Michel Foucault, THE ORDER OF THINGS
An Archaeology of the Human Sciences

A translation of Les Mots et les choses (1966)

CHAPTER 5: Classifying

I. WHAT THE HISTORIANS SAY

Histories of ideas or of the sciences - by which is meant here an average cross-section of them - credit the seventeenth century, and especially the eighteenth, with a new curiosity: the curiosity that caused them, if not to discover the sciences of life, at least to give them a hitherto unsuspected scope and precision. A certain number of causes and several essential manifestations are traditionally attributed to this phenomenon.

On the side of origins or motives, we place the new privileges accorded to observation: the powers attributed to it since Bacon and the technical improvements introduced in it by the invention of the microscope. Alongside these is set the then recently attained prestige of the physical sciences, which provided a model of rationality; since it had proved possible, by means of experimentation and theory, to analyse the laws of movement or those governing the reflection of light beams, was it not normal to seek, by means of experiments, observations, or calculations, the laws that might govern the more complex but adjacent realm of living beings? Cartesian mechanism, which subsequently proved an obstacle, was used at first, the historians tell us, as a sort of instrument of transference, and led, rather in spite of itself, from mechanical rationality to the discovery of that other rationality which is that of the living being. Still on the side of causes, and in a somewhat pell-mell fashion, the historians of ideas place a variety of new interests: the economic attitude towards agriculture - the Physiocrats' beliefs were evidence of this, but so too were the first efforts to create an agronomy; then, half-way between husbandry and theory, a curiosity with regard to exotic plants and animals, which attempts were made to acclimatize, and of which the great voyages of inquiry or exploration - that of Toumefort to the Middle East, for example, or that of Adanson to Senegal - brought back descriptions, engravings, and specimens; and then, above all, the ethical valorization of nature, together with the whole of that movement, ambiguous in its principle, by means of which - whether one was an aristocrat or a bourgeois - one 'invested' money and feeling into a land that earlier periods had for so long left fallow. Rousseau, at the heart of the eighteenth century, was a student of botany.

In their list of manifestations, the historians then include the varied forms that were taken by these new sciences of life, and the 'spirit', as they put it, that directed them. Apparently, under

the influence of Descartes, they were mechanistic to begin with, and continued to be so to the end of the seventeenth century; then the first efforts of an infant chemistry made its imprint upon them, but throughout the eighteenth century the vitalist themes are thought to have attained or returned to their privileged status, finally coalescing to form a unitary doctrine - that 'vitalism' which in slightly differing forms was professed by Bordeu and Barthes in Montpellier, by Blumenbach in Germany, and by Diderot then Bichat in Paris. Under these different theoretical regimens, questions were asked that were almost always the same but were given each time a different solution: the possibility of classifying living beings-some, like Linnaeus, holding that all of nature can be accommodated within a taxonomy, others, like Buffon, holding that it is too rich and various to be fitted within so rigid a framework; the generative process, with the more mechanistically minded in favour of preformation, and others believing in the specific development of germs; analysis of functions (circulation after Harvey, sensation, motivity, and, towards the end of the century, respiration).

After examining these problems and the discussions they give rise to, it is simple enough for the historians to reconstruct the great controversies that are said to have divided men's opinions and passions, as well as their reasoning. By these means they believe that they can discover the traces of a major conflict between a theology that sees the providence of God and the simplicity, mystery, and foresight of his ways residing beneath each form and in all its movements, and a science that is already attempting to define the autonomy of nature. They also recognize the contradiction between a science still too attached to the old pre-eminence of astronomy, mechanics, and optics, and another science that already suspects all the irreducible and specific contents there may be in the realms of life. Lastly, the historians see the emergence, as though before their very eyes, of an opposition between those who believe in the immobility of nature - in the manner of Tournefort, and above all Linnaeus - and those who, with Bonnet, Benoit de Maillet, and Diderot, already have a presentiment of life's creative powers, of its inexhaustible power of transformation, of its plasticity, and of that movement by means of which it envelops all its productions, ourselves included, in a time of which no one is master. Long before Darwin and long before Lamarck, the great debate on evolution would appear to have been opened by the Telliamed, the Pahngencsie and the Reve de d'Alembert. Mechanism and theology, supporting one another or ceaselessly conflicting with one another, tended to keep the Classical age as close as possible to its origin - on the side of Descartes and Malebranche; whereas, opposite them, irreligion and a whole confused intuition of life, conflicting in turn (as in Bonnet) or acting as accomplices (as with Diderot), are said to be drawing it towards its imminent future - towards the nineteenth century, which is supposed to have provided the still obscure and fettered endeavours of the eighteenth with their positive and rational fulfilment in a science of life which did not need to sacrifice rationality in order to preserve in the very quick of its consciousness the specificity of living things, and that somewhat subterranean warmth which circulates between them - the object of our knowledge - and us, who are here to know them.

It would be pointless to go back over the presuppositions inherent in such a method. Let it suffice here to point out its consequences: the difficulty of apprehending the network that is able to link together such diverse investigations as attempts to establish a taxonomy and microscopic observations; the necessity of recording as observed facts the conflicts between those who were fixists and those who were not, or between the experimentalists and the partisans of the system; the obligation to divide knowledge into two interwoven fabrics when in fact they were alien to one another - the first being defined by what was known already and from elsewhere (the Aristotelian or scholastic inheritance, the weight of Cartesianism, the prestige of Newton), the second by what still remained to be known (evolution, the specificity of life, the notion of organism); and above all the application of categories that are strictly anachronistic in relation to this knowledge. Obviously, the most important of all these refers to life. Historians want to write histories of biology in the eighteenth century; but they do not realize that biology did not exist then, and that the pattern of knowledge that has been familiar to us for a hundred and fifty years is not valid for a previous period. And that, if biology was unknown, there was a very simple reason for it: that life itself did not exist. All that existed was living beings, which were viewed through a grid of knowledge constituted by natural history.

II. NATURAL HISTORY

How was the Classical age able to define this realm of 'natural history', the proofs and even the unity of which now appear to us so distant, and as though already blurred? What is this field in which nature appeared sufficiently close to itself for the individual beings it contained to be classified, and yet so far removed from itself that they had to be so by the medium of analysis and reflection?

One has the impression - and it is often expressed - that the history of nature must have appeared as Cartesian mechanism ebbed. When it had at last become clear that it was impossible to fit the entire world into the laws of rectilinear movement, when the complexity of the vegetable and animal kingdoms had sufficiently resisted the simple forms of extended substance, then it became necessary for nature to manifest itself in all its strange richness; and the meticulous observation of living beings was thus born upon the empty strand from which Cartesianism had just withdrawn. Unfortunately, things do not happen as simply as that. It is quite possible - though it would be a matter requiring careful scrutiny - that one science can arise out of another; but no science can be generated by the absence of another, or from another's failure, or even from some obstacle another has encountered. In fact, the possibility of natural history, with Ray, Jonston, Christophorus Knauth, is contemporaneous with Cartesianism itself, and not with its failure. Mechanism from Descartes to d'Alembert and natural history from Tournefort to Daubenton were authorized by the same episteme.

For natural history to appear, it was not necessary for nature to become denser and more obscure, to multiply its mechanisms to the point of acquiring the opaque weight of a history that can only be retraced and described, without any possibility of measuring it, calculating it, or explaining it; it was necessary - and this is entirely the opposite-for History to become Natural. In the sixteenth century, and right up to the middle of the seventeenth, all that existed was histories: Belon had written a History of the nature of birds; Duret, an Admirable history of plants; Aldrovandi, a History of serpents and dragons. In 1657, Jonston published a Natural history of quadrupeds. This date of birth is not, of course, absolutely definitivel[1]; it is there only to symbolize a landmark, and to indicate, from afar, the apparent enigma of an event. This event is the sudden separation, in the realm of Historia, of two orders of knowledge henceforward to be considered different. Until the time of Aldrovandi, History was the inextricable and completely unitary fabric of all that was visible of things and of the signs that had been discovered or lodged in them: to write the history of a plant or an animal was as much a matter of describing its elements or organs as of describing the resemblances that could be found in it, the virtues that it was thought to possess, the legends and stories with which it had been involved, its place in heraldry, the medicaments that were concocted from its substance, the foods it provided, what the ancients recorded of it, and what travelers might have said of it. The history of a living being was that being itself, within the whole semantic network that connected it to the world. The division, so evident to us, between what we see, what others have observed and handed down, and what others imagine or naively believe, the great tripartition, apparently so simple and so immediate, into Observation, Document, and Fable, did not exist. And this was not because science was hesitating between a rational vocation and the vast weight of naive tradition, but for the much more precise and much more constraining reason that signs were then part of things themselves, whereas in the seventeenth century they become modes of representation.

