Chapter VII.

Of Classification, As Subsidiary To Induction.

§ 1. There is, as has been frequently remarked in this work, a classification of things, which is inseparable from the fact of giving them general names. Every name which connotes an attribute, divides, by that very fact, all things whatever into two classes, those which have the attribute and those which have it not; those of which the name can be predicated, and those of which it can not. And the division thus made is not merely a division of such things as actually exist, or are known to exist, but of all such as may hereafter be discovered, and even of all which can be imagined.

On this kind of Classification we have nothing to add to what has previously been said. The Classification which requires to be discussed as a separate act of the mind, is altogether different. In the one, the arrangement of objects in groups, and distribution of them into compartments, is a mere incidental effect consequent on the use of names given for another purpose, namely that of simply expressing some of their qualities. In the other, the arrangement and distribution are the main object, and the naming is secondary to, and purposely conforms itself to, instead of governing, that more important operation.

Classification, thus regarded, is a contrivance for the best possible ordering of the ideas of objects in our minds; for causing the ideas to accompany or succeed one another in such a way as shall give us the greatest command over our knowledge already acquired, and lead most directly to the acquisition of more. The general problem of Classification, in reference to these purposes, may be stated as follows: To provide that things shall be thought of in such groups, and those groups in such an order, as will best conduce to the remembrance and to the ascertainment of their laws.

Classification thus considered, differs from classification in the wider sense, in having reference to real objects exclusively, and not to all that are imaginable: its object being the due co-ordination in our minds of those things only, with the properties of which we have actually occasion to make ourselves acquainted. But, on the other hand, it embraces *all* really existing objects. We can not constitute any one class properly, except in reference to a general division of the whole of nature; we can not determine the group in which any one object can most conveniently be placed, without taking into consideration all the varieties of existing objects, all at least which have any degree of affinity with it. No one family of plants or animals could have been rationally constituted, except as part of a systematic arrangement of all plants or animals; nor could such a general arrangement have been properly made, without first determining the exact place of plants and animals in a general division of nature.

§ 2. There is no property of objects which may not be taken, if we please, as the foundation for a classification or mental grouping of those objects; and in our first attempts we are likely to select for that purpose properties which are simple, easily conceived, and perceptible on a first view, without any previous process of thought. Thus Tournefort's arrangement of plants was founded on the shape and divisions of the corolla; and that which is commonly called the Linnæan (though Linnæus also suggested another and more scientific arrangement) was grounded chiefly on the number of the stamens and pistils.

But these classifications, which are at first recommended by the facility they afford of ascertaining to what class any individual belongs, are seldom much adapted to the ends of that Classification which is the subject of our present remarks. The Linnæan arrangement answers the purpose of making us think together of all those kinds of plants which possess the same number of stamens and pistils; but to think of them in that manner is of little use, since we seldom have any thing to affirm in common of the plants which have a given number of stamens and pistils. If plants of the class Pentandria, order Monogynia, agreed in any other properties, the habit of thinking and speaking of the plants under a common designation would conduce to our remembering those common properties so far as they were ascertained, and would dispose us to be on the lookout for such of them as were not yet known. But since this is not the case, the only purpose of thought

which the Linnæan classification serves is that of causing us to remember, better than we should otherwise have done, the exact number of stamens and pistils of every species of plants. Now, as this property is of little importance or interest, the remembering it with any particular accuracy is of no moment. And, inasmuch as, by habitually thinking of plants in those groups, we are prevented from habitually thinking of them in groups which have a greater number of properties in common, the effect of such a classification, when systematically adhered to, upon our habits of thought, must be regarded as mischievous.

The ends of scientific classification are best answered, when the objects are formed into groups respecting which a greater number of general propositions can be made, and those propositions more important, than could be made respecting any other groups into which the same things could be distributed. The properties, therefore, according to which objects are classified, should, if possible, be those which are causes of many other properties; or, at any rate, which are sure marks of them. Causes are preferable, both as being the surest and most direct of marks, and as being themselves the properties on which it is of most use that our attention should be strongly fixed. But the property which is the cause of the chief peculiarities of a class, is unfortunately seldom fitted to serve also as the diagnostic of the class. Instead of the cause, we must generally select some of its more prominent effects, which may serve as marks of the other effects and of the cause.

