

[28] In the only attempt which, so far as I know, has been made to refute the preceding argumentation, it is maintained that in the first form of the syllogism,

A dragon is a thing which breathes flame, A dragon is a serpent, Therefore some serpent or serpents breathe flame,

"there is just as much truth in the conclusion as there is in the premises, or rather, no more in the latter than in the former. If the general name serpent includes both real and imaginary serpents, there is no falsity in the conclusion; if not, there is falsity in the minor premise."

Let us, then, try to set out the syllogism on the hypothesis that the name serpent includes imaginary serpents. We shall find that it is now necessary to alter the predicates; for it cannot be asserted that an imaginary creature breathes flame: in predicating of it such a fact, we assert by the most positive implication that it is real and not imaginary. The conclusion must run thus, "Some serpent or serpents either do or are *imagined* to breathe flame." And to prove this conclusion by the instance of dragons, the premises must be, A dragon is *imagined* as breathing flame, A dragon is a (real or imaginary) serpent: from which it undoubtedly follows, that there are serpents which are imagined to breathe flame; but the major premise is not a definition, nor part of a definition; which is all that I am concerned to prove.

Let us now examine the other assertion--that if the word serpent stands for none but real serpents, the minor premise (a dragon is a serpent) is false. This is exactly what I have myself said of the premise, considered as a statement of fact: but it is not false as part of the definition of a dragon; and since the premises, or one of them, must be false, (the conclusion being so,) the real premise cannot be the definition, which is true, but the statement of fact, which is false.

[29] "Few people" (I have said in another place) "have reflected how great a knowledge of Things is required to enable a man to affirm that any given argument turns wholly upon words. There is, perhaps, not one of the leading terms of philosophy which is not used in almost innumerable shades of meaning, to express ideas more or less widely different from one another. Between two of these ideas a sagacious and penetrating mind will discern, as it were intuitively, an unobvious link of connexion, upon which, though perhaps unable to give a logical account of it, he will found a perfectly valid argument, which his critic, not having so keen an insight into the Things, will mistake for a fallacy turning on the double meaning of a term. And the greater the genius of him who thus safely leaps over the chasm, the greater will probably be the crowing and vain-glory of the mere logician, who, hobbling after him, evinces his own superior wisdom by pausing on its brink, and giving up as desperate his proper business of bridging it over."

## BOOK II.

### OF REASONING.

[Greek: Diorismenon de touton legomen ede, dia tinon, kai pote, kai pos ginetai pas syllogismos hysteron de lekton peri apodeixeos. Proteron gar peri syllogismou lekton, e peri apodeixeos, dia to katholou mallon einai ton syllogismon. He men gar apodeixis, syllogismos tis; ho syllogismos de ou pas, apodeixis.]

ARIST. *Analyt. Prior.* 1. i. cap. 4.

**CHAPTER I.**

## OF INFERENCE, OR REASONING, IN GENERAL.

Sec. 1. In the preceding Book, we have been occupied not with the nature of Proof, but with the nature of Assertion: the import conveyed by a Proposition, whether that Proposition be true or false; not the means by which to discriminate true from false Propositions. The proper subject, however, of Logic is Proof. Before we could understand what Proof is, it was necessary to understand what that is to which proof is applicable; what that is which can be a subject of belief or disbelief, of affirmation or denial; what, in short, the different kinds of Propositions assert.

