Cuvier's Position in the History of Biology
Translated by Felicity Edholm

Editor's Note:
The French version of this text was first published in the *Revue d'Histoire des Sciences*, 23, 1970. The English translation presented here was produced by Felicity Edholm and first appeared in the *Critique of Anthropology*, 1979 4: 125. As always, editorial interventions have been restricted to only those cases where it is obviously a matter of a typographical error.

I would like initially to specify what I mean by the phrase epistemological transformation and will illustrate this by the use of two examples.

The first concerns biology, and biological concepts of the individual and individual variation. Cuvier could be characterised as the one person who actually believed in the species, as the one person who was totally unconcerned with what existed below the level of the species, who got entirely caught up in the notion of the species, who was able to focus on what existed below the level of the species and to apply biological knowledge to the individual. He believed that everything was organised from the level of the species, for the species, up to the species. We all know what Darwin said in contrast to this on the species. For Darwin the species was not the originally prior and analytically the ultimate reality, as it was for Cuvier. Darwin found it difficult to distinguish species from variety and cites several examples which demonstrate that in botany and in zoology it is not possible to say that this is a species and that a variety. Darwin did on the other hand admit that there was progressive consolidation of individual variations. Even within the species he says that small variations occur which are endlessly accentuated and which finally break through the definition which had, a posteriori, been given to the species. Finally individuals, variations of variations, link up with each other beyond and above the boundaries of the definition which had been given to the species. In fact Darwin admits that all the taxonomic definitions which had been proposed for the classification of plants and animals were, up to a certain point, abstract categories. For him there was therefore one reality, which was that of the individual, and another which was the 'variability 'of the individual - its capacity to vary. All other categories (species, genus, order etc) were kinds of constructions built on the basis of the only reality: the individual. In this respect we can say then thot Darwin's position is directly opposed to Cuvier's. However, odd as it might seem, it also in fact reflects an aspect of classical 17th and 18th-century taxonomy. The methodists, especially Lamarck for example, questioned the whole notion of the reality of the species, and since they felt that the continuity in nature was so well integrated, and contained so few interruptions, they thus believed that the species was perhaps an abstract category. So in Darwin we can see a kind of return to theories such as these which are found not only in Lamarck but also in the work of the methodists in the Lamarckian period. We might then ask (in the history of the biology of the individual) whether or not we could trace a direct connection between Jussieu or Lamarck to Darwin and bypass Cuvier entirely. In this version of history Cuvier would be entirely enucleated. Such an analysis is however neither adequate nor entirely justified. As often happens in situations like this, or return, repetition, reinterpretation, underlying them is a complex phenomenon, a highly charged process of transformation.

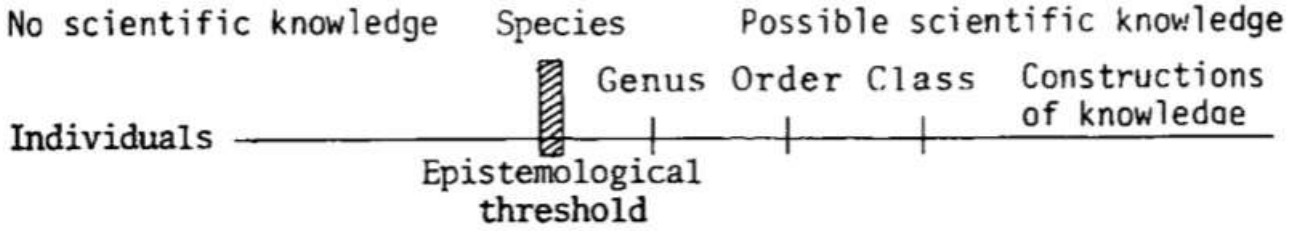
I would like to show how in the work of Lamarck and his contemporaries the individual, or rather the criticism of the concept of the species, is not entirely the isomorphism of, nor is it superimposed on the criticism of the species that is found in Darwin. In fact Darwin's criticism of the species could only occur as a result of the transformation, reorganisation and redistribution in biological knowledge which was achieved through the work of Cuvier. So in what does such a transformation exist?

Classical taxonomy was essentially the science of the species, in other words of the definition of the differences which separate each species from the others; the classification of these differences; the construction of the general categories of these differences; and the hierarchy involved in the relations between them. In other words the whole structure of classical taxonomy depends on differences between species and the attempts to define differences at a higher level than that of species difference.