A classification thus formed is properly scientific or philosophical, and is commonly called a Natural, in contradistinction to a Technical or Artificial, classification or arrangement. The phrase Natural Classification seems most peculiarly appropriate to such arrangements as correspond, in the groups which they form, to the spontaneous tendencies of the mind, by placing together the objects most similar in their general aspect; in opposition to those technical systems which, arranging things according to their agreement in some circumstance arbitrarily selected, often throw into the same group objects which in the general aggregate of their properties present no resemblance, and into different and remote groups, others which have the closest similarity. It is one of the most valid recommendations of any classification to the character of a scientific one, that it shall be a natural classification in this sense also; for the test of its scientific character is the number and importance of the properties which can be asserted in common of all objects included in a group; and properties on which the general aspect of the things depends are, if only on that ground, important, as well as, in most cases, numerous. But, though a strong recommendation, this circumstance is not a *sine qua non*; since the most obvious properties of things may be of trifling importance compared with others that are not obvious. I have seen it mentioned as a great absurdity in the Linnæan classification, that it places (which by-the-way it does not) the violet by the side of the oak; it certainly dissevers natural affinities, and brings together things quite as unlike as the oak and the violet are. But the difference, apparently so wide, which renders the juxtaposition of those two vegetables so suitable an illustration of a bad arrangement, depends, to the common eye, mainly on mere size and texture; now if we made it our study to adopt the classification which would involve the least peril of similar *rapprochements*, we should return to the obsolete division into trees, shrubs, and herbs, which though of primary importance with regard to mere general aspect, yet (compared even with so petty and unobvious a distinction as that into dicotyledons and monocotyledons) answers to so few differences in the other properties of plants, that a classification founded on it (independently of the indistinctness of the lines of demarcation) would be as completely artificial and technical as the Linnæan.

Our natural groups, therefore, must often be founded not on the obvious but on the unobvious properties of things, when these are of greater importance. But in such cases it is essential that there should be some other property or set of properties, more readily recognizable by the observer, which co-exist with, and may be received as marks of, the properties which are the real groundwork of the classification. A natural arrangement, for example, of animals, must be founded in the main on their internal structure, but (as M. Comte remarks) it would be absurd that we should not be able to determine the genus and species of an animal without first killing it. On this ground, the preference, among zoological classifications, is probably due to that of M. De Blainville, founded on the differences in the external integuments; differences which correspond, much more accurately than might be supposed, to the really important varieties, both in the other parts of the structure, and in the habits and history of the animals.

This shows, more strongly than ever, how extensive a knowledge of the properties of objects is necessary for making a good classification of them. And as it is one of the uses of such a classification that by drawing attention to the properties on which it is founded, and which, if the classification be good, are marks of many others, it facilitates the discovery of those others; we see in what manner our knowledge of things, and our classification of them, tend mutually and indefinitely to the improvement of each other.

We said just now that the classification of objects should follow those of their properties which indicate not only the most numerous, but also the most important peculiarities. What is here meant by importance? It has reference to the particular end in view; and the same objects, therefore, may admit with propriety of several different classifications. Each science or art forms its classification of things according to the properties which fall within its special cognizance, or of which it must take account in order to accomplish its peculiar practical end. A farmer does not divide plants, like a botanist, into dicotyledonous and monocotyledonous, but into useful plants and weeds. A geologist divides fossils, not like a zoologist, into families corresponding to those of living species, but into fossils of the paleozoic, mesozoic, and tertiary periods, above the coal and below the coal, etc. Whales are or are not fish according to the purpose for which we are considering them. "If we are speaking of the internal structure and physiology of the animal, we must not call them fish; for in these respects they deviate widely from fishes; they have warm blood, and produce and suckle their young as land quadrupeds do. But this would not prevent our speaking of the *whale-fishery*, and calling such animals *fish* on all occasions connected with this employment; for the relations thus arising depend upon the animal's living in the water, and being caught in a manner similar to other fishes. A plea that human laws which mention fish do not apply to whales, would be rejected at once by an intelligent judge."(224)

These different classifications are all good, for the purposes of their own particular departments of knowledge or practice. But when we are studying objects not for any special practical end, but for the sake of extending our knowledge of the whole of their properties and relations, we must consider as the most important attributes those which contribute most, either by themselves or by their effects, to render the things like one another, and unlike other things; which give to the class composed of them the most marked individuality; which fill, as it were, the largest space in their existence, and would most impress the attention of a spectator who knew all their properties but was not specially interested in any. Classes formed on this principle may be called, in a more emphatic manner than any others, natural groups.

