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Received 9c Mar. 1899

OUTLINES OF LOGIC:

AN ENGLISH TRANSLATION

THE OXFORD TRANSLATIONS.

113.
OUTLINES OF LOGIC:

AN ENGLISH TRANSLATION

OF

TRENDELENBURG'S

ELEMENTA LOGICES ARISTOTELEÆ.

SECOND EDITION.

WITH ENGLISH NOTES,

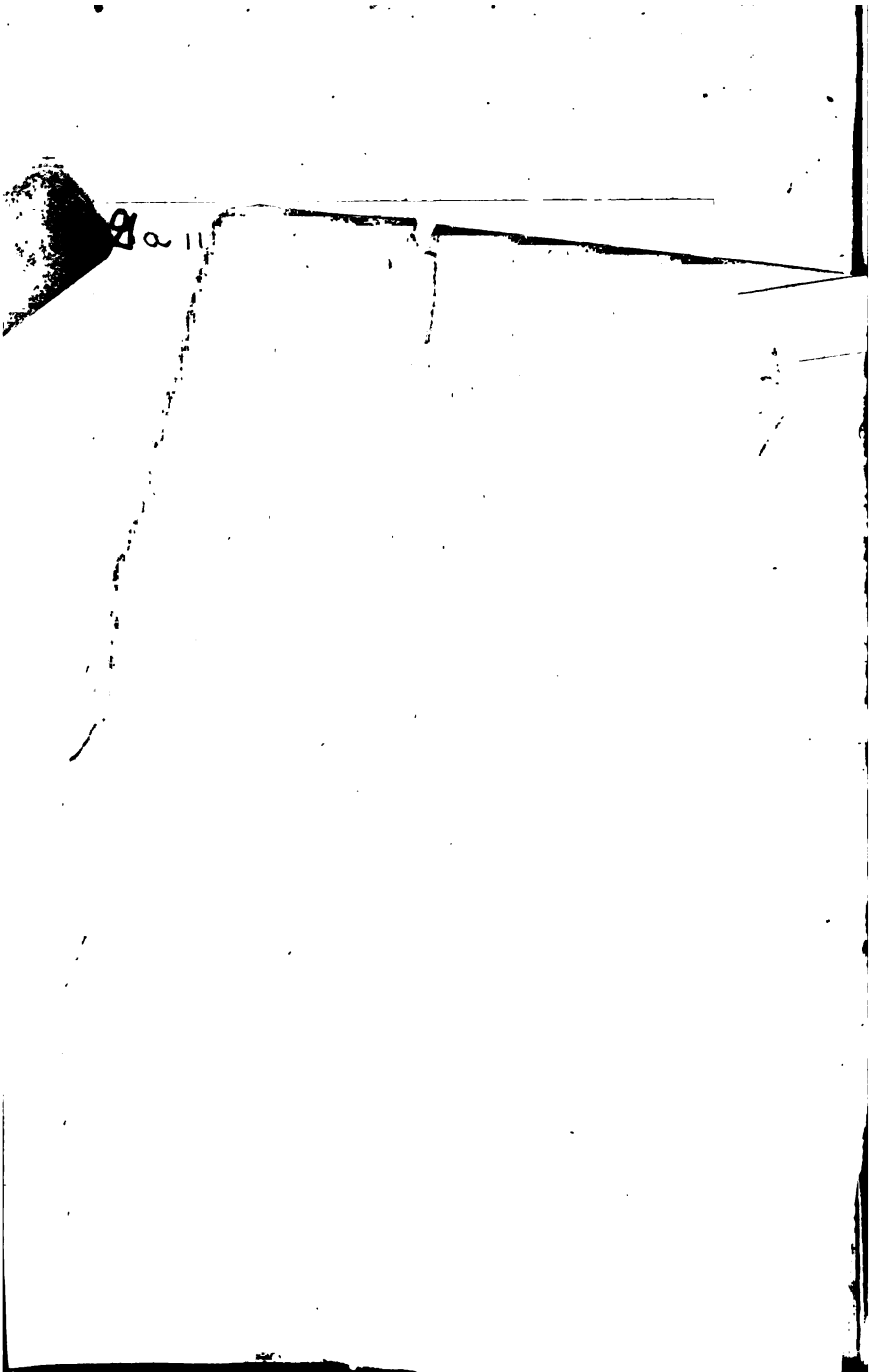
BY

R. BROUGHTON, M.A.,

HERTFORD COLLEGE.

Arranged for Interleaving with the Text.

Oxford:



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Friedrich Adolf

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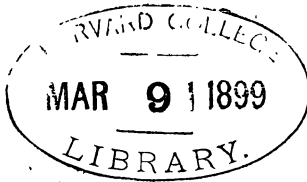
Oxford :

A. THOS. SHRIMPTON & SON, 23 & 24, BROAD STREET.

LONDON : SIMPKIN, MARSHALL, HAMILTON, KENT, & Co., Ltd.

1898.

Ca 113.508



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OUTLINES OF LOGIC.

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§ 1. WHEREVER we have truth or falsehood we must first have concepts compounded as if they were one; for it is with the compounding and dividing of concepts that truth and falsehood are concerned. Now simple names and verbs resemble the concept where no process of compounding or dividing has taken place, *e.g.*, the concepts *man* or *white*, where nothing is added to them. As yet we have neither truth nor falsehood, as we see by the fact that the concept *Goat-stag* has indeed a meaning, but as yet we cannot call the meaning either true or false, unless there be added the conception of Being or Not-being with or without a notion of time. He, therefore, judges rightly who thinks of that which is divided as divided, and of that which is in composition as compounded; and he falsely, who holds an opposite opinion to that which the facts of the case warrant.

§ 2. Every sentence is significant, but only that of which truth or falsehood can be predicated is declaratory. These cannot be predicated of all sentences, as, for instance, prayer takes the form of a sentence, but is neither true nor false. Dismissing, then, all other kinds as fitter subjects for investigation by Poetry or Rhetoric, our present study concerns itself with the Sentence declaratory.