This preliminary inquiry we have prosecuted to a definite result. Assertion, in the first place, relates either to the meaning of words, or to some property of the things which words signify. Assertions respecting the meaning of words, among which definitions are the most important, hold a place, and an indispensable one, in philosophy; but as the meaning of words is essentially arbitrary, this class of assertions are not susceptible of truth or falsity, nor therefore of proof or disproof. Assertions respecting Things, or what may be called Real Propositions, in contradistinction to verbal ones, are of various sorts. We have analysed the import of each sort, and have ascertained the nature of the things they relate to, and the nature of what they severally assert respecting those things. We found that whatever be the form of the proposition, and whatever its nominal subject or predicate, the real subject of every proposition is some one or more facts or phenomena of consciousness, or some one or more of the hidden causes or powers to which we ascribe those facts; and that what is predicated or asserted, either in the affirmative or negative, of those phenomena or those powers, is always either Existence, Order in Place, Order in Time, Causation, or Resemblance. This, then, is the theory of the Import of Propositions, reduced to its ultimate elements: but there is another and a less abstruse expression for it, which, though stopping short in an earlier stage of the analysis, is sufficiently scientific for many of the purposes for which such a general expression is required. This expression recognises the commonly received distinction between Subject and Attribute, and gives the following as the analysis of the meaning of propositions:--Every Proposition asserts, that some given subject does or does not possess some attribute; or that some attribute is or is not (either in all or in some portion of the subjects in which it is met with) conjoined with some other attribute.

We shall now for the present take our leave of this portion of our inquiry, and proceed to the peculiar problem of the Science of Logic, namely, how the assertions, of which we have analysed the import, are proved or disproved; such of them, at least, as, not being amenable to direct consciousness or intuition, are appropriate subjects of proof.

We say of a fact or statement, that it is proved, when we believe its truth by reason of some other fact or statement from which it is said to *follow*. Most of the propositions, whether affirmative or negative, universal, particular, or singular, which we believe, are not believed on their own evidence, but on the ground of something previously assented to, from which they are said to be *inferred*. To infer a proposition from a previous proposition or propositions; to give credence to it, or claim credence for it, as a conclusion from something else; is to *reason*, in the most extensive sense of the term. There is a narrower sense, in which the name reasoning is confined to the form of inference which is termed ratiocination, and of which the syllogism is the general type. The reasons for not conforming to this restricted use of the term were stated in an earlier stage of our inquiry, and additional motives will be suggested by the considerations on which we are now about to enter.

Sec. 2. In proceeding to take into consideration the cases in which inferences can legitimately be drawn, we shall first mention some cases in which the inference is apparent, not real; and which require notice chiefly that they may not be confounded with cases of inference properly so called. This occurs when the proposition ostensibly inferred from another, appears on analysis to be merely a repetition of the same, or part of the same, assertion, which was contained in the first. All the cases mentioned in books of Logic as examples of

aequipollency or equivalence of propositions, are of this nature. Thus, if we were to argue, No man is incapable of reason, for every man is rational; or, All men are mortal, for no man is exempt from death; it would be plain that we were not proving the proposition, but only appealing to another mode of wording it, which may or may not be more readily comprehensible by the hearer, or better adapted to suggest the real proof, but which contains in itself no shadow of proof.

Another case is where, from an universal proposition, we affect to infer another which differs from it only in being particular: as All A is B, therefore Some A is B: No A is B, therefore Some A is not B. This, too, is not to conclude one proposition from another, but to repeat a second time something which had been asserted at first; with the difference, that we do not here repeat the whole of the previous assertion, but only an indefinite part of it.

A third case is where, the antecedent having affirmed a predicate of a given subject, the consequent affirms of the same subject something already connoted by the former predicate: as, Socrates is a man, therefore Socrates is a living creature; where all that is connoted by living creature was affirmed of Socrates when he was asserted to be a man. If the propositions are negative, we must invert their order, thus: Socrates is not a living creature, therefore he is not a man; for if we deny the less, the greater, which includes it, is already denied by implication. These, therefore, are not really cases of inference; and yet the trivial examples by which, in manuals of Logic, the rules of the syllogism are illustrated, are often of this ill-chosen kind; formal demonstrations of conclusions to which whoever understands the terms used in the statement of the data, has already, and consciously, assented.