§ 3. On the subject of these groups Dr. Whewell lays down a theory, grounded on an important truth, which he has, in some respects, expressed and illustrated very felicitously, but also, as it appears to me, with some admixture of error. It will be advantageous, for both these reasons, to extract the statement of his doctrine in the very words he has used.

"Natural groups," according to this theory,(225) are "given by Type, not by Definition." And this consideration accounts for that "indefiniteness and indecision which we frequently find in the descriptions of such groups, and which must appear so strange and inconsistent to any one who does not suppose these descriptions to assume any deeper ground of connection than an arbitrary choice of the botanist. Thus in the family of the rose-tree, we are told that the *ovules* are *very rarely* erect, the *stigmata usually* simple. Of what use, it might be asked, can such loose accounts be? To which the answer is, that they are not inserted in order to distinguish the species, but in order to describe the family, and the total relations of the ovules and the stigmata of the family are better known by this general statement. A similar observation may be made with regard to the Anomalies of each group, which occur so commonly, that Dr. Lindley, in his *Introduction to the Natural System of Botany*, makes the 'Anomalies' an article in each family. Thus, part of the character of the Rosaceæ is, that they have alternate *stipulate* leaves, and that the *albumen* is *obliterated*; but yet in *Lowea*, one of the genera of this family, the stipulæ are *absent*; and the albumen is *present* in another, *Neillia*. This implies, as we have already seen, that the artificial character (or *diagnosis*, as Mr. Lindley calls it) is imperfect. It is, though very nearly, yet not exactly, commensurate with the natural group; and hence in certain cases this character is made to yield to the general weight of natural affinities.

"These views--of classes determined by characters which can not be expressed in words--of propositions which state, not what happens in all cases, but only usually--of particulars which are included in a class, though they transgress the definition of it, may probably surprise the reader. They are so contrary to many of the received opinions respecting the use of definitions, and the nature of scientific propositions, that they will probably appear to many persons highly illogical and unphilosophical. But a disposition to such a judgment arises in a great measure from this, that the mathematical and mathematico-physical sciences have, in a great degree, determined men's views of the general nature and form of scientific truth; while Natural History has not yet had time or opportunity to exert its due influence upon the current habits of philosophizing. The apparent indefiniteness and inconsistency of the classifications and definitions of Natural History belongs, in a far higher degree, to all other except mathematical speculations; and the modes in which approximations to exact distinctions and general truths have been made in Natural History, may be worthy our attention, even for the light they throw upon the best modes of pursuing truth of all kinds.

"Though in a Natural group of objects a definition can no longer be of any use as a regulative principle, classes are not therefore left quite loose, without any certain standard or guide. The class is steadily fixed, though not precisely limited; it is given, though not circumscribed; it is determined, not by a boundary-line without, but by a central point within; not by what it strictly excludes, but by what it eminently includes; by an example, not by a precept; in short, instead of a Definition we have a Type for our director.

"A Type is an example of any class, for instance a species of a genus, which is considered as eminently possessing the character of the class. All the species which have a greater affinity with this type-species than with any others, form the genus, and are arranged about it, deviating from it in various directions and different degrees. Thus a genus may consist of several species which approach very near the type, and of which the claim to a place with it is obvious; while there may be other species which straggle farther from this central knot, and which yet are clearly more connected with it than with any other. And even if there should be some species of which the place is dubious, and which appear to be equally bound to two generic types, it is easily seen that this would not destroy the reality of the generic groups, any more than the scattered trees of the intervening plain prevent our speaking intelligibly of the distinct forests of two separate hills.

"The type-species of every genus, the type-genus of every family, is then, one which possesses all the characters and properties of the genus in a marked and prominent manner. The type of the Rose family has alternate stipulate leaves, wants the albumen, has the ovules not erect, has the stigmata simple, and besides these features, which distinguish it from the exceptions or varieties of its class, it has the features which make it prominent in its class. It is one of those which possess clearly several leading attributes; and thus, though we can not say of any one genus that it *must* be the type of the family, or of any one species that it *must* be the type of the genus, we are still not wholly to seek; the type must be connected by many affinities with most of the others of its group; it must be near the centre of the crowd, and not one of the stragglers."

In this passage (the latter part of which especially I can not help noticing as an admirable example of philosophic style) Dr. Whewell has stated very clearly and forcibly, but (I think) without making all necessary distinctions, one of the principles of a Natural Classification. What this principle is, what are its limits, and in what manner he seems to me to have overstepped them, will appear when we have laid down another rule of Natural Arrangement, which appears to me still more fundamental.

