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V. *On Systematic Arrangement in the Formation of Natural History Collections.* By WILLIAM BRAND, C.S., F.B.S.

READ 9TH JANUARY 1840.

As I believe that nothing has been created without an object, so do I imagine that all things exist according to a suitable arrangement, the laws or conditions of which may, in some measure, be ascertained by a well directed investigation.

The first requisite for such an investigation, must of course be a due acquaintance with the various objects which successively present themselves, so that the inquirer may be enabled to recognise and identify them wherever they appear. But he cannot acquire this knowledge except by studying the features of each individual, and can only apply it by characterising the several individuals, so that they shall be readily distinguished from all others of their class.

This step in the inquiry may be called the process of *separation* or *disjunction*; and an object thus discriminated, is termed a *species*. But among various species there are often perceived certain affinities, or characters in common, which point them out as composing a group that may be appropriately described in combination. Such a group has usually been termed a *genus*; while several *genera*, having more affinities with one another than with the rest of a class, have been farther grouped under a still more comprehensive term; and so upwards, till the whole objects in any one kingdom of nature may be classed under a very few great divisions, each of which shall be distinguishable from the others, by some one or more features peculiar to itself, and common to the individuals of which it is composed. This again may be termed the process of *combination*; and it is one equally im-

portant with the other, as a means of attaining the end desired.

The groups thus constituted, are all, however, so far artificial, that they are interrupted links, where nature probably exhibits a continuous chain ; for I conceive that a separation into *species* or *individuals* is the only real classification which she has indicated. At least I think it is evident that many of the so-called species in existing classifications of animal objects, can be nothing else but varieties of an original form ; and it seems highly probable, reasoning from the animal to the vegetable world, that many forms now existing in both, which, though widely separated in appearance from the primitive type, are yet only modifications of it resulting from dispersion into regions and climes differing from those in which the species was originally placed. But this is a subject of too great extent, and involved in too deep obscurity, for present discussion ; and therefore I shall just further remark, that if it be capable of elucidation in any considerable degree, this, according to my view, can only be effected by examining individuals severally, as well as in contrast and combination.

It will be obvious, therefore, how misplaced is the reproach so often levelled at naturalists, that they waste their time and energies upon the external character and appearance of objects, instead of applying themselves to ascertain their relationship, properties, and uses. No doubt, the former is only a preliminary to those higher researches, but it is a preliminary indispensable to their successful prosecution ; and indeed, so rapid and vast has been the accumulation of materials hitherto, that the latter study would have been as yet premature, if not impracticable. In order to its promotion, a still farther advance in the process must be made ; namely, to ascertain the range or distribution of species, with their relative condition, and other attendant circumstances, in any different region of the globe.

This inquiry is also of a preliminary kind, but, like the other, is requisite towards the attainment of ultimate objects.

Now, in prosecuting such an investigation, I consider it necessary to commence by mapping out, or dividing the surface of the globe into appropriate sections; then to ascertain the various productions which occur in each, with the circumstances attending them; and lastly, to register the information thus acquired, in such a way as to afford a ready and comprehensive view of these productions, both as they exist in any one section, and as they stand relatively to those of other sections.

A collection, therefore, which, though presenting specimens of every different object in nature, has these arranged without reference to the countries producing them, and unaccompanied by information as to their condition in those countries, can only be viewed as accomplishing the *first* requisite I have mentioned, and as stopping short at the very threshold of scientific and useful research.

With regard to the formation of sections, for the purpose desired, although perhaps no very abrupt or decided transition in the features or character of animal productions is occasioned by topographical influences, yet certain lines may undoubtedly be traced, which, more than others, will indicate a change in this respect, and by means of which, therefore, appropriate sections may be constituted. Thus, the ridge of a mountain chain, such as the Andes, or a table-land like that of central Asia, which regulates the water sheds or sources of streams flowing from one point but in opposite directions, will naturally mark a transition of the kind referred to; so far at least as such transition can be influenced by a diversity of temperature and aspect. Again, the bed or channel of a great river, may sometimes with propriety be chosen as the sectional line; for, even though there should be no dissimilarity in the productions of its opposite margins, yet the tributaries on either side, of which it is the common receptacle, must often bring about a material change among these, especially when such tributaries arise at remote points, or have a lengthened course through regions of varied aspect and unequal temperature. To embrace, therefore, in *one* section, both sides of a common basin, of very

great magnitude, would in all probability be doing violence to geographical arrangement.

