport, Rhoda. 1982. Borrowed Words: Problems of Vocabulary in Eighteenth-Century Geology. *British Journal for the History of Science*, vol. 15, no. 1, pp. 27-44.

Raven, Charles E. 1947. *English Naturalists From Neckham to Ray*. Cambridge.

______. 1986. *John Ray. Naturalist. His Life and Works*, 2nd ed. (org. pub. 1950). Cambridge: Cambridge University Press.

Raven, James, Helen Small and Naomi Tadmor (eds.). 1996. *The Practice and Representation of Reading in England*. Cambridge: Cambridge University Press.

Rice, Tony. 2000. *Voyages. Trois Siècles d'Explorations Naturalistes*. (Voyages of Discovery. Three Centuries of Natural History Exploration, org. publ. 1999, trans., Patrice Lerant). Paris: Delachaux et Niestlé.

Richetti, John. 1983. *Philosophical Writing: Locke, Berkeley, Hume*. Cambridge, Mass.: Harvard University Press.

Rigotti, Francesca. 1986. Biology and Society in the Age of Enlightenment. *Journal of the History of Ideas*, vol. XLVII, no. 2, pp. 215-33.

Ritterbush, Phillip C. 1969. Art and Science as Influences on the Early Modern Development of Natural History Collections. *Proceedings of the biological Society of Washington*, vol. 86, pp. 3-48.

Rivers, Isabel (ed.). 1982. *Books and Their Readers in Eighteenth-Century England*. Leicester: Leicester University Press.

Robertson, John. 1983. The Scottish Enlightenment at the Limits of the Civic Tradition. In: Istvan Hont and Michael Ignatieff (eds.), *Wealth and Virtue: The Shaping of Political Economy in the Scottish Enlightenment*. Cambridge. Pp. 137-78.

Roger, Jacques. 1980. The Living World. In: G. S. Rousseau and Roy Porter (eds.), *The Ferment of Knowledge. Studies in the Historiography of Eighteenth-Century Science*. Cambridge: Cambridge University Press.

______. 1997. *The Life Sciences in Eighteenth-Century French Thought*. (Les Sciences de la Vie dans la Pensée française du XVIII Siècle: La Génération des Animaux de Decartes à l'Encyclopédie, org. publ. 1963; trans., Robert Ellrich). Stanford: Stanford University Press.

______. 1997. *Buffon. A Life in Natural History*. (Buffon, un Philosophe au Jardin Du Roi, org. publ. 1989; trans., Sarah Lucille Bonnefoi). Ithaca & London: Cornell University Press.

Rorty, Richard. 1980. *Philosophy and the Mirror of Nature*. Oxford, UK & Cambridge, Mass.: Blackwell.

Rosch, Eleanor. 1978. Principles of Categorisation. In: E. Rosch and B. B. Lloyd (eds.), *Cognition and Categorisation*. Hillsdale: Lawrence Erlbaum Associates, Publishers. Pp. 27-48.

Rousseau, G. S. 1982. Science Books and Their Readers in the Eighteenth Century. In: Isabel Rivers (ed.), *Books and Their Readers in Eighteenth-Century England*. Leicester: Leicester University Press. Pp. 197-255.

Ruby, Jane E. 1986. The Origins of Scientific 'Laws'. *Journal of the History of Ideas*, vol. 47, no. 3, pp. 341-59.

Rudwick, Martin J. S. 1976. The Emergence of a Visual Language for Geological Science, 1760-1840. *History of Science*, vol. XIV, pp. 149-95.

Sahlins, Marshall. 1981. *Historical Metaphors and Mythical Realities. Structure in the Early History of the Sandwich Islands Kingdom*. Ann Arbor: The University of Michigan Press.

______. 1985. *Island of History*. London & New York: Tavistock Publications.

______. 1995. *How "Natives" Think. About Captain Cook, for Example*. Chicago: The University of Chicago Press.

Sandblad, Henrik. 1974. Linneask Pastoral. En Miljöstudie kring Clas Bjerkander. In: Gunnar Eriksson, Tore Frängsmyr, and Magnus von Platen (eds.), *Vetenskapens Träd. Idéhistorisa Studier Tillägnade Sten Lindroth. 28.XII.1974*. Stockholm: Wahlström & Widstrand. Pp. 117-56.