§ 3. ¹ Of terms when not used in combination, each signifies either Substance, Quantity, Quality, Relation, Place, Time, Position, State, Action, or Passion. As examples

of Substance we may take *man, horse* ; of Quantity, of *two cubits, of three cubits* ; of Quality, *white, literary* ; of Relation, *double, half, greater* ; of Place, *in the Lyceum, in the market* ; of Time, *yesterday, last year* ; of Position, *is reclining, is sitting* ; of State, *is shod, is armed* ; of Action, *cuts, burns* ; of Passion, *is being cut, is being burnt*.

§ 4. A declaratory sentence is (1) affirmative, (2) negative. Affirmation is declaration of a relation between this and that ; Negation is a declaration of non-relation. The statements are true according as they agree with the facts of the case.

§ 5. The phrase Not-man is not a name ; nor is there any existing name by which we can call it, for it is neither a sentence nor a negation. Let it pass as an Indefinite name, for it can be ranked equally well under either Being or Not-being. Every affirmation or negation will be made up of a name and a verb, or of an indefinite name and a verb : for without a verb there can be neither affirmation nor negation.

§ 6. Of terms, some are General, others Singular. By the former I mean such as can be predicated of many subjects ; by the latter, such as cannot ; *e.g.*, we place *man* among general terms, *Kallias* among singular.

A Proposition is a sentence affirming or denying one thing of another. It may be either Universal, Particular, or ² Indefinite. ³ By Universal, I mean a proposition which asserts something of all or none of its subject ; by Particular, one which asserts or denies something of some or not all of the subject ; by Indefinite, one which makes an assertion without specifying whether it is universal or particular, as were one to say that the same science deals with opposites, or that pleasure is not a good.

It is very evident that the universal proposition is superior to the particular; for of the two propositions, when we know the former, we are acquainted with the latter also, and know it virtually, or in potentiality. As, for instance, if a man knows that every triangle contains angles equal to two right-angles, he may be said to know that the angles of an isosceles triangle are equal to two right-angles, even if he does not know the isosceles as a form of triangle. On the other hand, a man acquainted with the particular proposition has no knowledge whatever of the universal, either virtually or actually. Again, the universal proposition is cognised by the reason, the particular by the senses.

*§ 7. Every proposition is of predicability, either unqualified, necessary, or contingent.

§ 8. Of the whole number of existing terms, some are such as not to be truly predicable universally of any other terms; as, for instance, the terms Kleon, Kallias, and all other individual things and objects of sense-perception. On the other hand, these may have other things predicated of them; Kallias and Kleon, for instance, may be called men and animals. ⁵ Another class of terms are predicable of others, but cannot first have others predicated of them. A third class can be both predicated and predicated of, as, for instance, we may use *man* as a predicate of Kallias, and *animal* as a predicate of man. It is plain, then, that of existing terms some are naturally unfit for being used as predicates; for every object of sense-perception is of such a nature as to be predicable of nothing.

Genera can be predicated of their species, but species cannot conversely be predicated of their genera.

§ 9. It is impossible for the same thing to be at once predicable and not-predicable of the same thing, and in the same respect. This is the most certain of all principles, for it is impossible for any one to conceive the same thing both as being and as not-being. Accordingly, in all demonstrations this is appealed to as an ultimate principle.

⁶ Truth must always, and in all points, be consistent with itself; for with truth all the facts of the case agree, but with falsehood they quickly disagree.

§ 10. Inasmuch as it is possible to deny predicability where it exists, and to affirm it where it does not exist, to deny it where it does not exist, and to affirm it where it does, and in the same way with respect to⁷ other times than the present it will be possible to deny every affirmation and to affirm every negation. Plainly, therefore, to every affirmation a negation stands opposed, and to every negation an affirmation. Let this, then, be called Contradiction, affirmation and negation being the opposites. By Opposition I mean the affirmation and negation of the predicability of the same predicate, of the same subject, but ⁸ not in the same sense.

⁹ Contradiction is an opposition admitting of no intermediate. One part of a Contradiction is the affirmation of predicability, the other part is the negation of it.

In every case of affirmation and negation, whether the subject exist or no, one assertion will be false, and the other true. For in the case of the assertions, Socrates is ill, Socrates is not ill, if Socrates exist it is plain that one of them must be true or false. In like manner if he do not exist; for to say that he is ill when he does not exist is false, and to say that he is not ill true. So that of these propositions alone, which are opposed to each other as affirmative and negative, will it be a property that one must be either true or false (and the other the reverse).

§ 11. Of members of the same genus, those which stand most widely apart from one another we define as contraries.

Contradiction admits of no intermediate, contraries do admit of an intermediate.

§ 12. An affirmation and negation are opposed as contradictories, when the one enunciates a universal proposition, and the other maintains that the predicate cannot be universally affirmed of the given subject.

✓ *E.g.* (i.) All men are white.

Contradict.—Some men are not white.

✓ (ii.) No man is white.

Contradict.—Such and such a man is white.

Contrary opposition, on the other hand, consists in the affirmation and negation of the same universal proposition.

✓ *E.g.* (i.) All men are white. (ii.) All men are just.

Contraries.—No men are white. No men are just.

Such affirmation and negation, therefore, cannot both be true at the same time.

§ 13. Verbally, propositions may be opposed in four ways, thus :—

(i.) Universal affirmative to universal negative,

(ii.) Universal affirmative to particular negative,

(iii.) Particular affirmative to universal negative,

× (iv.) Particular affirmative to particular negative ;

but in reality in only three,¹⁰ for the particular affirmative is only verbally opposed to the particular negative. Of these Opposites, the universals, the affirmative to the negative, are contraries (*e.g.* the proposition, All science is good, to the proposition, No science is good), while the other two are contradictories.

§ 14. ¹¹ As we have seen, every proposition asserts predicability, either unqualified, necessary, or contingent ; and of propositions in each mode, some are affirmative and some negative ; and again, of affirmative and negative propositions, some are universal, others particular, others indefinite. The universal negative necessarily has its terms convertible : if no pleasure is a good, it follows that no good is a pleasure. The universal affirmative also is necessarily convertible, but only by becoming particular instead of universal : if all pleasure is a good, some good is a pleasure. Of the particular propositions the affirmative is necessarily convertible : if some pleasure is a good, then also some good will be a pleasure ; but this is not the case with the negative, for it does not follow that if some animals are not men, therefore some men are not animals.

