

ΑΡΙΣΤΟΤΕΛΟΥΣ ΑΝΑΛΥΤΙΚΩΝ ΤΣΤΕΡΩΝ

A

- 71 a 1 I. Πᾶσα διδασκαλία καὶ πᾶσα μάθησις διανο-
ητικὴ ἐκ προϋπαρχούσης γίνεται γνώσεως. φανε-
ρὸν δὲ τοῦτο θεωροῦσιν ἐπὶ πασῶν· αἱ τε γὰρ
μαθηματικαὶ τῶν ἐπιστημῶν διὰ τούτου τοῦ τρόπου
παραγίνονται καὶ τῶν ἄλλων ἐκάστη τεχνῶν.
5 ὁμοίως δὲ καὶ περὶ τοὺς λόγους οἱ τε διὰ συλλογισ-
μῶν καὶ οἱ δι' ἐπαγωγῆς· ἀμφότεροι γὰρ διὰ
προγιγνωσκομένων ποιοῦνται τὴν διδασκαλίαν, οἱ
μὲν λαμβάνοντες ὡς παρὰ ξυνιέντων, οἱ δὲ δεικ-
νύντες τὸ καθόλου διὰ τοῦ δῆλον εἶναι τὸ καθ'
ἕκαστον. ὡς δ' αὖτως καὶ οἱ ῥητορικοὶ συμπεύθου-
10 σιν· ἢ γὰρ διὰ παραδειγμάτων, ὃ ἐστὶν ἐπαγωγή,
ἢ δι' ἐνθυμημάτων, ὅπερ ἐστὶ συλλογισμός.
Διχῶς δ' ἀναγκαῖον προγιγνώσκειν· τὰ μὲν γὰρ

^a τέχνη is used here, as often, to cover the sense of produc-
tive (as opposed to theoretical) science; cf. 100 a 9.

^b Clearly Aristotle is thinking of "dialectic," as a means
of instruction distinct from science (which seeks only to
discover and demonstrate the truth) and rhetoric (which aims
at persuasion by means of probabilities). For Aristotle dia-

ARISTOTLE'S POSTERIOR ANALYTICS

BOOK I

I. ALL teaching and learning that involves the use of reason proceeds from pre-existent knowledge. This is evident if we consider all the different branches of learning, because both the mathematical sciences and every other art ^a are acquired in this way. Similarly too with logical arguments,^b whether syllogistic or inductive ; both effect instruction by means of facts already recognized, the former making assumptions as though granted by an intelligent audience, and the latter proving the universal from the self-evident nature of the particular. The means by which rhetorical arguments carry conviction are just the same ; for they use either examples,^c which are a kind of induction, or enthymemes,^d which are a kind of syllogism.

BOOK I.
KNOW-
LEDGE AND
DEMON-
STRATION.
Reasoned
knowledge
is always
based on
previous
knowledge.

There are two senses in which previous knowledge This may
lectic is the application of logical methods to argument with
a real or imaginary opponent ; it is by no means infallible,
since neither its premisses nor its conclusions are necessarily
true, but (properly used) it can be a useful auxiliary to
science.

^c Cf. *An. Pr.* II. xxiv.

^d *Ibid.* 70 a 10-24.

71 a

ὅτι ἔστι προϋπολαμβάνειν ἀναγκαῖον, τὰ δὲ τί τὸ
 λεγόμενον ἔστι ξυνιέναι δεῖ, τὰ δ' ἄμφω, οἷον ὅτι
 μὲν ἅπαν ἢ φῆσαι ἢ ἀποφῆσαι ἀληθές, ὅτι ἔστι, τὸ
 15 δὲ τρίγωνον, ὅτι τοδὶ σημαίνει, τὴν δὲ μονάδα
 ἄμφω, καὶ τί σημαίνει καὶ ὅτι ἔστιν· οὐ γὰρ ὁμοίως
 τούτων ἕκαστον δῆλον ἡμῖν. ἔστι δὲ γνωρίζειν τὰ
 μὲν πρότερον γνωρίσαντα,¹ τῶν δὲ καὶ ἅμα λαμ-
 βάνοντα τὴν γνώσιν, οἷον ὅσα τυγχάνει ὄντα ὑπὸ
 τὸ καθόλου οὗ² ἔχει τὴν γνώσιν· ὅτι μὲν γὰρ πᾶν
 20 τρίγωνον ἔχει δυσὶν ὀρθαῖς ἴσας προήδει, ὅτι δὲ
 τόδε τὸ ἐν τῷ ἡμικυκλίῳ τρίγωνόν ἐστιν ἅμα ἐπ-
 αγόμενος ἐγνώρισεν (ἐνίων γὰρ τοῦτον τὸν τρόπον
 ἢ μάθησίς ἐστι, καὶ οὐ διὰ τοῦ μέσου τὸ ἔσχατον
 γνωρίζεται, ὅσα ἤδη τῶν καθ' ἕκαστα τυγχάνει
 ὄντα καὶ μὴ καθ' ὑποκειμένου τινός). πρὶν δ'
 25 ἐπαχθῆναι ἢ λαβεῖν συλλογισμόν τρόπον μὲν τινα
 ἴσως φατέον ἐπίστασθαι, τρόπον δ' ἄλλον οὔ. ὁ
 γὰρ μὴ ἤδει εἰ ἔστιν ἀπλῶς, τοῦτο πῶς ἤδει ὅτι
 δύο ὀρθὰς ἔχει ἀπλῶς; ἀλλὰ δῆλον ὡς ὥδὲ μὲν
 ἐπίσταται, ὅτι καθόλου ἐπίσταται, ἀπλῶς δὲ οὐκ
 ἐπίσταται.