When Jonston wrote his Natural history of quadrupeds, did he know any more about them than Aldrovandi did, a half-century earlier? Not a great deal more, the historians assure us. But that is not the question. Or, if we must pose it in these terms, then we must reply that Jonston knew a great deal less than Aldrovandi. The latter, in the case of each animal he examined, offered the reader, and on the same level, a description of its anatomy and of the methods of capturing it; its allegorical uses and mode of generation; its habitat and legendary mansions; its food and the best ways of cooking its flesh. Jonston subdivides his chapter on the horse under twelve headings: name, anatomical parts, habitat, ages, generation, voice, movements, sympathy and antipathy, uses, medicinal uses [2]. None of this was omitted by Aldrovandi, and he gives us a great deal more besides. The essential difference lies in what is missing in Jonston. The whole of animal semantics has disappeared, like a dead and useless limb. The words that had been interwoven in the very being of the beast have been unravelled and removed: and the living being, in its anatomy, its form, its habits, its birth and death, appears as though stripped naked. Natural, history finds its locus in the gap that is now opened up between things and words - a silent gap, pure of all verbal sedimentation, and yet articulated according to the elements of

representation, those same elements that can now without let or hindrance be named. Things touch against the banks of discourse because they appear in the hollow space of representation. It is not therefore at the moment when one gives up calculation that one finally begins to observe. We must not see the constitution of natural history, with the empirical climate in which it develops, as an experiment forcing entry, willy-nilly, into a knowledge that was keeping watch on the truth of nature elsewhere; natural history - and this is why it appeared at precisely this moment - 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 one another, did not, from the very first, communicate in a representation. The descriptive order proposed for natural history by Linnaeus, long after Jonston, is very characteristic. According to this order, every chapter dealing with a given animal should follow the following plan: name, theory, kind, species, attributes, use, and, to conclude, Litteraria. All the language deposited upon things by time is pushed back into the very last category, like a sort of supplement in which discourse is allowed to recount itself and record discoveries, traditions, beliefs, and poetical figures. Before this language of language, it is the thing itself that appears, in its own characters, but within the reality that has been patterned from the very outset by the name. The constitution of a natural science in the classical age is not the effect, either direct or indirect, of the transference of a rationality formed elsewhere (for geometrical or mechanical purposes). It is a separate formation, one that has its own archaeology, even though it is linked (though in a correlative and simultaneous mode) to the general theory of signs and to the project for a universal mathesis.

Thus the old word 'history' changes its value, and perhaps rediscovers one of its archaic significations. In any case, though it is true that the historian, for the Greeks, was indeed the individual who sees and who recounts from the starting-point of his sight, it has not always been so in our culture. Indeed, it was at a relatively late date, on the threshold of the Classical age, that he assumed - or resumed - this role. Until the mid-seventeenth century, the historian's task was to establish the great compilation of documents and signs - of everything, throughout the world, that might form a mark, as it were. It was the historian's responsibility to 130 restore to language all the words that had been buried. His existence was defined not so much by what he saw as by what he retold, by a secondary speech which pronounced afresh so many words that had been muffled.

The Classical age gives history a quite different meaning: that of undertaking a meticulous examination of things themselves for the first time, and then of transcribing what it has gathered in smooth, neutralized, and faithful words. It is understandable that the first form of history constituted in this period of 'purification' should have been the history of nature. For its construction requires only words applied, without intermediary, to things themselves. The documents of this new history are not other words, texts or records, but unencumbered spaces

in which things are juxtaposed: herbariums, collections, gardens; the locus of this history is a non-temporal rectangle in which, stripped of all commentary, of all enveloping language, creatures present themselves one beside another, their surfaces visible, grouped according to their common features, and thus already virtually analysed, and bearers of nothing but their own individual names. It is often said that the establishment of botanical gardens and zoological collections expressed a new curiosity about exotic plants and animals, In fact, these had already claimed men's interest for a long while. What had changed was the space in which it was possible to see them and from which it was possible to describe them. To the Renaissance, the strangeness of animals was a spectacle: it was featured in fairs, in tournaments, in fictitious or real combats, in reconstitutions of legends in which the bestiary displayed its ageless fables. The natural history room and the garden, as created in the Classical period, replace the circular procession of the 'show' with the arrangement of things in a 'table'. What came surreptitiously into being between the age of the theatre and that of the catalogue was not the desire for knowledge, but a new way of connecting things both to the eye and to discourse. A new way of making history.

We also know what methodological importance these 'natural' allocations assumed, at the end of the eighteenth century, in the classification of words, languages, roots, documents, records-in short, in the constitution of a whole environment of history (in the now familiar sense of the word) in which the nineteenth century was to rediscover, after this pure tabulation of things, the renewed possibility of talking about words. And of talking about them, not in the style of commentary, but in a mode that was to be considered as positive, as objective, as that of natural history.

The ever more complete preservation of what was written, the establishment of archives, then of filing systems for them, the reorganization of libraries, the drawing up of catalogues, indexes, and inventories, all these things represent, at the end of the Classical age, not so much a new sensitivity to time, to its past, to the density of history, as a way of introducing into the language already imprinted on things, and into the traces it has left, an order of the same type as that which was being established between living creatures. And it is in this classified time, in this squared and spatialized development, that the historians of the nineteenth century were to undertake the creation of a history that could at last be 'true' - in other words, liberated from Classical rationality, from its ordering and theodicy:a history restored to the irruptive violence of time.

III. Structure

Thus arranged and understood, natural history has as a condition of its possibility the common affinity of things and language with representation; but it exists as a task only in so far as things and language happen to be separate. It must therefore reduce this distance between them so as

to bring language as close as possible to the observing gaze, and the things observed as close as possible to words. Natural history is nothing more than the nomination of the visible. Hence its apparent simplicity, and that air of naiveté it has from a distance, so simple does it appear and so obviously imposed by things themselves. One has the impression that with Toumefort, with Linnaeus or Buffon, someone has at last taken on the task of stating something that had been visible from the beginning of time, but had remained mute before a sort of invincible distraction of men's eyes. In fact, it was not an age-old inattentiveness being suddenly dissipated, but a new field of visibility being constituted in all its density.

Natural history did not become possible because men looked harder and more closely. One might say, strictly speaking, that the Classical age used its ingenuity, if not to see as little as possible, at least to restrict deliberately the area of its experience. Observation, from the seventeenth century onward, is a perceptible knowledge furnished with a series of systematically negative conditions. Hearsay is excluded, that goes without saying; but so are taste and smell, because their lack of certainty and their variability render impossible any analysis into distinct elements that could be universally acceptable. The sense of touch is very narrowly limited to the designation of a few fairly evident distinctions (such as that between smooth and rough); which leaves sight with an almost exclusive privilege, being the sense by which we perceive extent and establish proof, and, in consequence, the means to an analysis partes extra partes acceptable to everyone: the blind man in the eighteenth century can perfectly well be a geometrician, but he cannot be a naturalist [3]. And, even then, everything that presents itself to our gaze is not utilizable: colours especially can scarcely serve as a foundation for useful comparisons. The area of visibility in which observation is able to assume its powers is thus only what is left after these exclusions: a visibility freed from all other sensory burdens and restricted, moreover, to black and white. This area, much more than the receptivity and attention at last being granted to things themselves, defines natural history's condition of possibility, and the appearance of its screened objects: lines, surfaces, forms, reliefs.

It may perhaps be claimed that the use of the microscope compensates for these restrictions; and that though sensory experience was being restricted in the direction of its more doubtful frontiers, it was nevertheless being extended towards the new objects of a technically controlled form of observation. In fact, it was the same complex of negative conditions that limited the realm of experience and made the use of optical instruments possible. To attempt to improve one's power of observation by looking through a lens, one must renounce the attempt to achieve knowledge by means of the other senses or from hearsay. A change of scale in the visual sphere must have more value than the correlations between the various kinds of evidence that may be provided by one's impressions, one's reading, or learned compilations. Though indefinite confinement of the visible within its own extent is made more easily perceptible to the eye by a microscope, it is nevertheless not freed from it. And the best proof of this is probably that optical instruments were used above all as a means of resolving problems of generation. In

other words, as a means of discovering how the forms, arrangements, and characteristic proportions of individual adults, and of their species, could be handed on down the centuries while preserving their strictly defined identity. The microscope was called upon not to go beyond the frontiers of the fundamental domain of visibility, but to resolve one of the problems it posed: the maintenance of specific visible forms from generation to generation. The use of the microscope was based upon a non-instrumental relation between things and the human eye - a relation that defines natural history. It was Linnaeus, after all, who said that Naturalia - as opposed to Coelestia and Elementa - were intended to be transmitted directly to the senses [4]. And Tournefort thought that, in order to gain a knowledge of plants, 'rather than scrutinize each of their variations with a religious scruple', it was better to analyse them 'as they fall beneath the gaze'[5].

To observe, then, is to be content with seeing - with seeing a few things systematically. With seeing what, in the rather confused wealth of representation, can be analysed, recognized by all, and thus given a name that everyone will be able to understand: 'All obscure similitudes,' said Linnaeus, 'are introduced only to the shame of art' [6]. Displayed in themselves, emptied of all resemblances, cleansed even of their colours, visual representations will now at last be able to provide natural history with what constitutes its proper object, with precisely what it will convey in the well-made language it intends to construct. This object is the extension of which all natural beings are constituted - an extension that may be affected by four variables. And by four variables only: the form of the elements, the quantity of those elements, the manner in which they are distributed in space in relation to each other, and the relative magnitude of each element. As Linnaeus said, in a passage of capital importance, 'every note should be a product of number, of form, of proportion, of situation'[7]. For example, when one studies the reproductive organs of a plant, it is sufficient, but indispensable, to enumerate the stamens and pistil (or to record their absence, according to the case), to define the form they assume, according to what geometrical figure they are distributed in the flower (circle, hexagon, triangle), and what their size is in relation to the other organs. These four variables, which can be applied in the same way to the five parts of the plant - roots, stem, leaves, flowers, fruits - specify the extension available to representation well enough for us to articulate it into a description acceptable to everyone: confronted with the same individual entity, everyone will be able to give the same description; and, inversely, given such a description everyone will be able to recognize the individual entities that correspond to it. In this fundamental articulation of the visible, the first confrontation of language and things can now be established in a manner that excludes all uncertainty.

Each visibly distinct part of a plant or an animal is thus describable in so far as four series of values are applicable to it. These four values affecting, and determining, any given element or organ are what botanists term its structure. 'By the structure of a plant's parts we mean the composition and arrangement of the pieces that make up its body.' [8] Structure also makes

possible the description of what one sees, and this in two ways which are neither contradictory nor mutually exclusive. Number and magnitude can always be assigned by means of a count or a measure; they can therefore be expressed in quantitative terms. Forms and arrangements, on the other hand, must be described by other methods: either by identification with geometrical figures, or by analogies that must all be 'of the utmost clarity'[9]. In this way it becomes possible to describe certain fairly complex forms on the basis of their very visible resemblance to the human body, which serves as a sort of reservoir for models of visibility, and acts as a spontaneous link between what one can see and what one can say[l0].

