CHAPTER VIII.

Of Division.

Section 385. To divide a term is to unfold its extension, that is, to set forth the things of which it is a name.

Section 386. But as in definition we need not completely unfold the intension of a term, so in division we must not completely unfold its extension.

Section 387. Completely to unfold the extension of a term would involve stating all the individual objects to which the name applies, a thing which would be impossible in the case of most common terms. When it is done, it is called Enumeration. To reckon up all the months of the year from January to December would be an enumeration, and not a division, of the term 'month.'

Section 388. Logical division always stops short at classes. It may be defined as the statement of the various classes of things that can be called by a common name. Technically we may say that it consists in breaking up a genus into its component species.

Section 389. Since division thus starts with a class and ends with classes, it is clear that it is only common terms which admit of division, and also that the members of the division must themselves be common terms.

Section 390. An 'individual' is so called as not admitting of logical division. We may divide the term 'cow' into classes, as Jersey, Devonshire, &c., to which the name 'cow' will still be applicable, but the parts of an individual cow are no longer called by the name of the whole, but are known as beefsteaks, briskets, &c.

Section 391. In dividing a term the first requisite is to fix upon some point wherein certain members of the class differ from others. The point thus selected is called the Fundamentum Divisionis or Basis of the Division.

Section 392. The basis of the division will of course differ according to the purpose in hand, and the same term will admit of being divided on a number of different principles. Thus we may divide the term 'man,' on the basis of colour, into white, black, brown, red, and yellow; or, on the basis of locality, into Europeans, Asiatics, Africans, Americans, Australians, New Zealanders, and Polynesians; or again, on a very different principle, into men of nervous, sanguine, bilious,

lymphatic and mixed temperaments.

Section 393. The term required to be divided is known as the Totum Divisum or Divided Whole. It might also be called the Dividend.

Section 394. The classes into which the dividend is split up are called the Membra Dividentia, or Dividing Members.

Section 395. Only two rules need be given for division--

(1) The division must be conducted on a single basis.

(2) The dividing members must be coextensive with the divided whole.

Section 396. More briefly, we may put the same thing thus--There must be no cross-division (1) and the division must be exhaustive (2).

Section 397. The rule, which is commonly given, that each dividing member must be a common term, is already provided for under our definition of the process.

Section 398. The rule that the dividend must be predicable of each of the dividing members is contained in our second rule; since, if there were any term of which the dividend were not predicable, it would be impossible for the dividing members to be exactly coextensive with it. It would not do, for instance, to introduce mules and donkeys into a division of the term horse.

Section 399. Another rule, which is sometimes given, namely, that the constituent species must exclude one another, is a consequence of our first; for, if the division be conducted on a single principle, the constituent species must exclude one another. The converse, however, does not hold true. We may have a division consisting of mutually exclusive members, which yet involves a mixture of different bases, e.g. if we were to divide triangle into scalene, isosceles and equiangular. This happens because two distinct attributes may be found in invariable conjunction.

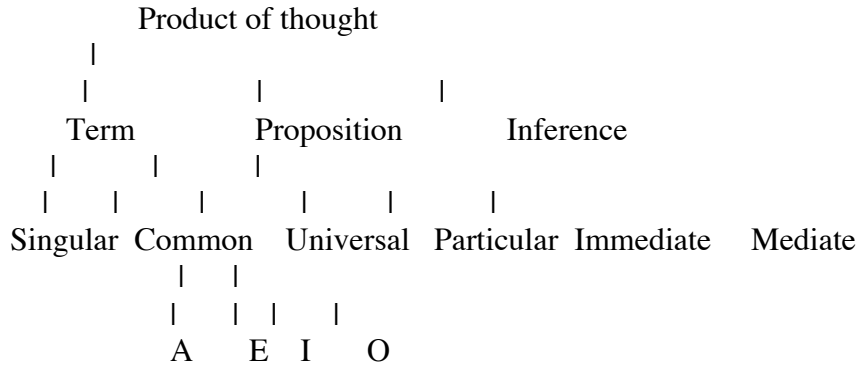
Section 400. There is no better test, however, of the soundness of a division than to try whether the species overlap, that is to say, whether there are any individuals that would fall into two or more of the classes. When this is found to be the case, we may be sure that we have mixed two or more different fundamenta divisionis. If man, for instance, were to be divided into European, American, Aryan, and Semitic, the species would overlap; for both Europe and America contain inhabitants of Aryan and Semitic origin. We have here members

of a division based on locality mixed up with members of another division, which is based on race as indicated by language.

Section 401. The classes which are arrived at by an act of division may themselves be divided into smaller classes. This further process is called Subdivision.

