

## Chapter VIII.

### Of Classification By Series.

§ 1. Thus far, we have considered the principles of scientific classification so far only as relates to the formation of natural groups; and at this point most of those who have attempted a theory of natural arrangement, including, among the rest, Dr. Whewell, have stopped. There remains, however, another, and a not less important portion of the theory, which has not yet, as far as I am aware, been systematically treated of by any writer except M. Comte. This is, the arrangement of the natural groups into a natural series.(228)

The end of Classification, as an instrument for the investigation of nature, is (as before stated) to make us think of those objects together which have the greatest number of important common properties; and which, therefore, we have oftenest occasion, in the course of our inductions, for taking into joint consideration. Our ideas of objects are thus brought into the order most conducive to the successful prosecution of inductive inquiries generally. But when the purpose is to facilitate some particular inductive inquiry, more is required. To be instrumental to that purpose, the classification must bring those objects together, the simultaneous contemplation of which is likely to throw most light upon the particular subject. That subject being the laws of some phenomenon or some set of connected phenomena; the very phenomenon or set of phenomena in question must be chosen as the groundwork of the classification.

The requisites of a classification intended to facilitate the study of a particular phenomenon, are, first to bring into one class all Kinds of things which exhibit that phenomenon, in whatever variety of forms or degrees; and, secondly, to arrange those Kinds in a series according to the degree in which they exhibit it, beginning with those which exhibit most of it, and terminating with those which exhibit least. The principal example, as yet, of such a classification, is afforded by comparative anatomy and physiology, from which, therefore, our illustrations shall be taken.

§ 2. The object being supposed to be, the investigation of the laws of animal life; the first step, after forming the most distinct conception of the phenomenon itself, possible in the existing state of our knowledge, is to erect into one great class (that of animals) all the known Kinds of beings where that phenomenon presents itself; in however various combinations with other properties, and in however different degrees. As some of these Kinds manifest the general phenomenon of animal life in a very high degree, and others in an insignificant degree, barely sufficient for recognition; we must, in the next place, arrange the various Kinds in a series, following one another according to the degrees in which they severally exhibit the phenomenon; beginning therefore with man, and ending with the most imperfect kinds of zoophytes.

This is merely saying that we should put the instances, from which the law is to be inductively collected, into the order which is implied in one of the four Methods of Experimental Inquiry discussed in the preceding Book; the fourth Method, that of Concomitant Variations. As formerly remarked, this is often the only method to which recourse can be had, with assurance of a true conclusion, in cases in which we have but limited means of effecting, by artificial experiments, a separation of circumstances usually conjoined. The principle of the method is, that facts which increase or diminish together, and disappear together, are either cause and effect, or effects of a common cause. When it has been ascertained that this relation really subsists between the variations, a connection between the facts themselves may be confidently laid down, either as a law of nature or only as an empirical law, according to circumstances.

That the application of this Method must be preceded by the formation of such a series as we have described, is too obvious to need being pointed out; and the mere arrangement of a set of objects in a series, according to the degrees in which they exhibit some fact of which we are seeking the law, is too naturally suggested by the necessities of our inductive operations, to require any lengthened illustration here. But there are cases in which the arrangement required for the special purpose becomes the determining principle of the classification of the same objects for general purposes. This will naturally and properly happen, when those laws of the

objects which are sought in the special inquiry enact so principal a part in the general character and history of those objects--exercise so much influence in determining all the phenomena of which they are either the agents or the theatre--that all other differences existing among the objects are fittingly regarded as mere modifications of the one phenomenon sought; effects determined by the co-operation of some incidental circumstance with the laws of that phenomenon. Thus in the case of animated beings, the differences between one class of animals and another may reasonably be considered as mere modifications of the general phenomenon, animal life; modifications arising either from the different degrees in which that phenomenon is manifested in different animals, or from the intermixture of the effects of incidental causes peculiar to the nature of each, with the effects produced by the general laws of life; those laws still exercising a predominant influence over the result. Such being the case, no other inductive inquiry respecting animals can be successfully carried on, except in subordination to the great inquiry into the universal laws of animal life; and the classification of animals best suited to that one purpose, is the most suitable to all the other purposes of zoological science.

§ 3. To establish a classification of this sort, or even to apprehend it when established, requires the power of recognizing the essential similarity of a phenomenon, in its minuter degrees and obscurer forms, with what is called the *same* phenomenon in the greatest perfection of its development; that is, of identifying with each other all phenomena which differ only in degree, and in properties which we suppose to be caused by difference of degree. In order to recognize this identity, or, in other words, this exact similarity of quality, the assumption of a type-species is indispensable. We must consider as the type of the class, that among the Kinds included in it, which exhibits the properties constitutive of the class, in the highest degree; conceiving the other varieties as instances of degeneracy, as it were, from that type; deviations from it by inferior intensity of the characteristic property or properties. For every phenomenon is best studied (*cæteris paribus*) where it exists in the greatest intensity. It is there that the effects which either depend on it, or depend on the same causes with it, will also exist in the greatest degree. It is there, consequently, and only there, that those effects of it, or joint effects with it, can become fully known to us, so that we may learn to recognize their smaller degrees, or even their mere rudiments, in cases in which the direct study would have been difficult or even impossible. Not to mention that the phenomenon in its higher degrees may be attended by effects or collateral circumstances which in its smaller degrees do not occur at all, requiring for their production in any sensible amount a greater degree of intensity of the cause than is there met with. In man, for example (the species in which both the phenomenon of animal and that of organic life exist in the highest degree), many subordinate phenomena develop themselves in the course of his animated existence, which the inferior varieties of animals do not show. The knowledge of these properties may nevertheless be of great avail toward the discovery of the conditions and laws of the general phenomenon of life, which is common to man with those inferior animals. And they are, even, rightly considered as properties of animated nature itself; because they may evidently be affiliated to the general laws of animated nature; because we may fairly presume that some rudiments or feeble degrees of those properties would be recognized in all animals by more perfect organs, or even by more perfect instruments, than ours; and because those may be correctly termed properties of a class, which a thing exhibits exactly in proportion as it belongs to the class, that is, in proportion as it possesses the main attributes constitutive of the class.