§ 15. The range of enquiry is co-extensive with the range of knowledge ; we enquire as to four points : ¹² the Fact, the Reason, the Existence, the Essence. When, after enumerating every possible case, we enquire as to whether this or that is true—*e.g.*, as to whether the sun is or is not in eclipse—we are investigating a question of fact. Herein lies the proof : as soon as we have ascertained the fact of the eclipse we stop ; and if we start from the assumption that the sun is in eclipse, we do not investigate whether it is so or not. When we are assured of the fact, we proceed to enquire into the reason (or the How and the Why) of it ; as, for instance, when we know that the sun is in eclipse, or that there is an earthquake, we investigate the causes of these occurrences. So much for this class of questions. There is another class which we investigate differently from these ; such, for instance, is the question, Does or does not a Centaur or a God exist? (Here I am speaking simply of the fact of existence, and not, for instance, as to whether it is white or not.) Finally, when we have ascertained the fact of existence, we enquire as to its nature or essence ; as, for instance, What is the nature of a God, or of a man?

§ 16. It is not the same thing to know the fact and the reason of it : the knowledge of the latter is referred to the first cause. The perfection of knowledge is the contemplation of the reason of things.¹³

§ 17. We believe that we possess an absolute knowledge of anything when we believe ourselves to know the cause through which the thing is as its cause, and not only that, but as its invariable cause.

§ 18. All teaching and all learning, by the operation of the intellect, proceed from pre-existing knowledge. On a comprehensive examination this will be plain : it is thus (for example) that the mathematical sciences are attained, and similarly also all the arts.

§ 19. Things are prior and better known in two ways. For the same thing is not naturally prior and prior in relation to us, nor naturally better known and better known in relation to us. By "prior and better known in relation to us," I mean things which are more accessible to sense-perception ;

by "absolutely prior and better known," those that are less accessible: of the latter class are universals, of the former particulars.

§ 20. All belief comes either from syllogistic reasoning, or from induction. Knowledge is acquired either by induction or by demonstration: demonstration starting from universals, induction from particulars.

§ 21. A syllogism is a form of reasoning in which, certain premisses being granted, a conclusion differing from these necessarily results by virtue of their existence. By this phrase I mean that the result is produced by means of the premisses; and when I say "by their means," I assert that there is no need of any fresh term for the conclusion to be a necessity.

§ 22. By Terms I mean the parts into which the proposition may be analysed, i.e., the predicate, and the subject which is predicated of.

§ 23. ¹⁴ Whatever is asserted of the predicate will be equally asserted of the subject also.

§ 24. Whenever three terms are so related to one another, that the last (or minor) term is included in the middle as a whole, and the middle is or is not included in the first (or major) term as a whole, there must necessarily be a perfect conclusion of the extreme terms.

By the Middle Term I mean one which is itself included in another, and has another included in it. In position also it holds the middle place. The extreme terms are such that the same thing may be ranked under one, and have the other ranked under it.

Example.—A is a predicate of all B (all B is A).

B is a predicate of all C (all C is B).

Necessarily A is a predicate of all C (all C is A).

A figure like this I call the First.

§ 25. Whenever the same thing is predicated of all of one subject and none of another, or of all or none of either of them, such a figure as this I call the Second, and in it I call that the middle term which is predicate in both premisses. In this figure the middle is placed outside the extreme terms, and comes¹⁵ first. There will be a valid syllogism, whether the terms are universal or not.* If they are universal, we shall have a conclusion whenever the middle can be predicated of all the major and none of the minor, or *vice versa*; it making no difference which of the terms is negative. For let M be the predicate of no N and of all X, since a negative proposition is convertible, N will be predicable of no M; but M was given as the predicate of all X, so that N is the predicate of no X. For this was proved before (in the first figure). Again, if M is a predicate of all N but of no X, then N is a predicate of no X. For if M is a predicate of no X, X is a predicate of no M. But M was given as a predicate of all N: ∴ X will be a predicate of no N; for again we have got to the first figure. And since negative propositions are convertible, N will be a predicate of no X, so that there will be the same conclusion.

2nd Fig.	1st Fig.
No N is M	No M is N
All X is M	All X is M
	∴ No X is N

No affirmative conclusion can be reached by this figure; but both the universals and the particulars are all negative.

§ 26. The case in which one predicate may be asserted and another denied universally of the same subject, or in which both may be either asserted or denied universally of it, I call the Third Figure; and in it I call that term the middle which is subject of both predicates, while the major and minor terms are the predicates. The middle term is placed outside the major and minor, and comes¹⁶ after them. There will be a valid conclusion, whether the terms are applied universally to the middle or not.†

2nd Fig.	1st Fig.
All N is M	No M is X
No X is M	All N is M
No X is N	∴ No N is X
	∴ No X is N

* N.B.—Of course, at least *one* of them must be, or there would be an undistributed middle.

† *i.e.*, whether both are or only one, one must be.

If they are both applied universally, whenever both P and R can be predicated of all S, P will necessarily be predicable of some R. For since an affirmative proposition is convertible, S will be predicable of some R; and P is predicable of all S: therefore P is necessarily predicable of some R; for we have arrived at our conclusion by the first figure. It will not be possible to obtain a universal conclusion, either negative or affirmative, by means of this figure.

3rd Fig.	1st Fig.
All S is P	All S is P
All S is R	Some R is S
	Some R is P

§ 27. It is clear that in all demonstration there will be three terms, and no more. This being plain, it is clear also that it must proceed from two premisses, and no more. For the three terms make up two premisses.

§ 28. In all the figures the middle term must necessarily occur in both the premisses. Where the middle term is both predicated and predicated of, or where the same term is predicated and has another term denied of it, we shall have the first figure; where it is both predicated of one thing and denied of another, the second figure; where other terms are predicated of it, or one is denied and the other predicated, the third.

§ 29. In every figure also there must be one term affirmative and one universal predication. For unless there be one universal predication, either there will be no conclusion at all, or it will have nothing to do with the question; or, again, the original question will be begged.