By limiting and filtering the visible, structure enables it to be transcribed into language. It permits the visibility of the animal or plant to pass over in its entirety into the discourse that receives it. And ultimately, perhaps, it may manage to reconstitute itself in visible form by means of words, as with the botanical calligrams dreamed of by Linnaeus[11]. His wish was that the order of the description, its division into paragraphs, and even its typographical modules, should reproduce the form of the plant itself. That the printed text, in its variables of form, arrangement, and quantity, should have a vegetable structure. 'It is beautiful to follow nature: to pass from the Root to the Stems, to the Petioles, to the Leaves, to the Peduncles, to the Flowers.' The description would have to be divided into the same number of paragraphs as there are parts in the plant, everything concerning its principal parts being printed in large type, and the analysis of the 'parts of parts' being conveyed in small type. One would then add what one knew of the plant from other sources in the same way as an artist completes his sketch by introducing the interplay of light and shade: 'the Adumbration would exactly contain the whole history of the plant, such as its names, its structure, its external assemblage, its nature, its use.' The plant is thus engraved in the material of the language into which it has been transposed, and recomposes its pure form before the reader's very eyes. The book becomes the herbarium of living structures. And let no one reply that this is merely the reverie of a systematizer and does not represent the whole of natural history. Buffon was a constant adversary of Linnaeus, yet the same structure exists in his work and plays the same role: 'The method of examination will be directed towards form, magnitude, the different parts, their number, their position, and the very substance of the thing'[12]. Buffon and Linnaeus employ the same grid; their gaze occupies the same surface of contact upon things; there arc the same black squares left to accommodate the invisible; the same open and distinct spaces to accommodate words.

By means of structure, what representation provides in a confused and simultaneous form is analysed and thereby rendered suitable to the linear unwinding of language. In effect, description is to the object one looks at what the proposition is to the representation it expresses: its arrangement in a series, elements succeeding elements. But it will be remembered that language in its empirical form implied a theory of the proposition and a theory of articulation. In itself, the proposition remained empty; and the ability of articulation to give form to authentic discourse was conditional upon its being linked together by the patent or

secret function of the verb to be. Natural history is a science, that is, a language, but a securely based and well-constructed one: its propositional unfolding is indisputably an articulation; the arrangement of its elements into a linear series patterns representation according to an evident and universal mode. Whereas one and the same representation can give rise to a considerable number of propositions, since the names that embody it articulate it according to different modes, one and the same animal, or one and the same plant, will be described in the same way, in so far as their structure governs their passage from representation into language. The theory of structure, which runs right through natural history in the Classical age, superimposes the roles played in language by the proposition and articulation in such a way that they perform one and the same function.

And it is by this means that structure links the possibility of a natural history to the mathesis. In fact, it reduces the whole area of the visible to a system of variables all of whose values can be designated, if not by a quantity, at least by a perfectly clear and always finite description. It is therefore possible to establish the system of identities and the order of differences existing between natural entities. Adanson was of the opinion that one day it would be possible to treat botany as a rigorously mathematical science, and that it would prove permissible to pose botanical problems in the same way as one does algebraic or geometrical ones: 'find the most obvious point that establishes the line of separation or discussion between the scabious family and the honeysuckle family'; or again, find a known genus of plants (whether natural or artificial is unimportant) that stands exactly half-way between Dog's-bane and Borage[13]. By virtue of structure, the great proliferation of beings occupying the surface of the globe is able to enter both into the sequence of a descriptive language and into the field of a mathesis that would also be a general science 136 of order. And this constituent relation, complex as it is, is established within the apparent simplicity of a description of the visible.

All this is of great importance for the definition of natural history in terms of its object. The latter is provided by surfaces and lines, not by functions or invisible tissues. The plant and the animal are seen not so much in their organic unity as by the visible patterning of their organs. They are paws and hoofs, flowers and fruits, before being respiratory systems or internal liquids. Natural history traverses an area of visible, simultaneous, concomitant variables, without any internal relation of subordination or organization. In the seventeenth and eighteenth centuries anatomy lost the leading role that it had played during the Renaissance and that it was to resume in Cuvier's day; it was not that curiosity had diminished in the meantime, or that knowledge had regressed, but rather that the fundamental arrangement of the visible and the expressible no longer passed through the thickness of the body. Hence the epistemological precedence enjoyed by botany: the area common to words and things constituted a much more accommodating, a much less 'black' grid for plants than for animals; in so far as there are a great many constituent organs visible in a plant that are not so in animals, taxonomic knowledge based upon immediately perceptible variables was richer and more coherent in the botanical

order than in the zoological. We must therefore reverse what is usually said on this subject: it is not because there was a great interest in botany during the seventeenth and eighteenth centuries that so much investigation was undertaken into methods of classification. But because it was possible to know and to say only within a taxonomic area of visibility, the knowledge of plants was bound to prove more extensive than that of animals.

At the institutional level, the inevitable correlatives of this patterning were botanical gardens and natural history collections. And their importance, for Classical culture, does not lie essentially in what they make it possible to see, but in what they hide and in what, by this process of obliteration, they allow to emerge: they screen off anatomy and function, they conceal the organism, in order to raise up before the eyes of those who await the truth the visible relief of forms, with their elements, their mode of distribution, and their measurements. They are books furnished with structures, the space in which characteristics combine, and in which classifications are physically displayed. One day, towards the end of the eighteenth century, Cuvier was to topple the glass jars of the Museum, smash them open and dissect all the forms of animal visibility that the

Classical age had preserved in them. This iconoclastic gesture, which Lamarck could never bring himself to make, does not reveal a new curiosity directed towards a secret that no one had the interest or courage to uncover, or the possibility of uncovering, before. It is rather, and much more seriously, a mutation in the natural dimension of Western culture: the end of history in the sense in which it was understood by Tournefort, Linnaeus, Buffon, and Adanson - and in the sense in which it was understood by Boissier de Sauvages also, when he opposed historical knowledge of the visible to philosophical knowledge of the invisible, of what is hidden and of causes [14]. And it was also to be the beginning of what, by substituting anatomy for classification, organism for structure, internal subordination for visible character, the series for tabulation, was to make possible the precipitation into the old flat world of animals and plants, engraved in black on white, a whole profound mass of time to which men were to give the renewed name of history.

IV. CHARACTER

Structure is that designation of the visible which, by means of a kind of pre-linguistic sifting, enables it to be transcribed into language. But the description thus obtained is nothing more than a sort of proper noun: it leaves each being its strict individuality and expresses neither the table to which it belongs, nor the area surrounding it, nor the site it occupies. It is designation pure and simple. And for natural history to become language, the description must become a 'common noun'. It has been seen how, in spontaneous language, the primary designations, which concerned only individual representations, after having originated in the language of action and the resultant primitive roots, had little by little, through the momentum of derivation,

acquired more general values. But natural history is a well-constructed language: it should not accept the constraint imposed by derivation and its forms; it should not lend credit to any etymology[i5]. It should unite in one and the same operation what everyday language keeps separate: not only must it designate all natural entities very precisely, but it must also situate them within the system of identities and differences that unites them to and distinguishes them from all the others. Natural history must provide, simultaneously, a certain designation and a controlled derivation. And just as the theory of structure superimposed articulation and the proposition so that they became one and the same, so the theory of character must identify the values that designate and the area in which they are derived. Toumefort says:

To know plants is to know with precision the names that have been given to them in relation to the structure of some of their parts. . . The idea of the character that essentially distinguishes plants from one another ought invariably to be one with the name of each plant[16].

Establishing character is at the same time easy and difficult. Easy, because natural history does not have to establish a system of names based upon representations that are difficult to analyse, but only to derive it from a language that has already been unfolded in the process of description. The process of naming will be based, not upon what one sees, but upon elements that have already been introduced into discourse by structure. It is a matter of constructing a secondary language based upon that primary, but certain and universal, language. But a major difficulty appears immediately. In order to establish the identities and differences existing between all natural entities, it would be necessary to take into account every feature that might have been listed in a given description. Such an endless task would push the advent of natural history back into an inaccessible never-never land, unless there existed techniques that would avoid this difficulty and limit the labour of making so many comparisons. It is possible, a priori, to state that these techniques are of two types. Either that of making total comparisons, but only within empirically constituted groups in which the number of resemblances is manifestly so high that the enumeration of the differences will not take long to complete; and in this way, step by step, the establishment of all identities and distinctions can be guaranteed. Or that of selecting a finite and relatively limited group of characteristics, whose variations and constants may be studied in any individual entity that presents itself. This last procedure was termed the System, the first the Method. They are usually contrasted, in the same way as Linnaeus is contrasted with Buffon, Adanson, or Antoine-Laurent de Jussieu - or as a rigid and simple conception of nature is contrasted with the detailed and immediate perception of its relations, or as the idea of a motionless nature is contrasted with that of a teeming continuity of beings all communicating with one another, mingling with one another, and perhaps being transformed into one another.. .. And yet the essential does not lie in this conflict between the great intuitions of nature. It lies rather in the network of necessity which at this point rendered the choice between two ways of constituting natural history as a language both possible and indispensable. The rest is merely a logical and inevitable consequence.

From the elements that the System juxtaposes in great detail by means of description, it selects a particular few. These define the privileged and, in fact, exclusive structure in relation to which identities or differences as a whole are to be examined. Any difference not related to one of these elements will be considered irrelevant. If, like Linnaeus, one selects as the characteristic elements 'all the different parts related to fructification'[17], then a difference of leaf or stem or root or petiole must be systematically ignored. Similarly, any identity not occurring in one of these selected elements will have no value in the definition of the character. On the other hand, when these elements are similar in two individuals they receive a common denomination. The structure selected to be the locus of pertinent identities and differences is what is termed the character. According to Linnaeus, the character should be composed of 'the most careful description of the fructification of the first species. All the other species of the genus are compared with the first, all discordant notes being eliminated; finally, after this process, the character emerges'[18].