§ 4. The reader is by this time familiar with the general truth (which I restate so often on account of the great confusion in which it is commonly involved), that there are in nature distinctions of Kind; distinctions not consisting in a given number of definite properties *plus* the effects which follow from those properties, but running through the whole nature, through the attributes generally, of the things so distinguished. Our knowledge of the properties of a Kind is never complete. We are always discovering, and expecting to discover, new ones. Where the distinction between two classes of things is not one of Kind, we expect to find their properties alike, except where there is some reason for their being different. On the contrary, when the distinction is in Kind, we expect to find the properties different unless there be some cause for their being the

same. All knowledge of a Kind must be obtained by observation and experiment upon the Kind itself; no inference respecting its properties from the properties of things not connected with it by Kind, goes for more than the sort of presumption usually characterized as an analogy, and generally in one of its fainter degrees.

Since the common properties of a true Kind, and consequently the general assertions which can be made respecting it, or which are certain to be made hereafter as our knowledge extends, are indefinite and inexhaustible; and since the very first principle of natural classification is that of forming the classes so that the objects composing each may have the greatest number of properties in common; this principle prescribes that every such classification shall recognize and adopt into itself all distinctions of Kind, which exist among the objects it professes to classify. To pass over any distinctions of Kind, and substitute definite distinctions, which, however considerable they may be, do not point to ulterior unknown differences, would be to replace classes with more by classes with fewer attributes in common; and would be subversive of the Natural Method of Classification.

Accordingly all natural arrangements, whether the reality of the distinction of Kinds was felt or not by their framers, have been led, by the mere pursuit of their own proper end, to conform themselves to the distinctions of Kind, so far as these have been ascertained at the time. The species of Plants are not only real Kinds, but are probably, all of them, real lowest Kinds, Infimæ Species; which, if we were to subdivide, as of course it is open to us to do, into sub-classes, the subdivision would necessarily be founded on *definite* distinctions, not pointing (apart from what may be known of their causes or effects) to any difference beyond themselves.

In so far as a natural classification is grounded on real Kinds, its groups are certainly not conventional: it is perfectly true that they do not depend upon an arbitrary choice of the naturalist. But it does not follow, nor, I conceive, is it true, that these classes are determined by a type, and not by characters. To determine them by a type would be as sure a way of missing the Kind, as if we were to select a set of characters arbitrarily. They are determined by characters, but these are not arbitrary. The problem is, to find a few definite characters which point to the multitude of indefinite ones. Kinds are Classes between which there is an impassable barrier; and what we have to seek is, marks whereby we may determine on which side of the barrier an object takes its place. The characters which will best do this should be chosen: if they are also important in themselves, so much the better. When we have selected the characters, we parcel out the objects according to those characters, and not, I conceive, according to resemblance to a type. We do not compose the species Ranunculus acris, of all plants which bear a satisfactory degree of resemblance to a model buttercup, but of those which possess certain characters selected as marks by which we might recognize the possibility of a common parentage; and the enumeration of those characters is the definition of the species.

The question next arises, whether, as all Kinds must have a place among the classes, so all the classes in a natural arrangement must be Kinds? And to this I answer, certainly not. The distinctions of Kinds are not numerous enough to make up the whole of a classification. Very few of the genera of plants, or even of the families, can be pronounced with certainty to be Kinds. The great distinctions of Vascular and Cellular, Dicotyledonous or Exogenous and Monocotyledonous or Endogenous plants, are perhaps differences of kind; the lines of demarcation which divide those classes seem (though even on this I would not pronounce positively) to go through the whole nature of the plants. But the different species of a genus, or genera of a family, usually have in common only a limited number of characters. A Rose does not seem to differ from a Rubus, or the Umbelliferæ from the Ranunculaceæ, in much else than the characters botanically assigned to those genera or those families. Unenumerated differences certainly do exist in some cases; there are families of plants which have peculiarities of chemical composition, or yield products having peculiar effects on the animal economy. The Cruciferæ and Fungi contain an unusual proportion of nitrogen; the Labiatæ are the chief sources of essential oils, the Solaneæ are very commonly narcotic, etc. In these and similar cases there are possibly distinctions of Kind; but it is by no means indispensable that there should be. Genera and Families may be eminently natural, though marked out from one another by properties limited in number; provided those properties are important, and the objects contained in each genus or family resemble each other more than they resemble any thing which is excluded from the genus or family.