For let the question be, that pleasure derived from "Music" is good. If, then, one should lay down that "Pleasure is good," without prefixing the "all," there will be no conclusion. If we say, "Some pleasure is good"; if the pleasure meant is other than that derived from music, it is beside the question; if it has to do with music the original question is begged.

§ 30. It is only through the first figure that we can search for the knowledge of a thing's essence. In the second figure we can obtain no affirmative conclusion,

while the knowledge of a thing's essence belongs to affirmation. In the last figure we can, indeed, obtain an affirmative conclusion, only not a universal one; but the essence belongs to universals.

§ 31. It is clear that whoever tries to reason from premisses less sure than the conclusion, reasons badly.

§ 32. It is impossible to obtain a false conclusion from true premisses, but a true conclusion may be obtained from false ones;¹⁷ only, however, concerning the fact, not the reason of it.

It is plain, then, that if the conclusion be false, either some or all of the premisses must be false; but when the conclusion is true the premisses are not necessarily true, neither all nor any of them. It is quite possible, with no true premiss in the Syllogism, for the conclusion all the same to be true; only not necessarily so. The reason of this is, that when two things are so related that the existence of the first necessitates the existence of the second; if the second does not exist, neither does the first either; but if the second exist, the first does not of necessity exist also.

§ 33. A demonstrative syllogism is called a *Φιλοσόφημα*; an argumentative syllogism an *Επιχείρημα*; a captious syllogism a *Σόφισμα*; and an argumentative syllogism, involving a contradiction, an *Ἀπόρημα*.

We speak of demonstration when the conclusion of a syllogism proceeds from true and primary premisses, or from premisses which owe their origin to true and primary principles of the particular science. An argumentative syllogism, on the other hand, is one which reasons from probable matters.

One form of false argument is that which seems to reach a conclusion, while in reality it does not. We call this the Captious Syllogism.

Captious arguments are those which reach, or pretend to reach, a conclusion from premisses which seem to be but are not probable.

Doubt would seem to be produced by the balancing of opposite arguments.

§ 34. Induction is the process from particulars to universals. For instance, if the pilot who is instructed in his work is the best, and so also with the driver, we may conclude generally that the instructed man is in each case the best. Induction is a more persuasive and clearer process, and is more easily known by sense-perception, and more accessible to ordinary men. The syllogism, on the other hand, is a more cogent process, and a more powerful weapon, against opponents.

§ 35. Induction and the inductive syllogism is the proving by means of the minor that the major may be predicated of the middle*; *e.g.*, if B be the middle term, A and C the extremes, it proves by means of C that A is predicable of B. It is thus we make our inductions.¹⁸ Of (the minor term) C, which is made up of the sum of the particulars, we must have immediate knowledge; for induction proceeds by means of the sum of the particulars.

§ 36. Induction is in a way opposed to the syllogism: the latter, by means of the middle, proving the major term predicable of the minor, while the former, by means of the minor, proves the major predicable of the middle. Naturally, therefore, the conclusion reached through the middle term is prior and more knowable, but relatively to us that gained by induction is clearer.

§ 37. *Εἰκός*, or probable judgment, is not the same as *Σημεῖον*, or judgment based upon marks. The first is a proposition founded upon common opinion. For that which, as a general rule, we know as occurring or not occurring, being or not being, this we call probable, as that "those who envy, hate," or "the objects of love feel affection."¹⁹ The judgment based on marks, on the other hand, is to be taken as a demonstrative proposition, either necessary, or founded on opinion:

* N.B.—The middle term in induction, and in the first figure of the syllogism, is that which quantitatively is between the other two.

for when the existence or occurrence of another phenomenon is either preceded or followed by the phenomenon in question, it is a mark of its occurrence or existence. A conclusion obtained from premisses based either on probabilities or marks, we called an Enthymeme.

§ 38. ²⁰ When the major term is proved to be predicable of the middle, by means of a term like the minor, we call the process *Παράδειγμα*, or Example. In this we must know that the middle is predicable of the minor, and the major of the parallel term. For instance, let A be "*evil*"; B *the making war on neighbours*; instances of this, C *by the Athenians against the Thebans*, D *by the Thebans against the Phocians*. If then we wish to prove that it is an evil to make war on the Thebans, we must first obtain the premiss that it is an evil to make war on neighbours. This we believe from parallel cases, such as the Theban war against the Phocians. Making war, therefore, on neighbours being an evil, and the war against the Thebans being against neighbours, it is plain that to make war on the Thebans is an evil. Plainly, therefore, B is predicable of C and D (both being cases of making war on neighbours), and A of D (for the war against the Phocians did not profit the Thebans). That A is predicable of B will be shown through D. The method is the same when the parallel cases, which make us believe in the connection of the middle and major terms, are more in number.

Plainly, then, Example does not stand in the relation of part to whole, nor of whole to part, but of part to part; both cases coming under the same head, and one of them being known. Moreover, it differs from induction, inasmuch as the latter, by means of all the individuals, showed the major to be predicable of the middle, without applying the syllogistic process to the major; while example makes this application, and its proof is not from the sum of the individuals.

§ 39. Both the syllogistic and the inductive proof make their demonstration by means of premisses previously known: the first taking the premisses on authority, the second proving the universal by means of the obviousness of the particular.

Rhetorical persuasion proceeds on the same methods, either by way of examples when it comes under induction, or of enthymemes when it comes under the syllogism.

✓ § 40. *Ελεγχος, or Disproof, is the proof of a contradiction.

✓ § 41. *Ενστασις, or Objection, is a proposition opposed to a proposition. It differs from the proposition (used as premiss) inasmuch as the objection may be particular, while the premiss either cannot be so at all, or, at least, not in universal syllogisms.

§ 42. Some propositions being knowable immediately, others mediately (for first principles are known immediately, all that come under these mediately), when we try to prove immediately that which is not so knowable, we beg the original question.

Of begging the question there seem to be five ways. The most glaring, and the one we shall notice first, is to ✓ assume the very proposition to be proved. It is not easy for this to pass unnoticed, if we look at the thing itself; but it is easier in the case of synonyms, and in all cases where the name and the description have the same meaning.