The system is arbitrary in its basis, since it deliberately ignores all differences and all identities not related to the selected structure. But there is no law that says that it will not be possible to arrive one day, through a use of this technique, at the discovery of a natural system - one in which all the differences in the character would correspond to differences of the same value in the plant's general structure; and in which, inversely, all the individuals or all the species grouped together under a common character would in fact have the same relation of resemblance in all and each of their parts. But one cannot find the way to this natural system unless one has first established with certainty an artificial system, at least in certain of the vegetable or animal domains. This is why Linnaeus does not seek to establish a natural system immediately, 'before a complete knowledge has been attained of everything that is relevant'[19] to his system. It is true that the natural method constitutes 'the first and last wish of botanists', and that all its 'fragments should be searched for with the greatest care'[20], as Linnaeus himself searches for them in his Classes Plantarum; but until this natural method appears in its certain and finished form, 'artificial systems are absolutely necessary'[21].

Moreover, the system is relative: it is able to function according to a desired degree of precision. If the selected character is composed of a large structure, having a large number of variables, then as soon as one passes from one individual to another, even if it is immediately adjacent, the differences will appear at once: the character in this case is very close to pure description [22]. If, on the other hand, the selected structure is limited in extent, and its variables few, then the differences will be rare and the individuals grouped in compact masses. The character is chosen according to the degree of detail required in the classification. In order to establish genera, Tournefort chose the combination of flower and fruit as his character. Not, as with Cesalpino, because these were the most useful parts of the plant, but because they permitted a numerically satisfying combinability: the elements that would be taken from the other three parts (roots, stems, and leaves) were, in effect, either too numerous if treated together or too few if taken

separately [23]. Linnaeus calculated that the thirty-eight organs of reproduction, each comprising the four variables of number, form, situation, and proportion, would produce 5,776 configurations, or sufficient to define the general]. If one wishes to obtain groups more numerous than genera, then one must make use of more limited characters ('factitious characters agreed upon between botanists'), as, for example, the stamens alone, or the pistil alone. In this way one would be able to distinguish classes or orders[25].

In this way, a grid can be laid out over the entire vegetable or animal kingdom. Each group can be given a name. With the result that any species, without having to be described, can be designated with the greatest accuracy by means of the names of the different groups in which it is included. Its complete name will cross the entire network of characters that one has established, right up to the largest classifications of all. But for convenience, as Linnaeus points out, part of this name should remain 'silent' (one does not name the class and order), while the other part should be 'sounded' (one must name the genus, the species, and the variety [26]. The plant thus recognized in its essential character and designated upon that basis will express at the same time that which accurately designates it and the relation linking it to those plants that resemble it and belong to the same genus (and thus to the same family and the same order). It will have been given at the same time its proper name and the whole series of common names (manifest or hidden) in which it resides. 'The generic name is, as it were, the official currency of our botanical republic'[27]. Natural history will have accomplished its fundamental task, which is that of 'arrangement and designation'[28].

The Method is another technique for resolving the same problem. Instead of selecting, from the totality described, the elements - whether few or numerous - that are to be used as characters, the method consists in deducing them stage by stage. Deduction is to be taken here in the sense of subtraction. One begins - as Adanson did in his examination of the plants of Senegal [29]-with a species either arbitrarily chosen or encountered by chance. One describes it in its entirety, leaving out none of its parts and determining all the values that the variables have derived from it. This process is repeated with the next species, also given by the arbitrary nature of representation; the description should be as total as in the first instance, but with the one difference that nothing that has been mentioned in the first description should be repeated in the second. Only the differences are listed. And similarly with the third species in relation to the first two, and so on indefinitely. So that, at the very end, all the different features of all the plants have been listed once, but never more than once. And by arranging the later and progressively more sparse descriptions around the earlier ones, we shall be able to perceive, through the original chaos, the emergence of the general table of relations. The character that distinguishes each species or each genus is the only feature picked out from the background of tacit identities. Indeed, such a technique would probably be the most reliable, only the number of existing species is so great that it would be impossible to deal with them all. Nevertheless, the examination of such species as we do meet with reveals the existence of great 'families', of very

broad groups in which the species and the genera have a considerable number of identities. So considerable, indeed, that they signalize themselves by a very large number of characteristics, even to the least analytic eye; the resemblance between all the species of Ranunculus, or between all the species of Aconite, is immediately apparent to the senses. At this point, in order to prevent the task becoming infinite, one is obliged to reverse the process. One admits the existence of the great families that are manifestly recognizable, and whose general features have been defined, as it were blindfold, by the first descriptions of them. These are the common features that we now establish in a positive way; then, whenever we meet with a genus or species that is manifestly contained by them, it will suffice to indicate what difference distinguishes it from the others that serve it as a sort of natural entourage. A knowledge of each species can be acquired easily upon the basis of this general characterization: 'We shall divide each of the three kingdoms into several families which will group together all those beings that are strikingly related, and we shall review all the general and particular characters of the beings contained within those families'; in this way we shall be assured of relating all these beings to their natural families; and thus, beginning with the ferret and the wolf, the dog and the bear, we shall come to know sufficient about the lion, the tiger, and the hyena, which are animals of the same family [30].

It is immediately apparent in what way the method and the system are opposed. There can be only one method; but one can invent and apply a considerable number of systems: Adanson alone set out sixty-five [31]. The system is arbitrary throughout its development, but once the system of variables - the character - has been defined at the outset, it is no longer possible to modify it, to add or subtract even one element. The method is imposed from without, by the total resemblances that relate things together; it immediately transcribes perception into discourse; it remains, in its point of departure, very close to description; but it is always possible to apply to the general character it has defined empirically such modifications as may be imposed: a feature one had thought essential to a whole group of plants or animals may very well prove to be no more than a particularity of a few of them, if one discovers others that, without possessing that feature, belong quite obviously to the same family; the method must always be ready to rectify itself. As Adanson says, the system is like 'the trial and error method in mathematics': it is the result of a decision, but it must be absolutely coherent; the method, on the other hand, is a given arrangement of objects or facts grouped together according to certain given conventions or resemblances, which one expresses by a general notion applicable to all those objects, without, however, regarding that fundamental notion or principle as absolute or invariable, or as so general that it cannot suffer any exception . . . The method differs from the system only in the idea that the author attaches to his principles, regarding them as variables in the method and as absolutes in the system [32].

Moreover, the system can recognize only relations of coordination between animal or vegetable structures. Since the character is selected, not on account of its functional importance but on

account of its combinative efficacity, there is no proof that in the internal hierarchy of any individual plant such and such a form of pistil or arrangement of stamens necessarily entails such and such a structure: if the germ of the Adoxa is placed between the calyx and the corolla, or if, in the arum, the stamens 143 are arranged between the pistils, these are nothing more or less than 'singular Structures'[33]; their slight importance is a product of their rarity alone, whereas the equal division of calyx and corolla derives its value only from its frequency[34]. The method, on the other hand, because it proceeds from identities and differences of the most general kind to those that are less so, is capable of bringing out vertical relations of subordination. It enables us, in fact, to see which characters are important enough never to be negated within a given family. In relation to the system, the reversal is very important: the most essential characters make it possible to distinguish the largest and most visibly distinct families, whereas, for Toumefort or Linnaeus, the essential character defined the genus; and it was sufficient for the naturalists' 'agreement' to select a factitious character that would distinguish between classes or orders. In the method, general organization and its internal dependencies are more important than the lateral application of a constant apparatus of variables.

Despite these differences, both system and method rest upon the same epistemological base. It can be defined briefly by saying that, in Classical terms, a knowledge of empirical individuals can be acquired only from the continuous, ordered, and universal tabulation of all possible differences. In the sixteenth century, the identity of plants or animals was assured by the positive mark (sometimes hidden, often visible) which they all bore: what distinguished the various species of birds, for instance, was not the differences that existed between them but the fact that this one hunted its food at night, that another lived on the water, that yet another fed on living flesh [35]. Every being bore a mark, and the species was measured by the extent of a common emblem. So that each species identified itself by itself, expressed its individuality independently of all the others: it would have been perfectly possible for all those others not to exist, since the criteria of definition would not thereby have been modified for those that remained visible. But, from the seventeenth century, there can no longer be any signs except in the analysis of representations according to identities and differences. That is, all designation must be accomplished by means of a certain relation to all other possible designations. To know what properly appertains to one individual is to have before one the classification - or the possibility of classifying - all others. Identity and what marks it are defined by the differences that remain. An animal or a plant is not what is indicated - or betrayed - by the stigma that is to be found imprinted upon it; it is what the others are not; it exists in itself only in so far as it is bounded by what is distinguish- able from it. Method and system are simply two ways of defining identities by means of the general grid of differences. Later on, beginning with Cuvier, the identity of species was to be determined in the same way by a set of differences, but the differences were in this case to emerge from the background of the great organic unities possessing their own internal systems of dependencies (skeleton, respiration, circulation); the invertebrates were to be defined, not only by their lack of vertebrae, but also by a certain mode

of respiration, by the existence of a type of circulation, and by a whole organic cohesiveness outlining a positive unity. The internal laws of the organism were to replace differential characters as the object of the natural sciences. Classification, as a fundamental and constituent problem of natural history, took up its position historically, and in a necessary fashion, between a theory of the mark and a theory of the organism.