Sapir, Edward. 1968. The Status of Linguistics as a Science. In: D. G. Mandelbaum (ed.), *Selected Writings of Edward Sapir* (org. pub. 1929). Los Angeles: Univesity of California Press.

Sarasohn, Lisa T. 1984. A Science Turned Upside Down: Feminism and the Natural Philosophy of Margaret Cavendish. *Huntington Library Quarterly*, vol. 47, pp. 289-307.

______. 1999. Thomas Hobbes and the Duke of Newcastle. A Study in the Mutuality of Patronage Before the Establishment of the Royal Society. *Isis*, vol. 90, pp. 715-37.

Saussure, Ferdinand de. 1995. *Course in General Linguistics*. (Cours de linguistique générale, org. publ. 1916; trans., Roy Harris). London: Duckworth.

Schaffer, Simon. 1983. Natural History and Public Spectacle in the Eighteenth Century. *History of Science*, vol. 21, no. 1, pp. 1-43.

______. 1984. Making Certain (Review of Barbara Shapiro: 'Probability and Certainty'). *Social Studies of Science*, vol. 14, pp. 137-52.

______. 1994. Self Evidence. In: James Chandler, Arnold Davidson, and Harry Harootunian (eds.), *Questions of Evidence. Proof, Practice, and Persuasion Across the Disciplines*. Chicago & London: The University of Chicago Press. Pp. 56-91.

Schiebinger, Londa. 1987. The History and Philosophy of Women in Science: A Review Essay. *Signs: Journal of Women in Culture and Society*, vol. 12, no. 2, pp. 305-32.

______. 1993. *Nature's Body. Gender in the Making of Modern Science*. Boston: Beacon Press.

______. 1999. Maria Winkelmann at the Berlin Academy: A Turning Point for Women in Science. In: Sally Gregory Kohlstedt (ed.), *History of Women in the Sciences. Readings From Isis*. Chicago & London: The University of

Chicago Press. Pp. 39-65.

Schneider, David. 1968. *American Kinship: A Cultural Account*. Englewood Cliffs: Prentice-Hall.

Schofield, R. S. 1968. The Measurement of Literacy in Pre-Industrial England. In: Jack Goody (ed.), *Literacy in Traditional Societies*. Cambridge: Cambridge University Press. Pp. 311-25.

Schupbach, William. 1985. Some Cabinets of Curiosities in European Academic Institutions. In: Oliver Impey and Arthur MacGregor (eds.), *The Origin of Museums: The Cabinets of Curiosities in Sixteenth- and Seventeenth-Century Europe*. Oxford: Clarendon Press. Pp. 169-78.

Shanley, Mary Lyndon. 1982. Marriage Contract and Social Contract in Seventeenth-Century English Political Thought. In: Jean Bethke Elshtain (ed.), *The Family in Political Thought*. Sussex: The Harvester Press. Pp. 80-95.

Shapin, Steven. 1981. Of Gods and Kings: Natural Philosophy and Politics in the Leibniz-Clarke Disputes. *Isis*, vol. 72, pp. 187-215.

______. 1988. The House of Experiment in Seventeenth-Century England. *Isis*, vol. 79, pp. 373-404.

______. 1990. Science and the Public. In: R. C. Olby, G. N. Cantor, J. R. R. Christie, and M. J. S. Hodge (eds.), *Companion to the History of Modern Science*. London & New York: Routledge. Pp. 990-1007.

______. 1994. *A Social History of Truth. Civility and Science in Seventeenth-Century England*. Chicago & London: The University of Chicago Press.

______. 1995. Here and Everywhere: Sociology of Scientific Knowledge. *Annual Review of Sociology*, vol. 21, pp. 289-321.

______. 1996. *The Scientific Revolution*. Chicago & London: The University of Chicago Press.

Shapin, Steven and Simon Schaffer. 1985. *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*. Princeton: Princeton University Press.

Shapiro, Barbara. 1969. *John Wilkins, 1614-1672. An Intellectual Biography*. Berkeley & Los Angeles: University of California Press.

______. 1983. *Probability and Certainty in Seventeenth-Century England. A Study of the Relationship Between Natural Science, Religion, History, Law, and Literature*. Princeton: Princeton University Press.

Shea, William R. (ed.). 2000. *Science and the Visual Image in the Enlightenment*. Canton, MA: Science History Publications.