✓ The second way is, having to prove a particular, to assume the corresponding universal, *e.g.*, in trying to prove that there is one and the same science for contraries, to assume generally that there is one and the same for all opposites. Plainly, the proposition which should have been proved is here assumed along with many others.

✓ The third way is, having to prove the universal to assume a particular, *e.g.*, having to prove that there is the same science for all contraries, to assume it for any particular pair. In this case also, it is plain that the proposition which should have been proved with many others, is assumed separately by itself.

✓ The fourth way is, to beg the question by dividing it, *e.g.*, having to prove that the art of medicine deals with both health and sickness, to assume each part of the proposition separately.

- ✓ The last way is, of two propositions that follow necessarily on each other, to assume one, *e.g.*, having to prove the diameter incommensurable in terms of the side, to assume that the side is incommensurable in terms of the diameter.

§ 43. An affirmative proposition is prior, and better known than a negative: for it is only through affirmation that negation is knowable; and affirmation is the prior, on the same principle as Being is prior to Not-being. Moreover, demonstrative proof has the more primordial character, for without the demonstrative there can be no negative.

§ 44. All who employ the proof *per impossibile*, obtain a false conclusion; and thus, by means of an hypothesis, prove their original proposition, by showing that the supposition of its contradictory involves an impossible result.

The method of proof *per reductionem ad impossibile* is as follows:—Having to show that A is not predicable of B, we assume that it is predicable, and also that B is predicable of C, with the result that A is predicable of C. But this is known and acknowledged as impossible. It is impossible, therefore, for A to be predicable of B.—We have shown that affirmative proof is better than negative: it is now plain also that it is better than proof *per reductionem ad impossibile*.

§ 45. Knowledge and the thing known differ from opinion and the thing opined, inasmuch as knowledge is of universals, and rests on necessary grounds; and the necessary does not admit of being otherwise. But opinion is an uncertain thing.

§ 46. It is impossible to make an induction without having sense-perception: for individuals are the objects of sense-perception.

On the other hand, we cannot arrive at knowledge by means of sense-perception only. Even if this has cognisance of quality, and not merely of this or that particular object,

yet it is necessarily the particular object, and under particular conditions of place and time, that the senses perceive. Of the Universal and the Always it is impossible to have sense-perception. This is not subject to conditions of particular existence and particular time; if it were, it would not be universal. It is only that which is always and everywhere that we call universal. Thus, if we were on the moon, and saw the interception of the earth, we might still be ignorant of the cause of the eclipse, for our senses would only perceive the fact of the present eclipse, and not the general cause of it; for, as we said, our senses cannot perceive the universal.

§ 47. An universal Attribute is an attribute which may be predicated of its subject always, as belonging to its essence, and in virtue of its being what it is. Plainly, then, all universals are necessarily predicable of their subjects. The phrases, "as belonging to its essence," and "in virtue of its being what it is," have the same meaning; thus, the attribute of having points may be predicated of a line, both essentially and as line. Similarly a triangle, as triangle, contains angles equal to two right-angles, for it is of the essence of a triangle to have its angles equal to two right-angles. An attribute is predicable universally when it is proved predicable in instances taken at random, and as they present themselves.

§ 48. The subject of an essential attribute is itself the cause of the attribute. The universal being primary, is therefore also the cause of its own attributes.

§ 49. It is altogether impossible that there should ever be a demonstration of all things, for we should at last come to the infinite; so that not even so would there be demonstration.

²¹ It is impossible to travel through an infinite progress in thought.

§ 50. Primary truths are such as are credible, not on other grounds, but on their own authority. We have not, in the case of scientific first principles, to investigate reasons; but each first principle must be credible on its own authority.

Preliminary (i.e. *a priori*) knowledge is of two kinds. Either we must know the fact of an object's existence, or we must have a conception of the meaning of a term; and in some cases both the one and the other.

For instance, the statement that either the affirmation or the negation of anything is true we must know as a fact. Of the term "triangle" we must have a conception that it has such and such a meaning; while in the case of an unit we must both comprehend the meaning of the term, and know the fact of its existence.

§ 51. Not all knowledge is demonstrative, that of immediate truths has not this character. This is plainly necessary; for if, in order to demonstrate, we must know the prior laws from which demonstration proceeds, we come at last to some point where immediate principles begin; and these are necessarily indemonstrable. We assert, then, that this is so; and that not only has man scientific knowledge, but also a foundation of science by which we know the meaning of terms.

Not merely must all or some of the elementary laws be first known, they must also be more fully known; for a predicate is always especially predicable of that which is the cause of its predicability, *e.g.*, we love our friend more than the person whom we love only for his sake. Thus, if primary laws are the sources of any given knowledge or belief, it is plain that these themselves are more fully known or believed, for it is only owing to them that the derived propositions are believed.

§ 52. All demonstration has, as its first principle, an immediate proposition, and by "immediate" I mean that than which no other is more elementary.

§ 53. ²² An immediate syllogistic first principle is called a Thesis when it is indemonstrable, but not a necessary antecedent to all knowledge; when indispensable for any knowledge whatever to be acquired it is called an Axiom.

§ 54. The most primary truths are indemonstrable definitions.

For definition is of the essence and fundamental character, and the essence is always postulated and taken for granted in all sciences; mathematics, for example, postulating the nature of unity and inequality, and all other sciences proceeding on the same plan.

Definition is the explanation of the essence.

§ 55. Definition declares either the essence of the thing (real), or the meaning of the name (nominal).

It is plain that all those who, in whatever way, try to declare the meaning of a term simply by means of a name, do not declare the real definition of the thing, inasmuch as every definition is a kind of sentence.

The geometer assumes the meaning of a triangle and proves its existence.

§ 56. In searching for a definition we must first, by examination of a number of individuals like one another, and without any essential difference, find what quality they all possess in common. Then we must take another set of the same genus as the former, but a different species, though of the same species among themselves. Having found some common characteristic of all of these, and similarly in all the other sets, we must again examine if the characteristics we have obtained share any point in common until we come to one single character, and this will be our definition. If we cannot arrive at any common characteristic, but there are two or more (common to different sets), it is plain that the subject of our investigation is no one single thing, but two or more. For instance, if we wish to find a definition of High-Spirit we must examine the cases of such high-spirited characters as we know to find what point they all have in common in respect to this quality. Thus, if Alcibiades, Achilles, and Ajax are all high-spirited, in what point do they all agree? we may answer, In impatience of insult, which drove one to treason, another to anger, and the third to suicide. Again, take other instances, such as Lysander or Socrates: these showed their High-Spirit in their unaltered bearing of prosperity and adversity. Taking, then, these two answers, we must examine what point is shared in common by calmness in vicissitude and impatience of insult. If we cannot find any we must say that there are two kinds of High-Spirit.