§ 4. It remains to consider how the internal distribution of the series may most properly take place; in what manner it should be divided into Orders, Families, and Genera.

The main principle of division must of course be natural affinity; the classes formed must be natural groups; and the formation of these has already been sufficiently treated of. But the principles of natural grouping must be applied in subordination to the principle of a natural series. The groups must not be so constituted as to place in the same group things which ought to occupy different points of the general scale. The precaution necessary to be observed for this purpose is, that the *primary* divisions must be grounded not on all distinctions indiscriminately, but on those which correspond to variations in the degree of the main phenomenon. The series of Animated Nature should be broken into parts at the points where the variation in the degree of intensity of the main phenomenon (as marked by its principal characters, Sensation, Thought,

Voluntary Motion, etc.) begins to be attended by conspicuous changes in the miscellaneous properties of the animal. Such well-marked changes take place, for example, where the class Mammalia ends; at the points where Fishes are separated from Insects, Insects from Mollusca, etc. When so formed, the primary natural groups will compose the series by mere juxtaposition, without redistribution; each of them corresponding to a definite portion of the scale. In like manner each family should, if possible, be so subdivided, that one portion of it shall stand higher and the other lower, though of course contiguous, in the general scale; and only when this is impossible is it allowable to ground the remaining subdivisions on characters having no determinable connection with the main phenomenon.

Where the principal phenomenon so far transcends in importance all other properties on which a classification could be grounded, as it does in the case of animated existence, any considerable deviation from the rule last laid down is in general sufficiently guarded against by the first principle of a natural arrangement, that of forming the groups according to the most important characters. All attempts at a scientific classification of animals, since first their anatomy and physiology were successfully studied, have been framed with a certain degree of instinctive reference to a natural series, and have accorded in many more points than they have differed, with the classification which would most naturally have been grounded on such a series. But the accordance has not always been complete; and it still is often a matter of discussion, which of several classifications best accords with the true scale of intensity of the main phenomenon. Cuvier, for example, has been justly criticised for having formed his natural groups, with an undue degree of reference to the mode of alimentation, a circumstance directly connected only with organic life, and not leading to the arrangement most appropriate for the purposes of an investigation of the laws of animal life, since both carnivorous and herbivorous or frugivorous animals are found at almost every degree in the scale of animal perfection. Blainville's classification has been considered by high authorities to be free from this defect; as representing correctly, by the mere order of the principal groups, the successive degeneracy of animal nature from its highest to its most imperfect exemplification.

§ 5. A classification of any large portion of the field of nature in conformity to the foregoing principles, has hitherto been found practicable only in one great instance, that of animals. In the case even of vegetables, the natural arrangement has not been carried beyond the formation of natural groups. Naturalists have found, and probably will continue to find it impossible to form those groups into any series, the terms of which correspond to real gradations in the phenomenon of vegetative or organic life. Such a difference of degree may be traced between the class of Vascular Plants and that of Cellular, which includes lichens, algæ, and other substances whose organization is simpler and more rudimentary than that of the higher order of vegetables, and which therefore approach nearer to mere inorganic nature. But when we rise much above this point, we do not find any sufficient difference in the degree in which different plants possess the properties of organization and life. The dicotyledons are of more complex structure, and somewhat more perfect organization, than the monocotyledons; and some dicotyledonous families, such as the Compositæ, are rather more complex in their organization than the rest. But the differences are not of a marked character, and do not promise to throw any particular light upon the conditions and laws of vegetable life and development. If they did, the classification of vegetables would have to be made, like that of animals, with reference to the scale or series indicated.

Although the scientific arrangements of organic nature afford as yet the only complete example of the true principles of rational classification, whether as to the formation of groups or of series, those principles are applicable to all cases in which mankind are called upon to bring the various parts of any extensive subject into mental co-ordination. They are as much to the point when objects are to be classed for purposes of art or business, as for those of science. The proper arrangement, for example, of a code of laws, depends on the same scientific conditions as the classifications in natural history; nor could there be a better preparatory discipline for that important function, than the study of the principles of a natural arrangement, not only in the abstract, but in their actual application to the class of phenomena for which they were first elaborated, and which are still the best school for learning their use. Of this the great authority on codification, Bentham, was perfectly aware; and his early *Fragment on Government*, the admirable introduction to a series of writings

unequaled in their department, contains clear and just views (as far as they go) on the meaning of a natural arrangement, such as could scarcely have occurred to any one who lived anterior to the age of Linnæus and Bernard de Jussieu.

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Book V.

ON FALLACIES.

"Errare non modo affirmando et negando, sed etiam sentiendo, et in tacitâ hominum cogitatione contingit."--HOBBS, *Computatio sive Logica*, chap. v.

"Il leur semble qu'il n'y a qu'à douter par fantaisie, et qu'il n'y a qu'à dire en général que notre nature est infirme; que notre esprit est plein d'aveuglement: qu'il faut avoir un grand soin de se défaire de ses préjugés, et autres choses semblables. Ils pensent que cela suffit pour ne plus se laisser séduire à ses sens, et pour ne plus se tromper du tout. Il ne suffit pas de dire que l'esprit est foible, il faut lui faire sentir ses foiblesses. Ce n'est pas assez de dire qu'il est sujet à l'erreur, il faut lui découvrir en quoi consistent ses erreurs."--MALEBRANCHE, *Recherche de la Vérité*.