The most complex case of this sort of apparent inference is what is called the Conversion of propositions; which consists in turning the predicate into a subject, and the subject into a predicate, and framing out of the same terms thus reversed, another proposition, which must be true if the former is true. Thus, from the particular affirmative proposition, Some A is B, we may infer that Some B is A. From the universal negative, No A is B, we may conclude that No B is A. From the universal affirmative proposition, All A is B, it cannot be inferred that all B is A; though all water is liquid, it is not implied that all liquid is water; but it is implied that some liquid is so; and hence the proposition, All A is B, is legitimately convertible into Some B is A. This process, which converts an universal proposition into a particular, is termed conversion *per accidens*. From the proposition, Some A is not B, we cannot even infer that some B is not A; though some men are not Englishmen, it does not follow that some Englishmen are not men. The only mode usually recognised of converting a particular negative proposition, is in the form, Some A is not B, therefore, something which is not B is A; and this is termed conversion by contraposition. In this case, however, the predicate and subject are not merely reversed, but one of them is changed. Instead of [A] and [B], the terms of the new proposition are [a thing which is not B], and [A]. The original proposition, Some A *is not* B, is first changed into a proposition equipollent with it, Some A *is* "a thing which is not B;" and the proposition, being now no longer a particular negative, but a particular affirmative, *admits* of conversion in the first mode, or as it is called, *simple* conversion.[1]

In all these cases there is not really any inference; there is in the conclusion no new truth, nothing but what was already asserted in the premises, and obvious to whoever apprehends them. The fact asserted in the conclusion is either the very same fact, or part of the fact asserted in the original proposition. This follows from our previous analysis of the Import of Propositions. When we say, for example, that some lawful sovereigns are tyrants, what is the meaning of the assertion? That the attributes connoted by the term "lawful sovereign," and the attributes connoted by the term "tyrant," sometimes coexist in the same individual. Now this is also precisely what we mean, when we say that some tyrants are lawful sovereigns; which, therefore, is not a second proposition inferred from the first, any more than the English translation of Euclid's Elements is a collection of theorems different from, and consequences of, those contained in the Greek original. Again, if we assert that no great general is a rash man, we mean that the attributes connoted by "great general," and those connoted by "rash," never coexist in the same subject; which is also the exact meaning which would be expressed by saying, that no rash man is a great general. When we say that all quadrupeds are warm-blooded,

we assert, not only that the attributes connoted by "quadruped" and those connoted by "warm-blooded" sometimes coexist, but that the former never exist without the latter: now the proposition, Some warm-blooded creatures are quadrupeds, expresses the first half of this meaning, dropping the latter half; and therefore has been already affirmed in the antecedent proposition, All quadrupeds are warm-blooded. But that *all* warm-blooded creatures are quadrupeds, or, in other words, that the attributes connoted by "warm-blooded" never exist without those connoted by "quadruped," has not been asserted, and cannot be inferred. In order to reassert, in an inverted form, the whole of what was affirmed in the proposition, All quadrupeds are warm-blooded, we must convert it by contraposition, thus, Nothing which is not warm-blooded is a quadruped. This proposition, and the one from which it is derived, are exactly equivalent, and either of them may be substituted for the other; for, to say that when the attributes of a quadruped are present, those of a warm-blooded creature are present, is to say that when the latter are absent the former are absent.

In a manual for young students, it would be proper to dwell at greater length on the conversion and aequipollency of propositions. For, though that cannot be called reasoning or inference which is a mere reassertion in different words of what had been asserted before, there is no more important intellectual habit, nor any the cultivation of which falls more strictly within the province of the art of logic, than that of discerning rapidly and surely the identity of an assertion when disguised under diversity of language. That important chapter in logical treatises which relates to the Opposition of Propositions, and the excellent technical language which logic provides for distinguishing the different kinds or modes of opposition, are of use chiefly for this purpose. Such considerations as these, that contrary propositions may both be false, but cannot both be true; that subcontrary propositions may both be true, but cannot both be false; that of two contradictory propositions one must be true and the other false; that of two subalternate propositions the truth of the universal proves the truth of the particular, and the falsity of the particular proves the falsity of the universal, but not *vice versa*;<sup>[2]</sup> are apt to appear, at first sight, very technical and mysterious, but when explained, seem almost too obvious to require so formal a statement, since the same amount of explanation which is necessary to make the principles intelligible, would enable the truths which they convey to be apprehended in any particular case which can occur. In this respect, however, these axioms of logic are on a level with those of mathematics. That things which are equal to the same thing are equal to one another, is as obvious in any particular case as it is in the general statement: and if no such general maxim had ever been laid down, the demonstrations in Euclid would never have halted for any difficulty in stepping across the gap which this axiom at present serves to bridge over. Yet no one has ever censured writers on geometry, for placing a list of these elementary generalizations at the head of their treatises, as a first exercise to the learner of the faculty which will be required in him at every step, that of apprehending a *general* truth. And the student of logic, in the discussion even of such truths as we have cited above, acquires habits of circumspect interpretation of words, and of exactly measuring the length and breadth of his assertions, which are among the most indispensable conditions of any considerable mental attainment, and which it is one of the primary objects of logical discipline to cultivate.