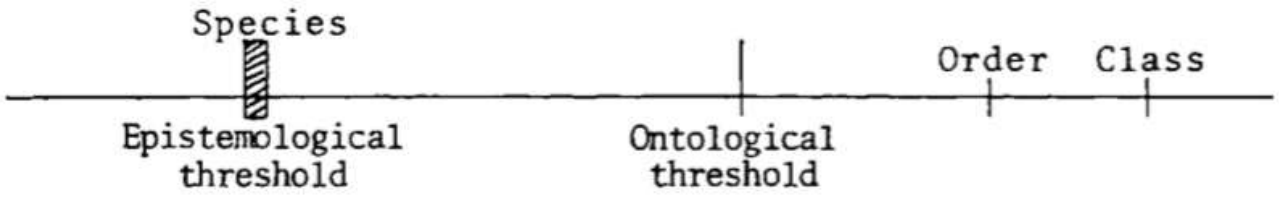
I think that we have evidence of the fact that biological classification chooses the difference between species as its minimal element - that it is unable to go below these differences. Linnaeus for example says that knowledge of individuals and of varieties is the knowledge of differences necessary to a florist, not a botanist. He also said that the knowledge of varieties was important for economics, for medicine, and for cooking. But he goes further than this. He adds that the knowledge of varieties was practical knowledge. In

contrast to this scientific theory begins with the species. The existence of this threshold between the individual and the species has important consequences.

First, the difference between species difference and the individual difference - which involves a break, a leap, a threshold. This threshold marks the point from which scientific knowledge can begin. Individual difference is not relevant to science. There is an epistemological threshold between the individual and the species.



On the other hand it is true that what is given as the primitive object of science is the species and the difference between species, everything which is constructed on the basis of the difference between species, in other words the difference between differences, or the similarities between differences, more general differences than those relevant to species and as a result the categories which are broader than those of the species, categories such as these are the constructs. These constructs, produced through knowledge, do not, unlike the definition of the species, depend on data that are in effect given to consciousness, they are hypotheses that can be more or less verified, hypotheses which are more or less well founded, hypotheses which will perhaps coincide with the facts. Thus everything above the level of the species will not belong to the same ontological category as what relates to the species or the the individual below the species level. So between the species and the genus a new threshold is created which this time is not epistemological but ontological.



This means that it is at the level above that of the individual that knowledge can be organised. From the level of the species onwards, knowledge is not given but constructed, while below this level a whole range of reality exists which is in effect given to experience.

It is on this issue that the problems of classical taxonomy originate: how is it possible to establish genera which are real or at least - since they are never real - well defined and well established? In this we can see the basis for the antimony and the opposition between the systematicians and the methodists. The former said that at any rate beyond the level of the species, we cannot directly achieve reality. A classificatory technique has to be established which might be arbitrary but must be effective and convenient. The methodists stated in contrast to this position that classes and classificatory constructs which have to be established had, up to a certain point, to be adjusted to the overall resemblances which were given in experience. A salad and a fir tree should not be classed together. Both debates, whether they depended on the natural method or on the arbitrary system, are always conducted the other side of this ontological threshold.

The problem is to understand how this form of classical taxonomy was transformed. How was it possible to rediscover in the individual, which from now on would be subsumed under the species and the genus, the one and only thread of reality (for Darwin the thread was genealogy)? How was Darwin able on the one hand to destroy the epistemological threshold and to demonstrate how in fact it was necessary to

begin with the individual, with individual variations; and on the other hand to show how, starting from the individual, it was possible to establish what the individual's species, order or class was and that this was the reality of its genealogy, the sequence of individuals? It would thus be possible to have a uniform table without the double threshold system.

This transformation became possible through the work of Cuvier.

Comparative anatomy as practised by Cuvier was firstly responsible for the introduction of comparative anatomy as the instrument for the taxonomic organisation and classification of the species. It also resulted in conferring the same ontological form on the species, the genus, the order, and the class. The first effect of comparative anatomy was therefore to have eliminated this ontological threshold. What comparative anatomy did demonstrate was that all the categories which existed above the level of the species, superior to the species, were not simply, as in the classical taxonomy, kinds of regions, areas of resemblances, groups with analogous characteristics that could be established either on an arbitrary basis according to a system of signs, or at a gross level, according to the general configuration of plants and of animals. Rather, they were seen as types of organisation. From now on to belong to a genus, an order, a class did not mean that things were considered as sharing with other species fewer characteristics than those which were specific to that thing. It did not imply a generic characteristic or the characteristics of a class; it meant to have a precise form of organisation, that is lungs and a valved heart or a digestive system which was situated above or below the nervous system. In short, then, to belong to a genus, a class, or an order, to belong to all the categories which lie below that of the species, means that each thing possesses, in itself, in its own anatomy, its own functioning, in its physiology, its form of existence, a certain perfectly analysable structure, and one which as a result of this has its own positivity.