V. CONTINUITY AND CATASTROPHE

At the heart of this well-constructed language that natural history has become, one problem remains. It is possible after all that the transformation of structure into character may never be possible, and that the common noun may never be able to emerge from the proper noun. Who can guarantee that the descriptions, once made, are not going to display elements that vary so much from one individual to the next, or from one species to the next, that any attempt to use them as the basis for a common noun would be doomed in advance? Who can be certain that each structure is not strictly isolated from every other structure, and that it will not function as an individual mark? In order that the simplest character can become apparent, it is essential that at least one element in the structure examined first should be repeated in another. For the general order of differences that makes it possible to establish the arrangement of species implies a certain number of similarities. The problem here is isomorphic with the one we have already met in relation to language[36]: for a common noun to be possible, there had to be an immediate resemblance between things that permitted the signifying elements to move along the representations, to slide across the surface of them, to cling to their similarities and thus, finally, to form collective designations. But in order to outline this rhetorical space in which nouns gradually took on their general value, there was no need to determine the status of that resemblance, or whether it was founded upon truth; it was sufficient for it to strike the imagination with sufficient force. In natural history, however, which is a well-constructed language, these analogies of the imagination cannot have the value of guarantees; and since natural history is threatened, like all language, by the radical doubt that Hume brought to bear upon the necessity for repetition in experience, it must find a way of avoiding that threat. There must be continuity in nature.

This requirement that nature should be continuous does not take exactly the same form in the systems as it does in the methods. For the systematician, continuity consists only of the unbroken juxtaposition of the different regions that can be clearly distinguished by means of characters; all that is required is an uninterrupted gradation of the values that the structure selected as a character can assume in the species as a whole; starting from this principle, it will become apparent that all these values are occupied by real beings, even though they may not yet be known. 'The system indicates the plants, even those it has not mentioned; which is something that the enumeration of a catalogue can never do'[37]. And the categories will not simply be arbitrary conventions laid out over this continuity of juxtaposition; they will correspond

(if they have been properly established) to areas that have a distinct existence on this uninterrupted surface of nature; they will be areas that are larger than individuals but just as real. In this way, according to Linnaeus, the reproductive system made it possible to establish the existence of indisputably well-founded genera: 'Know that it is not the character that constitutes the genus, but the genus that constitutes the character, that the character derives from the genus, not the genus from the character'[38]. In the methods, on the other hand, since resemblances - in their massive and clearly evident form - are posited to start with, the continuity of nature will not be this purely negative postulate (no blank spaces between distinct categories), but a positive requirement: all nature forms one great fabric in which beings resemble one another from one to the next, in which adjacent individuals are infinitely similar to each other; so that any dividing-line that indicates, not the minute difference of the individual, but broader categories, is always unreal. There is a continuity produced by fusion in which all generality is nominal. Our general ideas, says Buffon, are relative to a continuous scale of objects of which we can clearly perceive only the middle rungs and whose extremities increasingly flee from and escape our considerations. . . The more we increase the number of divisions in the productions of nature, the closer we shall approach to the true, since nothing really exists in nature except individuals, and since genera, orders, and classes exist only in our imagination [39].

And Bonnet, meaning much the same thing, said:

There are no leaps in nature: everything in it is graduated, shaded. If there were an empty space between any two beings, what reason would there be for proceeding from the one to the other? There is thus no being above and below which there are not other beings that are united to it by some characters and separated from it by others.

It is therefore always possible to discover 'intermediate productions', such as the polyp between the animal and the vegetable, the flying squirrel between the bird and the quadruped, the monkey between the quadruped and man. Consequently, our divisions into species and classes 'are purely nominal'; they represent no more than 'means relative to our needs and to the limitations of our knowledge'[40].

In the eighteenth century, the continuity of nature is a requirement of all natural history, that is, of any effort to establish an order in nature and to discover general categories within it, whether they be real and prescribed by obvious distinctions or a matter of convenience and quite simply a pattern produced by our imagination. Only continuity can guarantee that nature repeats itself and that structure can, in consequence, become character. But this requirement immediately becomes a double one. For if it were given to experience, in its uninterrupted momentum, to traverse exactly, step by step, the great continuity comprising individuals, varieties, species, genera, and classes, there would be no need to constitute a science; descriptive designations

would attain to generality quite freely, and the language of things would be constituted as scientific discourse by its own spontaneous momentum. The identities of nature would be presented to the imagination as though spelled out letter by letter, and the spontaneous shift of words within their rhetorical space would reproduce, with perfect exactitude, the identity of beings with their increasing generality. Natural history would become useless, or rather it would already have been written by man's everyday language; general grammar would at the same time be the universal taxonomy of beings. But if a natural history perfectly distinct from the analysis of words is indispensable, that is because experience does not reveal the 147 continuity of nature as such, but gives it to us both broken up - since there are a great many gaps in the series of values effectively occupied by the variables (there are possible creatures whose place in the grid one can note without ever having had the opportunity to observe them) - and blurred, since the real, geographic and terrestrial space in which we find ourselves confronts us with creatures that are interwoven with one another, in an order which, in relation to the great network of taxonomies, is nothing more than chance, disorder, or turbulence. Linnaeus pointed out that, by associating the hydra (which is an animal) and the conferva (which is an alga), or the sponge and the coral, in the same localities, nature is not, as the order of our classifications would have it, linking together 'the most perfect plants with the animals termed very imperfect, but combining imperfect animals with imperfect plants'[41]. And Adanson remarked that nature is a confused mingling of beings that seem to have been brought together by chance: here, gold is mixed with another metal, with stone, with earth; there, the violet grows side by side with an oak. Among these plants, too, wander the quadruped, the reptile, and the insect; the fishes are confused, one might say, with the aqueous element in which they swim, and with the plants that grow in the depths of the waters . . . This mixture is indeed so general and so multifarious that it appears to be one of nature's laws [42].

Now, this great mixture is the result of a chronological series of events. And these events have their point of origin and their primary locus of application, not in the living species themselves, but in the space in which those species reside. They are produced in the relation of the Earth to the Sun, in climatic conditions, in the movements of the earth's crust; what they affect first are the oceans and the continents, the surface of the globe; living beings are affected only indirectly and in a secondary way: they are attracted or driven away by heat; volcanoes destroy them; they disappear with the land that crumbles away beneath them. It is possible, as Buffon, for example, supposed [43], that the earth was originally incandescent, before gradually growing colder; the animals, accustomed to living in very high temperatures, then regrouped themselves in the only region that still remains torrid, whereas the temperate or cold lands were peopled by species that had not had the opportunity to appear until that time. With the revolutions in the history of the earth, the taxonomic area (in which adjacencies are of the order of character and not of modus vivendi) was divided up into a concrete and geographical area that jumbled it all up. Moreover, it was probably broken up into fragments, and many species, adjacent to those we know or intermediary between taxonomic squares familiar to us, must have disappeared, leaving

nothing behind them but traces difficult to decipher. In any case, this historical series of events is an addition to the expanse of beings: it does not properly appertain to it; its development lies in the real dimension of the world, not the analytic one of classifications; what it calls into question is the world as a locus for beings, not the beings themselves in so far as they have the property of being alive. There is a historicity, symbolized by the biblical accounts, which affects our astronomic system directly and the taxonomic grid of species indirectly; and apart from Genesis and the Flood, it is very possible that our globe underwent other revolutions that have not been revealed to us. It is connected to the whole astronomic system, and the links that join this globe to the other celestial bodies, in particular to the Sun and the comets, could have been the source of many revolutions that have left no traces perceptible to us, but of which the inhabitants of neighbouring worlds may perhaps have some knowledge[44].

To be able to exist as a science, natural history must, then, presuppose two groupings. One of them is constituted by the continuous network of beings; this continuity may take various spatial forms; Charles Bonnet thinks of it sometimes as a great linear scale of which one extremity is very simple, the other very complicated, with a narrow intermediary region - the only one that is visible to us - in the centre; sometimes as a central trunk from which there is a branch forking out on one side (that of the shellfish, with the crabs and crayfish as supplementary ramifications) and the series of insects on the other, branching out to include the frogs [45]; Buffon defines this same continuity 'as a wide woven strip, or rather a bundle which every so often puts out side branches that join it up with the bundles of another order' [46]; Pallas sees it as a polyhedric figure [47]; Hermann wished to constitute a three-dimensional model composed of threads all starting from a common point of origin, separating from one another, 'spreading out through a very great number of lateral branches', then coming together again[48]. The series of events, however, is quite distinct from these spatial configurations, each of which describes the taxonomic continuity in its own way; the series of events is discontinuous, and different in each of its episodes; but, as a whole, it can be drawn only as a simple line, which is that of time itself (and which can be conceived as straight, broken, or circular). In its concrete form, and in the depth that is proper to it, nature resides wholly between the fabric of the taxinomia and the line of revolutions. The tabulations that it forms in the eyes of men, and that it is the task of the discourse of science to traverse, are the fragments of the great surface of living species that are apparent according to the way it has been patterned, burst open, and frozen, between two temporal revolutions.

It will be seen how superficial it is to oppose, as two different opinions confronting one another in their fundamental options, a 'fixism' that is content to classify the beings of nature in a permanent tabulation, and a sort of 'evolutionism' that is supposed to believe in an immemorial history of nature and in a deep-rooted, onward urge of all beings throughout its continuity. The solidity, without gaps, of a network of species and genera, and the series of events that have blurred that network, both belong, at the same level, to the epistemological foundation that

made a body of knowledge like natural history possible in the Classical age. They are not two ways of perceiving nature, radically opposed because deeply rooted in philosophical choices older and more fundamental than any science; they are two simultaneous requirements in the archaeological network that defines the knowledge of nature in the Classical age. But these two requirements are complementary, and therefore irreducible. The temporal series cannot be integrated into the gradation of beings. The eras of nature do not prescribe the internal time of beings and their continuity; they dictate the intemperate interruptions that have constantly dispersed them, destroyed them, mingled them, separated them, and interwoven them. There is not and cannot be even the suspicion of an evolutionism or a transformism in Classical thought; for time is never conceived as a principle of development for living beings in their internal organization; it is perceived only as the possible bearer of a revolution in the external space in which they live.