57. Of the component parts in a definition each will be predicable of other things besides those defined; but this will not be the case with the sum of the parts,

for the sum of the parts is necessarily the essence of the thing defined. Thus of every triad we may predicate number, inequality, and both kinds of primality—that of not being measurable by any number, and that of not being compounded out of any numbers. This, then, is the definition of a triad—an unequal number prime in both senses of the word; of these predicates two apply to all odd numbers, and the third to the duad; but the sum of the three predicates is applicable to nothing save the triad.

§ 58. In treating of any whole we should divide the genus until we reach the individuals most elementary in species; as, in the case of number, the triad and duad.

Every genus is divided by means of mutually opposing differentiæ, as living creatures into those that live on land, in the air, or in the water.

If the opposing differentiæ be such as to admit of no intermediate, we do not beg the question in asserting that the whole genus must be included in the divided parts; for it must necessarily be all included in one or other of them, if it has really a principle of division.

Furthermore, we must divide by negation, the method of the dichotomists. But of negation, as negation, there is no differentia, for we cannot have species of that which is not, *e.g.*, we cannot have species of not-winged, not-footed creatures in the same way as of winged and footed.

§ 59. Definition is by genus and differentia.

We must keep the genus distinct from all other genera; and the species, as marked by the differentia, from all other species in the same genus.

A definition to be good must be made by means of the genus and differentiæ; and these belong to a class more absolutely knowable and primary than the species itself.

There are three ways of defining, otherwise than by what is more primary.

The first of these is of two opposites, defining one by means of the other, *e.g.*, good by means of bad; this is a vicious method, for opposites are naturally coeval, and some, moreover, think that the same science deals with both, so that we cannot even say that one is better known than the other. We must not forget, however, that in some cases very probably no other method of definition is possible; thus we cannot define "double" without mentioning a "half," and similarly in the case of all terms essentially correlative. All these only exist in so far as they are in some kind of relation, so that it is impossible to explain one without the other; and thus the one must necessarily be included in the description of the other.

A second vicious method of definition is to make use of the very thing to be defined. This escapes notice when we do not make use of its actual name, as, for instance, in the definition of the sun as "a star that shines by day," the use of the term "day" being equivalent to that of "sun." For this fault to be detected, we must substitute the idea for the name, *e.g.*, for the name "day," the idea of the motion of the sun over the earth; for plainly, in mentioning the motion of the sun over the earth, we mention the sun, and thus, in using the term "day," we practically use the term "sun."

Again, the definition is faulty where one opposing species is defined by means of another; for instance, the species Odd, as that which is greater by unity than Even. The opposing species of the same genus are naturally coeval, and the Odd and the Even are opposed, they being the differentiated species of number.

§ 60. To know the nature of a thing, is the same as to know the reason of it. What is an eclipse? The cutting off of light from the moon by the intervention of the earth. What is the reason of an eclipse? or why is the moon eclipsed? Owing to the failure of light, caused by the intervention of the earth. What is harmony? A ratio of numbers in acute or grave. Why is the acute in harmony with the grave? Because grave and acute have a numerical ratio.

§ 61. We investigate the reason when we know the fact. In some cases the two come to light together ; but it is quite impossible to know the reason before knowing the fact. We cannot know what a thing is while we do not know if it is.

The explanation seems to testify to the phenomena, and the phenomena to the explanation.

§ 62. The cause is the middle term. It is this which is the object in every investigation.

§ 63. A description, to rank as a definition, must not merely exhibit the fact, as most definitions are content with doing ; it must also contain a clear account of the cause. As it is, the accounts of definitions are like the conclusions of syllogisms. For instance, What is a square ? A square, we are told, is an equiangular and rectangular figure, equal to another figure, of which the sides are unequal. But the man who tells us that the square is the finding a mean proportional, tells us the cause of the matter.

§ 64. Not only does it appear that the knowledge of the nature of substances is useful when we come to contemplate the causes of their essential properties, (as, for example, in mathematics, to know the nature of a straight line and a curve, or of a line and a plane superficies, is useful towards perceiving the number of right-angles to which the angles of a triangle are equal), but the converse of this is also true, the knowledge of the properties greatly contributing to the knowledge of the nature of an object. When we are able to give an account according to our impressions of either all or most of the properties of an object, we shall then best be able to describe its essential nature. All demonstration begins with the nature of the object ; so that any definition which does not give us a knowledge of properties, and in which even to make a guess at them is difficult, is evidently only idly laid down for the purposes of argument.

§ 65. In some cases, the cause is something distinct from the object : in others, it is not. Of definitions, therefore, which duly declare the nature of an object, it is plain that some are immediate and elementary.

In these we must assume, or in some other way make evident, both the fact of existence and the nature. We see this in arithmetic, where both the nature and the existence of the monad is assumed. Definitions which are not immediate, and where the cause of an object's nature is something distinct from it, may, as was before laid down, be proved by demonstration.

§ 66. A thesis, or assumption, may either take one or other part of enunciation, so, I mean, as to assert or deny the existence of an object, in which case it is an hypothesis; or it may make no assertion, and then is called a definition, definition being a kind of thesis. The arithmetician employs a thesis when he assumes that the unit is indivisible in quantity; but this is not an hypothesis; for it is not the same thing to assume what is the nature of an unit, and to assume the fact of its existence.

§ 67. Every demonstrative science concerns itself with three things, of which two are assumed as existing; these being the genus whose essential attributes it investigates, and the general axioms from which, as first principles, it makes its demonstrations; and thirdly, the attributes of which it assumes the respective meanings.