I must however observe that, in mapping out a continent or region in the way described, I do not consider it by any means requisite that its productions should *previously* be ascertained; for this would be inverting the due order of inquiry, and assuming results without having the premises whence they must be drawn. An attentive regard to the general aspect and topography of a region is, I conceive, alone necessary for the accomplishment of that object.

Another quality which must be attended to in the formation of these sections, is, that they should, on the one hand, be of sufficiently limited extent for exhibiting all important changes which may occur among the productions of a region; and on the other, not be so numerous as to render definite limits unattainable, or otherwise obstruct the scheme in its practical working. To attain the proper medium in this respect is, however, somewhat difficult, and perhaps no two naturalists would arrive at the same result,—so that any scale or mode of division adopted, must always be liable to controversy. After studying numerous maps, and viewing the subject in every way, I have been led to the conclusion, that about 110 sections would suffice for the proposed object; and that a greater or less number could not readily be formed according to a uniform principle, and, at the same time, of nearly equal or proportionate extent.

This object being accomplished, the next requisite for ascertaining with accuracy the productions of the earth, is to procure specimens of these from *every* section wherein they occur, along with full particulars relative to their condition; and to record those particulars in such methodical array, as to make them directly available for the purpose intended. To carry on this process efficiently, however, I consider it essential that the information should be registered immediately on being obtained, or at least as soon thereafter as possible, both that the rapid accumulation of objects in a general collection may not interrupt the regularity of procedure; and because I conceive that a material saving of la-

bour will always be effected by disposing of these objects at once, and singly as they occur.

Various methods may be devised for rendering collections in Natural History easily available to the student; but I consider the most perspicuous and comprehensive to be that of recording the species, with all information acquired respecting them, in a *tabular form*, and by an *alphabetical* arrangement, and employing *signs* or *marks*, to denote the leading particulars of such information. These signs need only be few, and of the most simple kind; and yet, if judiciously applied, they may be rendered expressive of circumstances which, if registered in the ordinary way, would soon occupy volumes, and, after all, be wholly unavailable for any practical use. But to ensure the right operation of such a record, two things must be especially provided for in its plan; namely, 1st, That it shall be so *comprehensive* as readily to embrace detached particulars of information, though communicated without order, and from many different sources; and, 2d, That the *absence* of any desired particulars shall not prevent the insertion of those which *have been* obtained. If based on such a principle as to exclude all information, except what may be supplied according to a prescribed rule, its operation would be at once impeded, for it is vain to expect uniformity among numerous contributors scattered over the globe, many of whom would not, and some perhaps could not, follow the directions prescribed to them.

With respect to the advantages to be derived from this methodical arrangement of details, I conceive, that the mere *mechanical working* of a tabular catalogue, with its relative collection, if these be arranged on sound principles, would not only tend to direct and inform the student, but is calculated to promote in a high degree the attainment of all ultimate objects in Natural History. Indeed, the benefit attending such a process is not limited to that department of knowledge, for others may be, and have been, advanced in a similar manner. Thus, in prosecuting historical inquiries, with reference especially to the connection and sequence of events, or the progress of language and man-

ners, no method of procedure is more likely to facilitate the investigation, than that of first disposing, in tabular array the whole facts and circumstances whence any conclusions are to be deduced. To researches of this nature, indeed, a *territorial division* is scarcely applicable, (though even here it might often not be without advantage); but there are periods of time, or important revolutions and the like, which may be chosen instead; and with these materials the requisite fabric of arrangement may be constructed.

It is more especially, however, in the wide and diversified field of Nature, that I would anticipate an abundant harvest of fruits from this mode of investigation; and I venture to hope, that, ere long, it will be generally recognised as the simplest and best, if not the only effectual means of leading to practical results. Nor is it merely as promoting the *direct* acquisition of knowledge, that I advocate such a system, for I expect that its adoption will lead to the ascertainment of laws and operations in the natural world, both as regards the past and future, such as must otherwise remain unknown.

It may perhaps be thought, that I would attribute to the mere agency of *method* too great a share of the means necessary for reaching these high attainments; but I am deeply impressed with the conviction, that no extent of research into the character or properties of *individual objects*, however requisite as a preliminary step, can ever of itself bring us to the eminence desired; and if not individuals merely, but a whole kingdom of nature, in all its extent and variety, is to be the subject of investigation, then I apprehend it can only meet with adequate success, if objects are so presented to the inquirer, as that he shall be enabled at once to trace their mutual connection, and institute among them a due comparison in all other respects. Thus directed in studying the works of creation, I conceive that mankind would rapidly extend the present sphere of their researches, and ultimately acquire such a degree of insight respecting the natural world, as would exercise their noblest faculties, and conduce to their highest and most lasting enjoyment.