After the recognition and definition, then, of the *infimæ species*, the next step is to arrange those *infimæ species* into larger groups: making these groups correspond to Kinds wherever it is possible, but in most cases without any such guidance. And in doing this it is true that we are naturally and properly guided, in most cases at least, by resemblance to a type. We form our groups round certain selected Kinds, each of which serves as a sort of exemplar of its group. But though the groups are suggested by types, I can not think that a group when formed is *determined* by the type; that in deciding whether a species belongs to the group, a reference is made to the type, and not to the characters; that the characters "can not be expressed in words." This assertion is inconsistent with Dr. Whewell's own statement of the fundamental principle of classification, namely, that "general assertions shall be possible." If the class did not possess any characters in common, what general assertions would be possible respecting it? Except that they all resemble each other more than they resemble any thing else, nothing whatever could be predicated of the class.

The truth is, on the contrary, that every genus or family is framed with distinct reference to certain characters, and is composed, first and principally, of species which agree in possessing all those characters. To these are added, as a sort of appendix, such other species, generally in small number, as possess *nearly* all the properties selected; wanting some of them one property, some another, and which, while they agree with the rest *almost* as much as these agree with one another, do not resemble in an equal degree any other group. Our conception of the class continues to be grounded on the characters; and the class might be defined, those things which *either* possess that set of characters, *or* resemble the things that do so, more than they resemble any thing else.

And this resemblance itself is not, like resemblance between simple sensations, an ultimate fact, unsusceptible of analysis. Even the inferior degree of resemblance is created by the possession of common characters. Whatever resembles the genus Rose more than it resembles any other genus, does so because it possesses a greater number of the characters of that genus than of the characters of any other genus. Nor can there be any real difficulty in representing, by an enumeration of characters, the nature and degree of the resemblance which is strictly sufficient to include any object in the class. There are always some properties common to all things which are included. Others there often are, to which some things, which are nevertheless included, are exceptions. But the objects which are exceptions to one character are not exceptions to another; the resemblance which fails in some particulars must be made up for in others. The class, therefore, is constituted by the possession of *all* the characters which are universal, and *most* of those which admit of exceptions. If a plant had the ovules erect, the stigmata divided, possessed the albumen, and was without stipules, it possibly would not be classed among the Rosaceæ. But it may want any one, or more than one of these characters, and not be excluded. The ends of a scientific classification are better answered by including it. Since it agrees so nearly, in its known properties, with the sum of the characters of the class, it is likely to resemble that class more than any other in those of its properties which are still undiscovered.

Not only, therefore, are natural groups, no less than any artificial classes, determined by characters; they are constituted in contemplation of, and by reason of, characters. But it is in contemplation not of those characters only which are rigorously common to all the objects included in the group, but of the entire body of characters, all of which are found in most of those objects, and most of them in all. And hence our conception of the class, the image in our minds which is representative of it, is that of a specimen complete in all the characters; most naturally a specimen which, by possessing them all in the greatest degree in which they are ever found, is the best fitted to exhibit clearly, and in a marked manner, what they are. It is by a mental reference to this standard, not instead of, but in illustration of, the definition of the class, that we usually and advantageously determine whether any individual or species belongs to the class or not. And this, as it seems to me, is the amount of truth contained in the doctrine of Types.

We shall see presently that where the classification is made for the express purpose of a special inductive inquiry, it is not optional, but necessary for fulfilling the conditions of a correct Inductive Method, that we should establish a type-species or genus, namely, the one which exhibits in the most eminent degree the particular phenomenon under investigation. But of this hereafter. It remains, for completing the theory of natural groups, that a few words should be said on the principles of the nomenclature adapted to them.

§ 5. A Nomenclature in science is, as we have said, a system of the names of Kinds. These names, like other class-names, are defined by the enumeration of the characters distinctive of the class. The only merit which a set of names can have beyond this, is to convey, by the mode of their construction, as much information as possible: so that a person who knows the thing, may receive all the assistance which the name can give in remembering what he knows; while he who knows it not, may receive as much knowledge respecting it as the case admits of, by merely being told its name.