VI. MONSTERS AND FOSSILS

It will be objected that, long before Lamarck, there already existed a whole body of thought of the evolutionist type. That its importance was considerable in the middle of the eighteenth century, and up to the sudden halt marked by the work of Cuvier. That Bonnet, Maupertuis, Diderot, Robinet, and Benoit de Maillet all very clearly articulated the idea that living forms may pass from one into another, that the present species are no doubt the result of former transformations, and that the whole of the living world is perhaps in motion towards a future point, so that one cannot guarantee of any living form that it has been definitively acquired and is now stabilized forever. In fact, such analyses are incompatible with what we understand today by evolutionary thought. They are concerned, in fact, with linking the table of identities and differences to the series of successive events. And in order to conceive of the unity of that table and that series they have only two means at their disposal.

The first consists in integrating the series of successions with the continuity of the beings and their distribution over the table. All the creatures that taxonomy has arranged in an uninterrupted simultaneity are then subjected to time. Not in the sense that the temporal series would give rise to a multiplicity of species that a horizontally oriented eye could then arrange according to the requirements of a classifying grid, but in the sense that all the points of the taxonomy are affected by a temporal index, with the result that 'evolution' is nothing more than the interdependent and general displacement of the whole scale from the first of its elements to the last. This system is that of Charles Bonnet. He implies in the first place that the chain of being, stretching up through an innumerable series of links towards the perfection of God, does not at present attain to it [49]; that the distance between God and the least defective of his creatures is still infinite; and that across this, perhaps unbridgeable, distance the whole uninterrupted fabric of beings is ceaselessly advancing towards a greater perfection. He implies further that this 'evolution' keeps intact the relation that exists between the different species: if one of them, in

the process of perfecting itself, should attain the degree of complexity possessed beforehand by the species one step higher, this does not mean that the latter has thereby been overtaken, because, carried onward by the same momentum, it cannot avoid perfecting itself to an equivalent degree:

There will be a continual and more or less slow progress of all the species towards a superior perfection, with the result that all the degrees of the scale will be continually variable within a determined and constant relation . . . Man, once transported to an abode more suited to the eminence of his faculties, will leave to the monkey and the elephant that foremost place that he occupied before among the animals of our planet. . . There will be Newtons among the monkeys and Vaubans among the beavers. The oysters and the polyps will stand in the same relation to the species at the top of the scale as the birds and the quadrupeds do now to man [50].

This 'evolutionism' is not a way of conceiving of the emergence of beings as a process of one giving rise to another; in reality, it is a way of generalizing the principle of continuity and the law that requires that all beings form an uninterrupted expanse. It adds, in a Leibnizian style [51], the continuity of time to the continuity of space, and the infiniteness of the progress of beings towards perfection to their infinite multiplicity. It is not a matter of progressive hierarchization, but of the constant and total force exerted by an already established hierarchy. In the end this presupposes that time, far from being a principle of taxinomia, is merely one of its factors, and that it is pre-established, like all the other values assumed by all the other variables. Bonnet must, therefore, be a preformationist -and as far removed as possible from what we understand, since the nineteenth century, by 'evolutionism'; he must suppose that the upheavals or catastrophes of the globe were arranged in advance as so many opportunities for the infinite chain of being to continue its progress in the direction of infinite amelioration: 'These evolutions were foreseen and inscribed in the germs of animals upon the very first day of creation. For these evolutions are linked with revolutions in the whole solar system that were arranged by God in advance.' The universe in its entirety has been a larva; now it is a chrysalis; one day it will, no doubt, become a butterfly[52]. And every species will be caught up in the same way in that great mutation. Such a system, it is clear, is not an evolutionism beginning to overthrow the old dogma of fixism; it is a taxinomia that includes time in addition - a generalized classification.

The other form of'evolutionism' consists of giving time a completely opposite role to play. It is used no longer to move the classifying table as a whole along the finite or infinite line leading to perfection, but to reveal, one after the other, the squares that, when viewed together, will form the continuous network of the species. It causes the variables of the living world to assume all possible values successively: it is the immediacy of a characterization that is accomplished little by little and, as it were, element after element. The partial identities or resemblances that make a taxinomia possible would then be the marks, revealed in the present, of one and the same living being, persisting through all the upheavals of nature and thereby filling all the vacant possibilities

offered by the 152 taxonomic table. If birds have wings in the way that fishes have fins, Benoît de Maillet points out, it is because they were once, at the time when the original waters of the earth were ebbing, dehydrated giltheads or dolphins that passed over, once for all, into an aerial home.

The seed of these fishes, carried into swamps, may perhaps have produced the first transmigration of the species from its marine to its terrestrial home. Even though a hundred millions may have perished without having been able to grow accustomed to it, it was sufficient for two of them to arrive at that point to give rise to the species [53].

Changes in the conditions of life of living beings seem here, as in certain forms of evolutionism, to be the necessary cause of the appearance of new species. But the mode in which the air, the water, the climate, or the earth acts upon animals is not that of an environment upon a function and upon the organs in which that function takes place; here, the exterior elements intervene only in so far as they occasion the emergence of a character. And that emergence, though it may be chronologically determined by such and such a global event, is rendered possible a priori by the general table of variables that defines all the possible forms of the living world. The quasi-evolutionism of the eighteenth century seems to presage equally well the spontaneous variation of character, as it was later to be found in Darwin, and the positive action of the environment, as it was to be described by Lamarck. But this is an illusion of hindsight: for this form of thought, in fact, the sequence of time can never be anything but the line along which all the possible values of the pre-established variables succeed one another. Consequently, a principle of modification must be defined within the living being, enabling it to take on a new character when a natural revolution occurs.

We are presented, then, with another choice: either to presuppose a spontaneous aptitude in living beings to change their forms (or at least to acquire - with succeeding generations - a slightly different character from that originally given, so that it will change gradually from one to the next and finally become unrecognizable), or to attribute to them some obscure urge towards a terminal species that will possess the characters of all those that have preceded it, but in a higher degree of complexity and perfection.

The first system is that of errors to infinity - as it is to be in Maupertuis. According to this system, the table of species that it is possible for natural history to establish has been built up piecemeal by the balance, constantly 153 present in nature, between a memory that guarantees its continuity (maintenance of the species in time and their resemblance to one another) and a tendency towards deviation that simultaneously guarantees the existence of history, differences, and dispersion. Maupertuis supposes that the particles of matter are endowed with activity and memory. When attracted to one another, the least active form mineral substances; the most active form the more complex bodies of animals. These forms, which are the result of attraction

and chance, disappear if they are unable to survive. Those that do remain in existence give rise to new individuals in which the characters of the parent couple are preserved by memory. And this process continues until a deviation of the particles - a chance happening -brings into being a new species, which the stubborn force of memory maintains in existence in turn: 'By dint of repeated deviations, the infinite diversity of the animals came to pass* [5 4]. Thus, progressing from one to the next, living beings acquired by successive variations all the characters we now recognize in them, and, when one considers them in the dimension of time, the coherent, solid expanse they form is merely the fragmentary result of a much more tightly knit, much finer, continuity: a continuity that has been woven from an incalculable number of tiny, forgotten, or miscarried differences. The visible species that now present themselves for our analysis have been separated out from the ceaseless background of monstrosities that appear, glimmer, sink into the abyss, and occasionally survive. And this is the fundamental point: nature has a history only in so far as it is susceptible of continuity. It is because it takes on all possible characters in turn (each value of all the variables) that it is presented in the form of a succession.

The same can be said for the inverse system of the prototype and the terminal species. In this case it is necessary to suppose, with J-B. Robinet, that continuity is assured, not by memory, but by a project - the project of a complex being towards which nature makes its way from the starting-point of simple elements which it gradually combines and arranges: 'First of all, the elements combine. A small number of simple principles serves as a basis for all bodies'; these are the ones that govern exclusively the organization of minerals; then 'the magnificence of nature' continues to increase without a break 'up to the level of the beings that move upon the surface of the globe'; 'the variation of the organs in number, in size, in refinement, in internal texture, and in external form, produces species which are divided and subdivided to infinity by new arrangements'[55]. And so on, until we reach the most complex arrangement we know of. 154

So that the entire continuity of nature resides between an absolutely archaic prototype, buried deeper than any history, and the extreme complication of this model as it is now possible to observe it, at least on this earthly globe, in the person of the human being [56]. Between these two extremes there lie all the possible degrees of complexity and combination - like an immense series of experiments, of which some have persisted in the form of continuing species and some have sunk into oblivion. Monsters are not of a different 'nature' from the species themselves:

We should believe that the most apparently bizarre forms... belong necessarily and essentially to the universal plan of being; that they are metamorphoses of the prototype just as natural as the others, even though they present us with different phenomena; that they serve as means of passing to adjacent forms; that they prepare and bring about the combinations that follow them, just as they themselves were brought about by those that preceded them; that far from disturbing the order of things, they contribute to it. It is only, perhaps, by dint of producing

monstrous beings that nature succeeds in producing beings of greater regularity and with a more symmetrical structure[57].

In Robinet, as in Maupertuis, succession and history are for nature merely means of traversing the infinite fabric of variations of which it is capable. It is not, then, that time or duration ensures the continuity and specification of living beings throughout the diversity of successive environments, but that against the continuous background of all the possible variations time traces out an itinerary upon which climates and geography pick out only certain privileged regions destined to survive. Continuity is not the visible wake of a fundamental history in which one same living principle struggles with a variable environment. For continuity precedes time. It is its condition. And history can play no more than a negative role in relation to it: it either picks out an entity and allows it to survive, or ignores it and allows it to disappear.