There are thus positive systems of correlations. To this extent one cannot say that the genus is less real than the species, or the class than the species. From the level of the species to the most general category there is one and the same reality: biological reality, that is to say the reality of anatomo-physiological functioning.

The ontological threshold between the species and the genus thus disappears. Ontological homogeneity from now on therefore encompasses the individual and the species, the genus, the order, the class in an uninterrupted sequence. Furthermore the interlocking of the categories was in classical taxonomy quite appropriate for the classificatory table. But in the work of Cuvier we have an anatomo-physiological interlocking of all the categories with their internal support. We have this in each individual; in other words it is the individual in its real functioning which carries in itself, and in the depths of its mechanism, all the layers, the determinations, the orders, regulations and correlations which can exist between the different levels of the table. For Cuvier the individual was to be constructed from an interlocking of the anatomo-physiological structures which were to constitute its branches, its class, its order and its genus. These structures, taken as a whole, which are in effect present in each individual, which are patiently organising it, which physiologically control it, will thus to a certain extent define its conditions of existence. By conditions of existence Cuvier means the meeting of two things: on the one hand the set of correlations which are physiologically compatible with each other, and on the other the context in which it lives; in other words the nature of the molecules which it has assimilated either through breathing or by eating. Thus, at the beginning of *The Revolutions of the Globe*,[1] we find a passage in which Cuvier shows in what way these conditions of existence operate. The individual in its real existence, in its life, is nothing more than the sum total of the structures which are both taxonomic and anatomo-physiological. It is also this totality which is present in some way in the individual within a given context. There are as a result two series: one in which the individual lies outside the level of knowledge and in which the species, the genus, the order etc are all ontologically connected to each other; and the other with the real life of the individual and the milieu in which its specific generic characteristics are found and function. Two different kinds of knowledge can therefore be established: comparative anatomy, which allows the most general characteristic and the most universal structures of the individual to be considered, and which enables the class, the order, the genus, and the species to which they belong to be selected; and palaeontology, which starts with what can be directly

[1] Citation missing from the original. The passage has not been identified by myself, but it seems to be in Cuvier (1831) *A Discourse on the Revolutions of the Globe, and the Changes thereby Produced in the Animal Kingdom* (translator not credited), Carey & Lea, Philadelphia, USA., available at https://resource.nlm.nih.gov/60741090R and in the public domain. — Ed.

observed in the individual and leads ultimately to the level below the individual, that of an organ. Then, through the study of the organ, it can also consider the species, through taking into consideration the milieu in which it operates or through taking account of both the anatomical and the contextual. In this way two epistemological lines can be established, one for comparative anatomy and the other for palaeontology and both these are entirely different from classical taxonomy. The ontological and epistemological thresholds are thus eliminated. We can also understand how Darwin's work was possible. To understand this possibility does not mean that after Cuvier there were no other transformations nor that Darwin himself did not have to add various other transformations.

In fact what really constitutes the specificity and the limits of Cuvier's transformation is the fact that, in order to accommodate the two lines to each other, he had to admit some kind of teleology, an end which implied that class, order, genus and species were created so that the individual could live. Thus through this there is a kind of predetermination of the real conditions of existence of the individual. On the other hand the individual, according to Cuvier, bears in himself all the characteristics of the species, of the genus which for him are the inescapable determinations. His static view results from this position. It is both this and the notion of some ultimate end which are the additional theoretical conditions that Cuvier has to maintain so that his system can hold - the system which underlies his whole system of knowledge. This form of analysis of comparative anatomy, which is connected by its teleology is, by Cuvier himself, called the unity of the type. In contrast to this process through which Cuvier, starting from the given individual, analyses the notions of the species, the genus etc, in the conditions and in the context in which it functions, itself entails the analysis of the conditions of existence. It could be said that Cuvier could only maintain the unity of his system through subordinating the conditions of existence to the unity of the type. What Darwin had to do was to modify the very meaning of conditions of existence, since for Cuvier these depended on the confrontation of these conditions and the anatomo-physiological structure which characterises an individual and which incorporates in the individual the taxonomy to which it belongs, and the context in which it lives.

From Darwin on, these conditions, having been freed from the concept of the unity of the type, become the conditions of existence given to an individual living in a particular context. We can also in this way describe the transformation through which the problem of the relations between the individual and the species in the classical period changed into Darwin's understanding of this relationship. It seems to me that the movement from the one to the other was only made possible through a complete reconstruction of the epistemological field of biology which can be seen to operate in the work of Cuvier. Whatever the errors that Cuvier can be seen to have made, we can claim that there was a 'Cuvieian transformation.'