Section 402. Let it be noticed that Rule 1 applies only to a single act of division. The moment that we begin to subdivide we not only may, but must, adopt a new basis of division; since the old one has, 'ex hypothesi,' been exhausted. Thus, having divided men according to the colour of their skins, if we wish to subdivide any of the classes, we must look out for some fresh attribute wherein some men of the same complexion differ from others, e.g. we might divide black men into woolly-haired blacks, such as the Negroes, and straight-haired blacks, like the natives of Australia.

Section 403. We will now take an instance of division and subdivision, with a view to illustrating some of the technical terms which are used in connection with the process. Keeping closely to our proper subject, we will select as an instance a division of the products of thought, which it is the province of logic to investigate.



Here we have first a threefold division of the products of thought based on their comparative complexity. The first two of these, namely, the term and the proposition, are then subdivided on the basis of their respective quantities. In the case of inference the basis of the division is again the degree of complexity. The subdivision of the proposition is carried a step further than that of the others. Having exhausted our old basis of quantity, we take a new attribute, namely, quality, on which to found the next step of subdivision.

Section 404. Now in such a scheme of division and subdivision as the foregoing, the highest class taken is known as the Summum Genus. Thus

the summum genus is the same thing as the divided whole, viewed in a different relation. The term which is called the divided whole with reference to a single act of division, is called the summum genus whenever subdivision has taken place.

Section 405. The classes at which the division stops, that is, any which are not subdivided, are known as the Infimae Species.

Section 406. All classes intermediate between the summum genus and the infimae species are called Subaltern Genera or Subaltern Species, according to the way they are looked at, being genera in relation to the classes below them and species in relation to the classes above them.

Section 407. Any classes which fall immediately under the same genus are called Cognate Species, e.g. singular and common terms are cognate species of term.

Section 408. The classes under which any lower class successively falls are called Cognate Genera. The relation of cognate species to one another is like that of children of the same parents, whereas cognate genera resemble a line of ancestry.

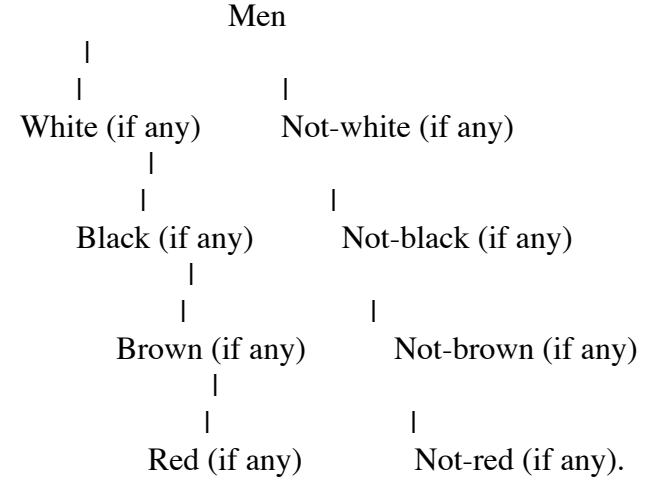
Section 409. The Specific Difference of anything is the attribute or attributes which distinguish it from its cognate species. Thus the specific difference of a universal proposition is that the predicate is known to apply to the whole of the subject. A specific difference is said to constitute the species.

Section 410. The specific difference of a higher class becomes a Generic Difference with respect to the class below it. A generic difference then may be said to be the distinguishing attribute of the whole class to which a given species belongs. The generic difference is common to species that are cognate to one another, whereas the specific difference is peculiar to each. It is the generic difference of an A proposition that it is universal, the specific difference that it is affirmative.

Section 411. The same distinction is observed between the specific and generic properties of a thing. A Specific Property is an attribute which flows from the difference of a thing itself; a Generic Property is an attribute which flows from the difference of the genus to which the thing belongs. It is a specific property of an E proposition that its predicate is distributed, a generic property that its contrary cannot be true along with it (Section 465); for this last characteristic flows from the nature of the universal proposition generally.