Simpson, A. D. C. 1984. Newton's Telescope and the Cataloguing of the Royal Society's Repository. *Notes and Records of the Royal Society*, vol. 38, no. 1, pp. 187-214.

Sismondo, Sergio. 1993. Some Social Constructions. *Social Studies of Science*, vol. 23, no. 3, pp. 515-53.

______.1993. Response to Knorr-Cetina. *Social Studies of Science*, vol. 23, no. 3, pp. 563-69.

Sjørslev, Inger. 1990. At Standse ved Tingen. Fetishen som Ting og Begreb. *Tidsskriftet Antropologi, Ordentlige Ting*, vol. 21/22, pp. 29-44.

Skinner, Andrew. 1999. Analytical Introduction. In: Adam Smith *The Wealth of Nations*. Vol. I-II, (ed. Andrew Skinner). London: Penguin. Pp. 8-96.

Sloan, Phillip R. 1972. John Locke, John Ray, and the Problem of the Natural System. *Journal of the History of Biology*, vol. 5, no. 1, pp. 1-53.

______. 1976. The Buffon-Linnæus Controversy. *Isis*, no. 67, pp. 356-75.

______. 1986. Darwin, Vital Matter, and the Transformation of Species. *Journal of the History of Biology*, vol. 19, no. 3, pp. 369-445.

______. 1990. Natural History, 1670-1802. In: R. C. Olby, G. N. Cantor, J. R. R. Christie, and M. J. S. Hodge (eds.), *Companion to the History of Modern Science*. London & New York: Routledge. Pp. 295-313.

Smith, Bernard S. 1960. *European Vision and the South Pacific, 1768-1850. A Study in the History of Art and Ideas*. Oxford: The Clarendon Press.

Solomon, Julie Robin. 1998. Prologue. Whys and Wherefores. In: *Objectivity in the Making. Francis Bacon and the Politics of Inquiry*. Baltimore & London: The Johns Hopkins University Press. Pp. xi-xix.

Spary, E. C. 1999. The 'Nature' of Enlightenment. In: William Clark, Jan Golinski, and Simon Schaffer (eds.), *The Sciences in Enlightened Europe*. Chicago & London: The University of Chicago Press. Pp. 272-305.

Spear, Percival. 1961. The British in India. In: Percival Spear, *India. A Modern History*. Ann Arbor: The University of Michigan Press.

Sperber, D. 1975. Pourqois les Animaux parfaits, les Hybrids et les Monstres sont-ils bon à penser symboliquement? *L'homme*, vol. 15, no. 2, pp. 5-34.

Stafford, Barbara M. 1996. Images of Ambiguity: Eighteenth-Century Microscopy and the Neither/Nor. In: David Philip Miller and Peter Hanns Reill (eds.), *Visions of Empire. Voyages, Botany, and Representations of Nature*. Cambridge: Cambridge University Press. Pp. 230-57.

Stafleu, Frans A. 1971. *Linnaeus and the Linnaeans: The Spreading of their Ideas in Systematic Botany, 1735-1789*. Utrecht:

Oosthoek.

Stearn, William T. 1959. The Background of Linnaeus' Contributions to the Nomenclature and Methods of Systematic Biology. *Systematic Zoology*, vol. 8, pp. 4-22.

Stemerding, Dirk. 1991. *Plants, Animals, and Formulae: Natural History in the Light of Latour's 'Science in Action' and Foucault's 'The Order of Things'*. Enschede: Faculteit Wijsbegeerte en Maatschappijwetenschappen, Universiteit Twente.

Stephen, Leslie and others (eds.). 1885-1901. *Dictionary of National Biography*. Vol. I-LXIII. London: Smith, Elder, & Co.

Stevens, P. F. 1984. Metaphors and Typology in the Development of Botanical Systematics, 1690-1960, or the Art of Putting New Wine in Old Bottles. *Taxon*, vol. 33, no. 2, pp. 169-221.

Stewart, Larry. 1986. Public Lectures and Private Patronage in Newtonian England. *Isis*, vol. 77 (March), pp. 47-58.

Stjernfelt, Frederik. 1997. *Rationalitens Himmel og andre Essays*. København: Gyldendal.

Stone, Lawrence. 1975. The Size and Composition of the Oxford Student Body 1580-1910. In: Lawrence Stone (ed.), *The University in Society. Oxford and Cambridge From the 14th to the Early 19th Century*. Vol. I. Princeton: Princeton University Press. Pp. 3-110.