§ 68. It is plain that we cannot demonstrate the peculiar principles of each individual genus; for these principles will hold good universally, and the science of these will be the sovereign science of the universe. For as the knowledge we derive from more primary causes is more perfect—for we speak of knowledge as derived from more primary causes, when it is derived from causes themselves uncaused—as, I say,²⁸ such knowledge has an especial and unusual perfection, so would the corresponding science be especially and unusually perfect.

- (a) § 69. We have already laid down that without a knowledge of the elementary and immediate principles, demonstrative science is an impossibility. The question may be raised as to how this knowledge of immediate principles
- (b) is obtained. Now every living creature is in possession of an innate perceptive power, which we call sense.

While all have this sense, in the case of some creatures the (c) impression made is permanent, in others it is not. Where (d) it is not, or in so far as it is not, there is no knowledge beyond that of the momentary sensation. Where there is this permanence, the creatures, when not using their organs of sense, still have the impression in their soul. There are many with whom this is the case; and they may (e) be further subdivided into those who have and those who have not a definite conception, derived from the permanence of such impressions. From sensation, as we say, (f) springs memory, and from the oft-repeated memory of the same thing, experience: for many memories are united in a single experience. From experience, or the whole (g) universal which abides unaltered in the mind—an unity besides a plurality, remaining ever the same in all its manifestations—from this comes the beginning both of art and of science: of art, if we have to do with production; of science, if with truth. Thus the faculties have not any (h) original and separate existence by themselves, nor are they derived from other faculties with greater powers of knowledge, but they spring from sensation; just as in a rout one soldier, making a stand, is joined by another, and then another, until their original formation is regained; the soul being naturally adapted for undergoing such a process. As (i) soon as one of the individual sensations makes a stand, we have the first beginning of a universal notion formed in the mind; for though our momentary sensations are of particulars,²⁴ sense is of the universal, taking cognisance, not of this or that particular man, but of man in general. Round the primary universals thus obtained a stand is made, until at last there centre round them the indecomposable and ultimate universals. First we have a kind of animal; then animal; then again some higher genius, fixing itself on these. It is plain, then, that by us knowledge of primary objects (k) can only be gained by induction; for it is in this way also that the sense builds up the universal in our minds. Of the intellectual faculties by which we attain truth, (l)

some are unerringly true, such as science and intuition ; others, such as opinion and calculation, admit of error. Again, except intuition, there is nothing more accurate than science. First principles, moreover, being more accessible to knowledge than the demonstrations from them, and all science being gained by reasoning, of first principles there can be no science. Lastly, there being nothing more truthful than science, with the one exception of intuition, we draw the conclusion that first principles are the subjects of
(*m*) intuition. From this we see that the beginning of demonstration is not demonstration any more than that of science is science ; if, therefore, besides science we have nothing else true, the beginning of science must be intuition.

NOTES.

¹ In this paragraph the ten Categories are enumerated, and examples of each are given. They are Aristotle's mode of analysing the parts of propositions, and are best understood by comparing them with the parts of speech in Grammar. Thus, under the head of Substance, come Nouns, which may be either the subject or predicate of a proposition. Quantity, Quality, and Relation include Adjectives denoting quantity, quality, or comparison. Place and Time include the Adverbs of place and time. Position, State, Action, Passion are all forms of the Verb, which is either the predicate, or forms part of the predicate of a proposition. Position represents Verbs of Rest: State, the Perfect Passive; Action, the Active Voice; Passion, the Passive Voice.

² Indefinite Propositions should be excluded from Logic as ambiguous. If it is said that the same science deals with opposites, it should be stated whether *some* opposites or *all* opposites are meant. The proposition is true in the former case, false in the latter. Thus medicine is the science of both sickness and health, which are opposites, but not all science has to do with opposites. Take, for instance, astronomy. Similarly, if it is asserted that pleasure is not good, it should be explained whether *some* pleasure or *all* pleasure is meant.

³ ἡ μὲν καθόλου, etc.] This means that when we speak of a class as *man*, for instance, we have cognition of it in the mind only; but when we speak of a particular man, as *Kallias*, he is cognizable by the senses.

⁴ This division of propositions in Aristotle corresponds to that of later logicians, who divide them into Pure and Modal. Pure propositions (*τῶν ὑπέροχων*) are those in which the predicate is predicated of the subject without any qualification, as "All men are mortal." Modal propositions are those in which the predicate is predicated of the subject in a qualified manner, and they are of two

kinds: (1) necessary (*τοῦ ἐξ ἀνάγκης ὑπάρχειν*), as "Every triangle must have its angles equal to two right angles"; (2) contingent (*τοῦ ἐνδέχασθαι ὑπάρχειν*), as "The sun may rise and set for a thousand years." Some logicians enumerated four kinds of modality, viz., necessary, contingent, possible, impossible; but the two latter may be dismissed, for what is impossible falls under necessity, and what is possible is contingent.

⁵ τὰ δ' αὐτὰ μὲν κατ' ἄλλων, etc.] This is explained by the last sentence in the section. "Genera can be predicated of their species, but species cannot conversely be predicated of their genera." Thus, in the proposition "All men are animals," the genus "animal" is predicated of the species "man," but the species "man" cannot be predicated of "animal."

⁶ δεῖ πᾶν τὸ ἀληθές, etc.] This sentence contains the principle of identity and contradiction, which may be put into the form "All A is A" and "No A is not-A."

⁷ καὶ περὶ τοῦ ἐκτός, etc.] *i.e.* when the copula of the proposition is "was," or "will be," as well as "is."

⁸ μὴ ὁμωμότως δέ.] *i.e.* in one case the proposition is positive, in the opposite it is negative, as explained in the next paragraph.

⁹ ἀντιθεσις ἧς οὐκ ἔστι μεταξὺ καθ' αὐτήν.] The difference between contradictory and contrary opposition is that between two contradictory propositions there is nothing intermediate. If one is true, the other is false. This is sometimes called the principle of the excluded third between two contradictories. But contraries admit of an intermediate, as is stated below in the next section. Black and white are contraries, but grey is intermediate. There is no intermediate between man and not-man.

¹⁰ τὸ γὰρ τιμὶ τῶ, etc.] Two particular propositions, such as "Some men are just," and "Some men are not just," are only verbally opposed. Both may be true. Later logicians call this opposition sub-contrary (*ὑπεναντίας προτάσεις*). They cannot both be false.