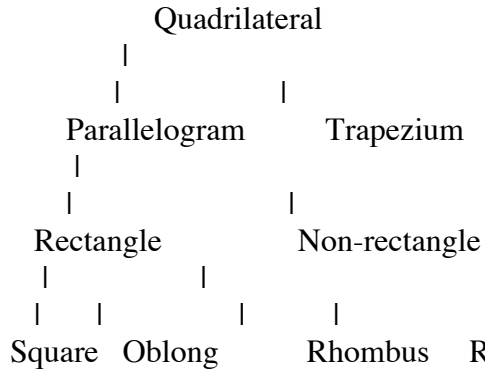
Section 412. It now remains to say a few words as to the place in logic of the process of division. Since the attributes in which members of the same class differ from one another cannot possibly be indicated by their common name, they must be sought for by the aid of experience; or, to put the same thing in other words, since all the infimae species are alike contained under the summum genus, their distinctive attributes can be no more than separable accidents when viewed in relation to the summum genus. Hence division, being always founded on the possession or non-possession of accidental attributes, seems to lie wholly outside the sphere of formal logic. This however is not quite the case, for, in virtue of the Law of Excluded Middle, there is always open to us, independently of experience, a hypothetical division by dichotomy. By dichotomy is meant a division into two classes by a pair of contradictory terms, e.g. a division of the class, man, into white and not-white. Now we cannot know, independently of experience, that any members of the class, man, possess whiteness; but we may be quite sure, independently of all experience, that men are either white or not. Hence division by dichotomy comes strictly within the province of formal logic. Only it must be noticed that both sides of the division must be hypothetical. For experience alone can tell us, on the one hand, that there are any men that are white, and on the other, that there are any but white men.

Section 413. What we call a division on a single basis is in reality the compressed result of a scheme of division and subdivision by dichotomy, in which a fresh principle has been introduced at every step. Thus when we divide men, on the basis of colour, into white, black, brown, red and yellow, we may be held to have first divided men into white and not-white, and then to have subdivided the men that are not-white into black and not-black, and so on. From the strictly formal point of view this division can only be represented as follows--



Section 414. Formal correctness requires that the last term in such a series should be negative. We have here to keep the term 'not-red' open, to cover any blue or green men that might turn up. It is only experience that enables us to substitute the positive term 'yellow' for 'not-red,' since we know as a matter of fact that there are no men but those of the five colours given in the original division.

Section 415. Any correct logical division always admits of being arrived at by the longer process of division and subdivision by dichotomy. For instance, the term quadrilateral, or four-sided rectilinear figure, is correctly divided into square, oblong, rhombus, rhomboid and trapezium. The steps of which this division consists are as follows--



Section 416. In reckoning up the infimae species in such a scheme, we must of course be careful not to include any class which has been already subdivided; but no harm is done by mixing an undivided class, like trapezium, with the subdivisions of its cognate species.

Section 417. The two processes of definition and division are intimately connected with one another. Every definition suggests a division by dichotomy, and every division supplies us at once with a complete definition of all its members.

Section 418. Definition itself, so far as concerns its content, is, as we have already seen, extraneous to formal logic: but when once we have elicited a genus and difference out of the material elements of thought, we are enabled, without any further appeal to experience, to base thereon a division by dichotomy. Thus when man has been defined as a rational animal, we have at once suggested to us a division of animal into rational and irrational.

Section 419. Again, the addition of the attributes, rational and irrational respectively, to the common genus, animal, ipso facto supplies us with definitions of the species, man and brute. Similarly, when we

subdivided rectangle into square and oblong on the basis of the equality or inequality of the adjacent sides, we were by so doing supplied with a definition both of square and oblong--'A square is a rectangle having all its sides equal,' and 'An oblong is a rectangle which has only its opposite sides equal.'

Section 420. The definition of a square just given amounts to the same thing as Euclid's definition, but it complies with a rule which has value as a matter of method, namely, that the definition should state the Proximate Genus of the thing defined.

Section 421. Since definition and division are concerned with the intension and extension of terms, they are commonly treated of under the first part of logic: but as the treatment of the subject implies a familiarity with the Heads of Predicables, which in their turn imply the proposition, it seems more desirable to deal with them under the second.

Section 422. We have already had occasion to distinguish division from Enumeration. The latter is the statement of the individual things to which a name applies. In enumeration, as in division, the wider term is predicable of each of the narrower ones.

Section 423. Partition is the mapping out of a physical whole into its component parts, as when we say that a tree consists of roots, stem, and branches. In a partition the name of the whole is not predicable of each of the parts.

Section 424. Distinction is the separation from one another of the various meanings of an equivocal term. The term distinguished is predicable indeed of each of the members, but of each in a different sense. An equivocal term is in fact not one but several terms, as would quickly appear, if we were to use definitions in place of names.

Section 425. We have seen that a logical whole is a genus viewed in relation to its underlying species. From this must be distinguished a metaphysical whole, which is a substance viewed in relation to its attributes, or a class regarded in the same way. Logically, man is a part of the class, animal; metaphysically, animal is contained in man. Thus a logical whole is a whole in extension, while a metaphysical whole is a whole in intension. From the former point of view species is contained in genus; from the latter genus is contained in species.