There are two modes of giving to the name of a Kind this sort of significance. The best, but which unfortunately is seldom practicable, is when the word can be made to indicate, by its formation, the very properties which it is designed to connote. The name of a Kind does not, of course, connote all the properties of the Kind, since these are inexhaustible, but such of them as are sufficient to distinguish it; such as are sure marks of all the rest. Now, it is very rarely that one property, or even any two or three properties, can answer this purpose. To distinguish the common daisy from all other species of plants would require the specification of many characters. And a name can not, without being too cumbrous for use, give indication, by its etymology or mode of construction, of more than a very small number of these. The possibility, therefore, of an ideally perfect Nomenclature, is probably confined to the one case in which we are happily in possession of something approaching to it--the Nomenclature of elementary Chemistry. The substances, whether simple or compound, with which chemistry is conversant, are Kinds, and, as such, the properties which distinguish each of them from the rest are innumerable; but in the case of compound substances (the simple ones are not numerous enough to require a systematic nomenclature), there is one property, the chemical composition, which is of itself sufficient to distinguish the Kind; and is (with certain reservations not yet thoroughly understood) a sure mark of all the other properties of the compound. All that was needful, therefore, was to make the name of every compound express, on the first hearing, its chemical composition; that is, to form the name of the compound, in some uniform manner, from the names of the simple substances which enter into it as elements. This was done, most skillfully and successfully, by the French chemists, though their nomenclature has become inadequate to the convenient expression of the very complicated compounds now known to chemists. The only thing left unexpressed by them was the exact proportion in which the elements were combined; and even this, since the establishment of the atomic theory, it has been found possible to express by a simple adaptation of their phraseology.

But where the characters which must be taken into consideration, in order sufficiently to designate the Kind, are too numerous to be all signified in the derivation of the name, and where no one of them is of such preponderant importance as to justify its being singled out to be so indicated, we may avail ourselves of a subsidiary resource. Though we can not indicate the distinctive properties of the Kind, we may indicate its nearest natural affinities, by incorporating into its name the name of the proximate natural group of which it is one of the species. On this principle is founded the admirable binary nomenclature of botany and zoology. In this nomenclature the name of every species consists of the name of the genus, or natural group next above it, with a word added to distinguish the particular species. The last portion of the compound name is sometimes taken from some *one* of the peculiarities in which that species differs from others of the genus; as Clematis *integrifolia*, Potentilla *alba*, Viola *palustris*, Artemisia *vulgaris*; sometimes from a circumstance of an historical nature, as Narcissus *poeticus*, Potentilla *tormentilla* (indicating that the plant is that which was formerly known by the latter name), Exacum *Candollii* (from the fact that De Candolle was its first discoverer); and sometimes the word is purely conventional, as Thlaspi *bursapastoris*, Ranunculus *thora*; it is of little consequence which; since the second, or, as it is usually called, the specific name, could at most express, independently of convention, no more than a very small portion of the connotation of the term. But by adding to this the name of the superior genus, we may make the best amends we can for the impossibility of so contriving the name as to express all the distinctive characters of the Kind. We make it, at all events, express as many of those characters as are common to the proximate natural group in which the Kind is included. If even those common characters are so numerous or so little familiar as to require a further extension of the same resource, we might, instead of a binary, adopt a ternary nomenclature, employing not only the name of the genus, but that of the next natural group in order of generality above the genus, commonly called the Family. This was done in the mineralogical nomenclature proposed by Professor Mohs.

"The names framed by him were not composed of two, but of three elements, designating respectively the Species, the Genus, and the Order; thus he has such species as *Rhombohedral Lime Haloide*, *Octohedral Fluor Haloide*, *Prismatic Hal Baryte*."(226) The binary construction, however, has been found sufficient in botany and zoology, the only sciences in which this general principle has hitherto been successfully adopted in the construction of a nomenclature.

Besides the advantage which this principle of nomenclature possesses, in giving to the names of species the greatest quantity of independent significance which the circumstances of the case admit of, it answers the further end of immensely economizing the use of names, and preventing an otherwise intolerable burden on the memory. When the names of species become extremely numerous, some artifice (as Dr. Whewell(227) observes) becomes absolutely necessary to make it possible to recollect or apply them. "The known species of plants, for example, were ten thousand in the time of Linnæus, and are now probably sixty thousand. It would be useless to endeavor to frame and employ separate names for each of these species. The division of the objects into a subordinated system of classification enables us to introduce a Nomenclature which does not require this enormous number of names. Each of the genera has its name, and the species are marked by the addition of some epithet to the name of the genus. In this manner about seventeen hundred generic names, with a moderate number of specific names, were found by Linnæus sufficient to designate with precision all the species of vegetables known at his time." And though the number of generic names has since greatly increased, it has not increased in any thing like the proportion of the multiplication of known species.