¹¹ In this section Conversion is explained, as Opposition is explained in §§ 10-13. The different kinds of Conversion applicable to different kinds of propositions are summed up in the memorial line: *fæci simpliciter convertitur, xva per acci*—O cannot be converted.

¹² Of these four points of inquiry, the Fact and the Existence correspond to each other, and the Reason and the Essence likewise.

¹³ κυριώτατον τοῦ εἰδέναι τὸ διότι θεωρεῖν.] Astronomy, for instance, was engaged for many ages in investigating the apparent motions of the heavens; from this it proceeded to the real motions as the causes of the apparent, and finally to the discovery of the one moving force, viz. gravitation, as the first cause. Readers of Aristotle will remember the passage (Eth. Nic. I. 7. 20), τὸ δ' ὅτι πρῶτον καὶ ἀρχή, and (I. 4. 7), ἀρχὴ γὰρ τὸ ὅτι.

¹⁴ To take an instance of this, if "gold is a metal," and we predicate "ductility" of "metal," we are able to predicate it of "gold" also. The "*dictum de omni et nullo*" is the general assertion of this principle. Whatever is predicated, *i.e.* asserted or denied, of the whole of a class may be predicated of each particular member of that class.

¹⁵ τίθεται δὲ τὸ μέσον . . . πρῶτον δὲ τῇ θέσει.] *i.e.* the middle term is predicated of both extremes in the premisses, and so stands first in the Greek; but in English it is the predicate of both premisses, and stands last.

¹⁶ τίθεται δὲ τὸ μέσον . . . ἴσχατον δὲ τῇ θέσει.] In English, in the third figure, the middle term stands first in both premisses. It will be observed that in Aristotle there is no fourth figure. The latter was added by later logicians, but is not much used. The moods of the fourth figure may be regarded as *indirect moods* of the first. Those of the first may be reduced to the fourth by transposing the premisses.

¹⁷ πλὴν οὐ διότι ἀλλ' ὅτι.] *i.e.* the conclusion is truly stated, but its necessity is not proved, because one or both of the premisses are false. As an instance of the former Aristotle gives, "No white is an animal, All snow is white. ∴ No snow is an animal"; as an instance of the latter, "No man is an animal, Every stone is a man. ∴ No stone is an animal."

¹⁸ δεῖ δὲ νοεῖν τὸ Γ, etc.] To compare the inductive syllogism with the demonstrative let us take an example of the former, as follows: Gold, silver, and iron, etc., are ductile; Gold, silver, and iron, etc., are all metals. ∴ All metals are ductile. Here, from the ductility (A) of gold, silver, and iron, etc. (c), and the fact that these are all metals (B), we conclude that all metals are ductile. This

is in form a syllogism in the third figure with a universal conclusion, which arises from the fact that in the minor premiss the predicate (B) is distributed. The corresponding syllogism in *Barbara* will be: All metals are ductile, Gold is a metal \therefore it is ductile, where the conclusion is part of the major premiss of the inductive syllogism.

¹⁹ *σημείον δὲ βούλεται εἶναι*, etc.] As an instance of a necessary demonstrative proposition (*τεκμήριον*) Aristotle gives, "He is sick, for he is feverish," where fever is a necessary sign of sickness, *i.e.* feverishness is always a sign of sickness. As an instance of the weaker kind (*ἔνδοξος*), founded on opinion, he gives, "Wise men are just, for Socrates was wise and just." This latter, which may be stated as a syllogism in the third figure with a universal conclusion, is invalid.

²⁰ Just as the Enthymeme, including *εἰκὸς* and *σημείον*, is a rhetorical syllogism—Example is like Induction. But the former differs from the latter in that it assumes a universal proposition, and proceeds to infer from one example of it, that has been known, another effect of a similar nature. In the instance given it is assumed that all wars with neighbours are dangerous; and because the war with the Phocians was unprofitable to the Thebans, it is inferred that the war with the Thebans will be unprofitable to the Athenians. Aristotle gives another instance of Example in the Rhetoric. Dionysius, when he asked for a body-guard, was proved to be forming a design of becoming tyrant of Syracuse, for Pisistratus at Athens and Theagenes at Megara proceeded in a similar manner.

²¹ *εἰς ἀπειρον γὰρ ἂν βαδίζου*.] Cf. Aris. Eth. Nic. I. 2. 1 and I. 7. 7, where this principle is applied (1) in determining the *summum bonum*, (2) in limiting the circle within which *αὐτάρκεια* is to radiate.

²² *θέσιν μὲν λέγω*, etc.] On the passage (Eth. Nic. I. 5. 6) where Aristotle says that no one would deem a man happy merely because he is virtuous, *εἰ μὴ θέσιν διαφύλακτων*, Grant points out the difference between *θέσεις* in demonstration, which are those unproved principles necessary to the existence of each separate science, just as *ἀξιώματα* are to the existence of reasoning in general, and *θέσεις* in dialectic, which are paradoxical positions resting on the authority of some great name. The latter kind of *θέσεις* is defined (*Topics*, I. xi. 4) to be *ὑπόληψις παράδοξος*.

²³ *ἐπιστήμη ἢ ἐκείνων*, etc.] This science is Metaphysics, from which as from their source all other sciences take their origin. Its

principles are also those which lie at the foundation of all other sciences (*ἀρχαὶ ἰδία*). They are not mere generalities, but, like definitions, proceed from a genus in combination with a specific difference. For instance, take the Science of Ethics (Eth. Nic. I 7. 10), where the definition of human happiness is derived from the proper work and function of man, which is the *ἰδία ἀρχή* of the science.

²⁴ ἡ δ' αἰσθησις τοῦ καθόλου ἐστίν.] Sense-perception is generally applied to the particular, but in a wider point of view it also embraces a universal, or the whole of a class, which is perceived by the mind. Such are the primary universals as opposed to the ultimate, which are not αἰσθητὰ, but νοητά.

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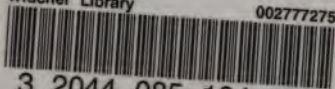
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