This has two consequences. First, the necessity of introducing monsters into the scheme - forming the background noise, as it were, the endless murmur of nature. Indeed, if it is necessary for time, which is limited, to run through-or perhaps to have already run through-the whole continuity of nature, one is forced to admit that a considerable number of possible variations have been encountered and then erased; just as the geological catastrophe was necessary to enable us to work back from the taxonomic table to the continuum, through a blurred, chaotic, and fragmented experience, so the proliferation of monsters without a future is necessary to enable us to work down again from the continuum, through a temporal series, to the table. In other words, what must be construed, as we move in one direction, as a drama of the earth and waters must be construed, in the other direction, as an obvious aberration of forms. The monster ensures in time, and for our theoretical knowledge, a continuity that, for our everyday experience, floods, volcanoes, and subsiding continents confuse in space. The other consequence is that the signs of continuity throughout such a history can no longer be of any order other than that of resemblance. Since this history is not defined by any relation of organism to environment[58], the living forms will be subjected in it to all possible metamorphoses and leave behind them no trace of the path they have followed other than the reference points represented by similitudes. How, for example, are we to recognize that nature, starting from a primitive prototype, has never ceased to work towards the provisionally terminal form that is man? By the fact that it has abandoned on the way thousands of forms that provide us with a picture of the rudimentary model. How many fossils are there, for man's car, or skull, or sexual parts, like so many plaster statues, fashioned one day and dropped the next in favour of a more perfected form?

The species that resembles the human heart, and for that reason is named Anthropocardite ... is worthy of particular attention. Its substance is flint inside. The form of a heart is imitated as perfectly as possible. One can distinguish in it the stump of the vena cava, together with a

portion of its two cross-sections. One can also see the stump of the great artery emerging from the left ventricle, together with its lower or descending branch [59].

The fossil, with its mixed animal and mineral nature, is the privileged locus of a resemblance required by the historian of the continuum, whereas the space of the taxinomia decomposed it with rigour.

The monster and the fossil both play a very precise role in this configuration. On the basis of the power of the continuum held by nature, the monster ensures the emergence of difference. This difference is still without law and without any well-defined structure; the monster is the root-stock of specification, but it is only a sub-species itself in the stubbornly slow stream of history. The fossil is what permits resemblances to subsist throughout all the deviations traversed by nature; it functions as 156 a distant and approximative form of identity; it marks a quasi-character in the shift of time. And this is because the monster and the fossil are merely the backward projection of those differences and those identities that provide taxinomia first with structure, then with character. Between table and continuum they form. a shady, mobile, wavering region in which what analysis is to define as identity is still only mute analogy; and what it will define as assignable and constant difference is still only free and random variation. But, in truth, it is so impossible for natural history to conceive of the history of nature, the epistemological arrangement delineated by the table and the continuum is so fundamental, that becoming can occupy nothing but an intermediary place measured out for it solely by the requirements of the whole. This is why it occurs only in order to bring about the necessary passage from one to the other - either as a totality of destructive events alien to living beings and occurring only from outside them, or as a movement ceaselessly being outlined, then halted as soon as sketched, and perceptible only on the fringes of the table, in its unconsidered margins. Thus, against the background of the continuum, the monster provides an account, as though in caricature, of the genesis of differences, and the fossil recalls, in the uncertainty of its resemblances, the first buddings of identity.

VII. THE DISCOURSE OF NATURE

The theory of natural history cannot be dissociated from that of language. And yet it is not a question of a transference of method, from one to the other; nor of a communication of concepts; nor of the prestige of a model which, because it has 'succeeded' in one field, has been tried out in the one next to it. Nor is it a question of a more general rationality imposing identical forms upon grammatical thinking and upon taxinomia. Rather, it concerns 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. There were doubtless, in this region we now term life, many inquiries other than attempts at classification, many kinds of analysis other than that of identities and differences. But they all rested upon a sort of historical a priori, which

authorized them in their dispersion and in their singular and divergent projects, and rendered equally possible all the differences of opinion of which they were the source. This a priori does not consist of a set of constant problems uninterruptedly presented to men's curiosity by concrete phenomena as so many enigmas; nor is it 157 made up of a certain state of acquired knowledge laid down in the course of the preceding ages and providing a ground for the more or less irregular, more or less rapid, progress of rationality; it is doubtless not even determined by what is called the mentality or the 'framework of thought' of any given period, if we are to understand by that the historical outline of the speculative interests, beliefs, or broad theoretical options of the time. This a priori is what, in a given period, delimits in the totality of experience a field of knowledge, defines the mode of being of the objects that appear in that field, provides man's everyday perception with theoretical powers, and defines the conditions in which he can sustain a discourse about things that is recognized to be true. In the eighteenth century, the historical a priori that provided the basis for inquiry into or controversy about the existence of genera, the stability of species, and the transmission of characters from generation to generation, was the existence of a natural history: the organization of a certain visible existence as a domain of knowledge, the definition of the four variables of description, the constitution of an area of adjacencies in which any individual being whatever can find its place. Natural history in the Classical age is not merely the discovery of a new object of curiosity; it covers a series of complex operations that introduce the possibility of a constant order into a totality of representations. It constitutes a whole domain of empiricity as at the same time describable and orderable. What makes it akin to theories of language also distinguishes it from what we have understood, since the nineteenth century, by biology, and causes it to play a certain critical role in Classical thought.

Natural history is contemporaneous with language: it is on the same level as the spontaneous play that analyses representations in the memory, determines their common elements, establishes signs upon the basis of those elements, and finally imposes names. Classification and speech have their place of origin in the same space that representation opens up within itself because it is consecrated to time, to memory, to reflection, to continuity. But natural history cannot and should not exist as a language independent of all other languages unless it is a well-constructed language -and a universally valid one. In spontaneous and 'badly constructed' language, the four elements (proposition, articulation, designation, derivation) leave interstices open between them: individual experiences, needs or passions, habits, prejudices, a more or less awakened concentration, have established hundreds of different languages - languages that differ from one another not only in the form of their words, but above all 158 in the way in which those words pattern representation. Natural history can be a well-constructed language only if the amount of play in it is enclosed: if its descriptive exactitude makes every proposition into an invariable pattern of reality (if one can always attribute to the representation what is articulated in it) and if the designation of each being indicates clearly the place it occupies in the general arrangement of the whole. In language, the function of the verb is

universal and void; it merely prescribes the most general form of the proposition; and it is within the latter that the names bring their system of articulation into play; natural history regroups these two functions into the unity of the structure, which articulates together all the variables that can be attributed to a being. And whereas in language the designation, in its individual functioning, is exposed to the hazard of derivations, which endow the common names with their scope and extension, the character, as established by natural history, makes it possible both to indicate the individual and to situate it in a space of generalities that fit inside one another. So that above the ordinary, everyday words (and by means of them, since it is of course necessary to use them for the initial descriptions) there is raised the edifice of a language in the second degree in which the exact Names of things finally rule:

The method, the soul of science, designates at first sight any body in nature in such a way that the body in question expresses the name that is proper to it, and that this name recalls all the knowledge that may, in the course of time, have been acquired about the body thus named: so that in the midst of extreme confusion there is revealed the sovereign order of nature [60].

But this essential nomination - this transition from the visible structure to the taxonomic character - leads back to a costly requirement. In order to fulfil and enclose the figure that proceeds from the monotonous function of the verb to be to derivation and traversal of rhetorical space, spontaneous language had no need of anything but the play of imagination: that is, of immediate resemblances. For taxonomy to be possible, on the other hand, nature must be truly continuous, and in all its plenitude. Where language required the similarity of impressions, classification requires the principle of the smallest possible difference between things. Now, this continuum, which appears therefore at the very basis of nomination, in the opening left between description and arrangement, is presupposed well before language, as its condition. And not only because 159 it can provide the basis for a well-constructed language, but because it accounts for all language in general. It is without doubt the continuity of nature that gives memory the opportunity of exercising itself, as when a representation, through some confused and ill-perceived identity, recalls another and makes it possible to apply to both the arbitrary sign of a common name. What was presented in the imagination as a blind similitude was merely the blurred and unreflected trace of the great uninterrupted fabric of identities and differences. Imagination (which, by making comparison possible, justifies language) formed, without its then being known, the ambiguous locus in which the shattered but insistent continuity of nature was united with the empty but attentive continuity of consciousness. It would not have been possible to speak, there would have been no place for even the merest name, if nature, in the very depth of things, before all representation, had not been continuous. To establish the great, unflawed table of the species, genera, and classes, natural history had to employ, criticize, and finally reconstitute at new expense a language whose condition of possibility resided precisely in that continuum. Things and words are very strictly interwoven: nature is posited only through the grid of denominations, and - though without such names it would remain mute and invisible - it

glimmers far off beyond them, continuously present on the far side of this grid, which nevertheless presents it to our knowledge and renders it visible only when wholly spanned by language.