Stone, Lawrence and Jeanne C. Fawtier Stone. 1984. *An Open Elite? England 1540-1880*. Oxford: Carendon Press.

Strathern, Marilyn and MacCormack, Carol P. (eds.). 1980. *Nature, Culture, Gender*. Cambridge: Camridge University Press.

Swales, John M. 1990. *Genre Analysis. English in Academic and Research Settings*. Cambridge: Cambridge University Press.

Sörling, Sverker. 1993. Offer for en Samler. *Den Jyske Historiker. Museum Europa. Om Tingenes Orden*, no. 64, pp. 53-62.

Taylor, Charles. 1989. *Sources of the Self. The Making of Modern Identity*. Cambridge: Cambridge University Press.

Thirsk, John. 1969. Younger Sons in the Seventeenth Century. *History*, vol. 54, no. 182, pp. 358-77.

Thomas, Keith. 1983. *Man and the Natural World. Changing Attitudes in England 1500-1800*. London: Routledge.

Thompson, E. P. 1993. *Customs in Common* (org. 1991). London: Penguin Books.

Tinker, Chauncey B. 1922. *Nature's Simple Plan. A Phase of Radical Thought in the Mid-Eighteenth Century*. Princeton/London: Princeton University Press/Humphrey Milford, Oxford University Press.

Trouillot, Michel-Rolph. 1991. Anthropology and the Savage Slot. The Poetics and Politics of Otherness. In: Richard G. Fox (ed.), *Recapturing Anthropology, Working in the Present*. Santa Fee/Washington: School of American Research Press. Pp. 17-44.

Trumbach, Randolph. 1978. *The Rise of the Egalitarian Family: Aristocratic Kinship and Domestic Relations in Eighteenth-Century England*. New York: Academic Press.

Turner, Victor. 1967. *The Forest of Symbols. Aspects of Ndembu Ritual*. Ithaca and London: Cornell University Press.

Wear, Andrew. 1983. William Harvey and the 'Way of the Anatomists'. *History of Science*, vol. 21, pp. 223-49.

Weber, Max. 1948/1970. Science As a Vocation. In: *From Max Weber: Essays in Sociology*, (ed. and trans. H. H. Gerth and C. Wright Mills). London: Routledge & Kegan Paul. Pp. 129-56.

White, Hayden. 1985. *Tropics of Discourse. Essays in Cultural Criticism* (org. publ. 1978). Baltimore and London: The Johns Hopkins University Press.

Whitehead, P. J. P. 1969. Zoological Specimens From Captain Cook's Voyages. *Journal of the Society for the Bibliography of Natural History*, vol. 5, no. 3, pp. 161-201.

______. 1970. Museums in the History of Zoology (Part II). *Museums Journal*, vol. 70, pp. 155-60.

Whorf, Benjamin L 1952. Language, Mind and Reality. *ETC: A Review of General Semantics*, vol. 9, no. 3.

Wilton, Andrew and Bignamini, Ilaria (eds.). 1996. *Grand Tour. The Lure of Italy in the Eighteenth Century*. London: Tate Gallery Publishing.

Winsor, Mary P. 1976. *Starfish, Jellyfish, and the Order of Life*. New Haven: Yale University Press.

Wolker, Robert. 1978. Perfectible Apes in Decadent Cultures: Rousseau's Anthropology Revisited. *Daedalus*, vol. 107, pp. 107-34.

Wood, Paul. 1992. The Scientific Revolution in Scotland. In: Roy Porter and Mikulas Teich (eds.), *The Scientific Revolution in National Context*. Cambridge: Cambridge University Press.

Yearley, Steven. 1981. Textual Persuasion: The Role of Social Accounting in the Construction of Scientific Arguments. *The Philosophy of Social Sciences*, vol. 11, no. 3, pp. 409-35.

Yerkes, Robert and Ada Yerkes. 1929. *The Great Apes: A Study of Anthropoid Life*. New Haven: Yale University Press.

Zaret, David. 1992. Religion, Science and Printing in the Public Spheres in Late Seventeenth-Century England. In: Craig Calhoun (ed.), *Habermas and the Public Sphere*. Cambridge, MA: The MIT Press. Pp. 212-35.

Aarsleff, Hans. 1982. *From Locke to Saussure. Essays in the Study of Language and Intellectual History*. London: Athlone.