Sec. 3. Having noticed, in order to exclude from the province of Reasoning or Inference properly so called, the cases in which the progression from one truth to another is only apparent, the logical consequent being a mere repetition of the logical antecedent; we now pass to those which are cases of inference in the proper acceptation of the term, those in which we set out from known truths, to arrive at others really distinct from them.

Reasoning, in the extended sense in which I use the term, and in which it is synonymous with Inference, is popularly said to be of two kinds: reasoning from particulars to generals, and reasoning from generals to particulars; the former being called Induction, the latter Ratiocination or Syllogism. It will presently be shown that there is a third species of reasoning, which falls under neither of these descriptions, and which, nevertheless, is not only valid, but is the foundation of both the others.

It is necessary to observe, that the expressions, reasoning from particulars to generals, and reasoning from

generals to particulars, are recommended by brevity rather than by precision, and do not adequately mark, without the aid of a commentary, the distinction between Induction (in the sense now adverted to) and Ratiocination. The meaning intended by these expressions is, that Induction is inferring a proposition from propositions *less general* than itself, and Ratiocination is inferring a proposition from propositions *equally* or *more general*. When, from the observation of a number of individual instances, we ascend to a general proposition, or when, by combining a number of general propositions, we conclude from them another proposition still more general, the process, which is substantially the same in both instances, is called Induction. When from a general proposition, not alone (for from a single proposition nothing can be concluded which is not involved in the terms), but by combining it with other propositions, we infer a proposition of the same degree of generality with itself, or a less general proposition, or a proposition merely individual, the process is Ratiocination. When, in short, the conclusion is more general than the largest of the premises, the argument is commonly called Induction; when less general, or equally general, it is Ratiocination.

As all experience begins with individual cases, and proceeds from them to generals, it might seem most conformable to the natural order of thought that Induction should be treated of before we touch upon Ratiocination. It will, however, be advantageous, in a science which aims at tracing our acquired knowledge to its sources, that the inquirer should commence with the latter rather than with the earlier stages of the process of constructing our knowledge; and should trace derivative truths backward to the truths from which they are deduced, and on which they depend for their evidence, before attempting to point out the original spring from which both ultimately take their rise. The advantages of this order of proceeding in the present instance will manifest themselves as we advance, in a manner superseding the necessity of any further justification or explanation.

Of Induction, therefore, we shall say no more at present, than that it at least is, without doubt, a process of real inference. The conclusion in an induction embraces more than is contained in the premises. The principle or law collected from particular instances, the general proposition in which we embody the result of our experience, covers a much larger extent of ground than the individual experiments which form its basis. A principle ascertained by experience, is more than a mere summing up of what has been specifically observed in the individual cases which have been examined; it is a generalization grounded on those cases, and expressive of our belief, that what we there found true is true in an indefinite number of cases which we have not examined, and are never likely to examine. The nature and grounds of this inference, and the conditions necessary to make it legitimate, will be the subject of discussion in the Third Book: but that such inference really takes place is not susceptible of question. In every induction we proceed from truths which we knew, to truths which we did not know; from facts certified by observation, to facts which we have not observed, and even to facts not capable of being now observed; future facts, for example; but which we do not hesitate to believe on the sole evidence of the induction itself.

Induction, then, is a real process of Reasoning or Inference. Whether, and in what sense, as much can be said of the Syllogism, remains to be determined by the examination into which we are about to enter.