This, no doubt, is why natural history, in the Classical period, cannot be established as biology. Up to the end of the eighteenth century, in fact, life does not exist: only living beings. These beings form one class, or rather several classes, in the series of all the things in the world; and if it is possible to speak of life it is only as of one character - in the taxonomic sense of that word - in the universal distribution of beings. It is usual to divide the things in nature into three classes: minerals, which are recognized as capable of growth, but not of movement or feeling; vegetables, which are capable of growth and susceptible to sensation; and animals, which are capable of spontaneous movement [61]. As for life and the threshold it establishes, these can be made to slide from one end of the scale to the other, according to the criteria one adopts. If, with Maupertuis, one defines life by the mobility and relations of affinity that draw elements towards one another and keep them together, then one must conceive of life as residing in the simplest particles of matter. But one must situate it much higher in the series if one defines it by means of 160 a crowded and complex character, as Linnaeus did when he set up as his criteria birth (by seed or bud), nutrition (by intussusception), ageing, exterior movement, internal propulsion of fluids, diseases, death, and presence of vessels, glands, epiderms, and utricles [62]. Life docs not constitute an obvious threshold beyond which entirely new forms of knowledge are required. It is a category of classification, relative, like all the other categories, to the criteria one adopts. And also, like them, subject to certain imprecisions as soon as the question of deciding its frontiers arises. Just as the zoophyte stands on the ambiguous frontier between animals and plants, so the fossils, as well as the metals, reside in that uncertain frontier region where one does not know whether one ought to speak of life or not. But the dividing-line between the living and the non-living is never a decisive problem [63]. As Linnaeus says, the naturalist - whom he calls Historiens naturalis - 'distinguishes the parts of natural bodies with his eyes, describes them appropriately according to their number, form, position, and proportion, and he names them'[64]. The naturalist is the man concerned with the structure of the visible world and its denomination according to characters. Not with life.

We must therefore not connect natural history, as it was manifested during the Classical period, with a philosophy of life, albeit an obscure and still faltering one. In reality, it is interwoven with a theory of words. Natural history is situated both before and after language; it decomposes the language of everyday life, but in order to recompose it and discover what has made it possible through the blind resemblances of imagination; it criticizes language, but in order to reveal its foundation. If natural history reworks language and attempts to perfect it, this is because it also delves down into the origin of language. It leaps over the everyday vocabulary that provides it with its immediate ground, and beyond that ground it searches for that which could have constituted its raison d'être but, inversely, it resides in its entirety in the area of language, since

it is essentially a concerted use of names and since its ultimate aim is to give things their true denomination. Between language and the theory of nature there exists therefore a relation that is of a critical type; to know nature is, in fact, to build upon the basis of language a true language, one that will reveal the conditions in which all language is possible and the limits within which it can have a domain of validity. The critical question did exist in the eighteenth century, but linked to the form of a determinate knowledge. For this reason it could not acquire either autonomy or the value of radical questioning: it prowled endlessly through a region 161 where what mattered was resemblance, the strength of the imagination, nature and human nature, and the value of general and abstract ideas - in short, the relations between the perception of similitude and the validity of the concept. In the Classical age - Locke and Linnaeus, Buffon and Hume are our evidence of this - the critical question concerned the basis for resemblance and the existence of the genus.

In the late eighteenth century, a new configuration was to appear that would definitively blur the old space of natural history for modem eyes. On the one hand, we see criticism displacing itself and detaching itself from the ground where it had first arisen. Whereas Hume made the problem of causality one case in the general interrogation of resemblances [65], Kant, by isolating causality, reverses the question; whereas before it was a question of establishing relations of identity or difference against the continuous background of similitudes, Kant brings into prominence the inverse problem of the synthesis of the diverse. This simultaneously transfers the critical question from the concept to the judgement, from the existence of the genus (obtained by the analysis of representations) to the possibility of linking representations together, from the right to name to the basis for attribution, from nominal articulation to the proposition itself, and to the verb to be that establishes it. Whereupon it becomes absolutely generalized. Instead of having validity solely when applied to the relations of nature and human nature, it questions the very possibility of all knowledge.

On the other hand, however, and during the same period, life assumes its autonomy in relation to the concepts of classification. It escapes from that critical relation which, in the eighteenth century, was constitutive of the knowledge of nature. It escapes - which means two things: life becomes one object of knowledge among others, and is answerable, in this respect, to all criticism in general; but it also resists this critical jurisdiction, which it takes over on its own account and brings to bear, in its own name, on all possible knowledge. So that throughout the nineteenth century, from Kant to Dilthey and to Bergson, critical forms of thought and philosophies of life find themselves in a position of reciprocal borrowing and contestation.

NOTES

[1] J. Ray published a Historia plantarum generalis as late as 1686. [2] Jonston, Historia naturalis de quadripedidus (Amsterdam, 1657, pp. I-II). [3] Diderot, Lettre sur les aveugles. Cf. Linnaeus: 'We should reject... all 162 accidental notes that do not exist in the Plant either for the eye or for the touch' (Philosophic botanique, section 258).

[4] Linnaeus, Systema naturae, p. 214. On the limited usefulness of the microscope, cf. ibid, pp. 220-1. (We have retained throughout the author's references to the French editions of the works of Linne (Linnaeus) - translator's note.)

[5] Toumefort, Isagoge in rem herbarium (1719); Fr. trans. in Becker-Tournefort (Paris, 1956, p. 295). Buffon criticized the Linnaean method for relying upon characters so tenuous that it rendered the use of the microscope unavoidable. From one naturalist to another, reproof concerning the use of an optical instrument has value as a theoretical objection. [6] Linnaeus, Philosophic botanique, section 299. [7] Ibid., section 167; cf. also section 327. [8] Toumefort, Elements de botanique, p. 558. [9] Linnaeus, Philosophic botanique, section 299.

[10] Linnaeus (op. cit., section 331) lists the parts of the body that can be used as archetypes, whether for dimensions or, above all, for forms: hair, nails, thumbs, palms, eyes, ears, fingers, navel, penis, vulva, breasts.

[11] Ibid., sections 328-9.

[12] Buffon, Discours sur la maniere de trailer l'histoire naturelle (CEuvres completes, t.I, p. 21).

[13] Adanson, Familles des plantes (Paris, 1763,1.1, preface, p. cci).

[14] Boissier de Sauvages, Nosologie methodique (Fr. trans. Lyon, 1772, t. I, pp. 91-2).

[15] Linnaeus, Philosophie botanique, section 258.

[r6] Toumefort, Elements de botanique, pp. 1-2.

[17] Linnaeus, Philosophic botanique, section 192.

[18] Ibid., section 193.

[19] Linnaeus, Systema naturae, section 12.

[20] Linnaeus, Philosophie botanique, section 77.

[21] Linnaeus, Systema naturae, section 12.

[22] 'The natural character of the species is its description' (Linnaeus, Philosophic botanique, section 193).

[23] Toumefort, Elements de botanique, p. 27.

[24] Linnaeus, Philosophic botanique, section 167.

[25] Linnaeus, Systeme sexuel des vegetaux (Fr. trans. Paris, year VI, p. 21).

[26] Linnaeus, Philosophie botanique, section 212.

[27] Ibid., section 284.

[28] Ibid., section 151. These two functions, which are guaranteed by the character, correspond exactly to the functions of designation and derivation performed in language by the common noun.

[29] Adanson, Histoire natmelle du Senegal (Paris, 1757).

[30] Adanson, Cours d'histoire naturelle (Paris, 1772; 1845 edn., p. 17).

[31] Adanson, Families des plantcs.

[32] Ibid., t. I, preface.

[33] Linnaeus, Philosophic botaniquie, section 105.

[34] Ibid., section 94.

[35] Cf. P. Belon, Histoire de la nature des oisvaux.

[36] Cf. p. 113 above.

[37] Linnaeus, Philosophic botanique, section 156.

[38] Ibid., section 169.

[39] Buffon, Discours sur la maniere de traiter I'histoire naturelle (CEuvres completes, t.I, pp. 36 and 39).

[40] ?. Bonnet, Contemplation de la nature, lere partie (CEuvres completes,t. IV, pp. 35-0).

[41] Linnaeus, Philosophie botanique.

[42] Adanson, Cours d'histoire naturelle, 1845 edn., pp. 4-5.

[43] Buffon, Histoire de la terre.

[44] ?. Bonnet, Palingenesie philosophique (CEuvres completes, t. VII, p. 122).

[45] C. Bonnet, Contemplation de la nature, chap. XX, pp. 130-8.

[46] Buffon, Histoire naturelle des oiseaux (1770,t. I, p. 396).

[47] Pallas, Elenchus Zoophylorum (1786).

[48] J. Hermann, Tabulae affinltatum animaHum (Strasbourg, 1783, p. 24).

[49] C. Bonnet, Contemplation de la nature, lere partie (CEuvres completes, t. IV, p. 34 et seq.).

[50] C. Bonnet, Palingenesie philosophise (CEuvres completes, t. VII, pp. 149-150).

[51] C. Bonnet (CEuvres completes, t. Ill, p. 173) quotes a letter from Leibniz to Hermann on the chain of being.

[52] C. Bonnet, Palingenesie philosophique (CEuvres completes, t. VII, p. 193).

[53] Benolt de Maillet, Telliamed ou les entretiens d'un philosophc chinois avec un missionnaire francais (Amsterdam, 1748, p. 142).

[54] Maupcrtuis, Essai sur la formation des corps organises (Berlin, 1754, p. 41).

[55] J-B. Robinet, De la nature (yd edn., 1766, pp. 25-8).

[56] J-B. Robinet, Considerations philosophiques sur la gradation naturelte des formes de I'etre (Paris, 1768, pp. 4-5).

[57] Ibid., p. 198.

[58] On the non-existence of the biological notion of the 'environment' in the eighteenth century, cf. G. Canguilhem, La Connaissance de la vie (Paris, 2nd edn., 1965, pp. 129-54).

[59] J-B. Robinet, Considerations philosophiques sur la gradation naturelle des formes de I'etre, p. 19.

[60] Linnaeus, Systerna naturae, p. 13.

[61] Cf, for example, Linnaeus, Systema naturae, p. 215.

[62] Linnaeus, Philosophie botanique, section 133. Cf. also Systeme sexuel des vegetaux, p. I.

[63] Bonnet accepted a quadripartite division in nature: unstructured brute beings, inanimate structured beings (vegetables), animate structured beings (animals), animate structured and reasoning beings (men). Cf. Contemplation de la nature, II ieme partie, chap. I.

[64] Linnaeus, Systema naturae, p. 215.

[65] Hume, A treatise of human nature (1739, book I, part III, section III, and part IV, section VI).