Εἰ δὲ μή, τὸ ἐν τῷ Μένωνι ἀπόρημα συμβήσεται·
 30 ἢ γὰρ οὐδὲν μαθήσεται ἢ ἂ οἶδεν. οὐ γὰρ δὴ ὥς γέ

¹ Ross : γνωρίζοντα codd.² Ross : ὦν codd.

^a Probably we should suppose that the figure is not drawn as a triangle; cf. Heath, *Mathematics in Aristotle*, p. 38.

^b The attributes of an individual are inferred from a knowledge of the attributes of the species, but the individual itself is directly apprehended as such.

^c Plato, *Meno* 80 D-E.

POSTERIOR ANALYTICS, I. 1

is necessary. Sometimes it is necessary to assume the *fact* beforehand, and sometimes one must understand the *meaning* of the term ; sometimes both are necessary. *E.g.*, we must assume as a fact that either the assertion or the negation of every statement is true ; and we must know what the term " triangle " means ; and as regards the unit, we must both know what it means and assume that it exists. This is because these truths are not all equally apparent to us. Recognition of a fact may sometimes entail both previous knowledge and knowledge acquired in the act of recognition ; *viz.*, knowledge of the particulars which actually fall under the universal, which is known to us. We knew already that every triangle has the sum of its interior angles equal to two right angles ; but that *this* figure ^a inscribed in the semi-circle is a triangle we recognize only as we are led to relate the particular to the universal (for some things, *viz.*, such as are ultimate particulars not predicable of anything else as subject, are only learnt in this way, *i.e.*, the minor is not recognized by means of the middle term ^b). Before the process of relation is completed or the conclusion drawn, we should presumably say that in one sense the fact is understood and in another it is not. For how could we know in the full sense that the figure contains angles equal to the sum of two right angles if we did not know in the full sense whether it exists ? Clearly we apprehend the fact not absolutely but in the qualified sense that we apprehend a general principle.

Unless we make this distinction, we shall be faced with the dilemma reached in the *Meno* ^c : either one can learn nothing, or one can only learn what is already known. We certainly must not offer the

be know-
ledge of
fact or of
meaning.

Previous
knowledge
disting-
uished
from
actualiza-
tion of po-
tential
knowledge.

This is the
escape from
the di-
lemma of
the *Meno*.

71 a

τινες ἐγχειροῦσι λύειν λεκτέον· ἀρ' οἶδας ἅπασαν
 δυάδα ὅτι ἀρτία ἢ οὐ; φήσαντος δὲ προήνεγκάν
 τινα δυάδα ἣν οὐκ ᾔετ' εἶναι, ὥστ' οὐδ' ἀρτίαν.
 λύουσι γὰρ οὐ φάσκοντες εἰδέναι πᾶσαν δυάδα ἀρ-

71 b

τίαν οὔσαν, ἀλλ' ἣν ἴσασιν ὅτι δυάς. καίτοι ἴσασι
 μὲν οὐπερ τὴν ἀπόδειξιν ἔχουσι καὶ οὐ ἔλαβον, ἔλα-
 βον δ' οὐχὶ παντός οὐ ἂν εἰδῶσιν ὅτι τρίγωνον ἢ ὅτι
 ἀριθμός, ἀλλ' ἀπλῶς κατὰ παντός ἀριθμοῦ καὶ τρι-
 γώνου· οὐδεμία γὰρ πρότασις λαμβάνεται τοιαύτη,
 5 ὅτι ὃν σὺ οἶδας ἀριθμὸν ἢ ὃ σὺ οἶδας εὐθύγραμμον,
 ἀλλὰ κατὰ παντός. ἀλλ' οὐδὲν (οἶμαι) κωλύει ὁ
 μανθάνει ἔστιν ὥς ἐπίστασθαι, ἔστι δ' ὥς ἀγνοεῖν·
 ἄτοπον γὰρ οὐκ εἰ οἶδέ πως ὁ μανθάνει, ἀλλ' εἰ ὠδί,
 οἶον ἢ μανθάνει καὶ ὥς.

II. Ἐπίστασθαι δὲ οἰόμεθ' ἕκαστον ἀπλῶς, ἀλλὰ
 10 μὴ τὸν σοφιστικὸν τρόπον τὸν κατὰ συμβεβηκός,
 ὅταν τὴν τ' αἰτίαν οἰώμεθα γινώσκειν δι' ἣν τὸ
 πρᾶγμά ἐστιν, ὅτι ἐκείνου αἰτία ἐστί, καὶ μὴ ἐν-
 δέχεσθαι τοῦτ' ἄλλως ἔχειν. δηλὸν τοίνυν ὅτι
 τοιοῦτόν τι τὸ ἐπίστασθαί ἐστι· καὶ γὰρ οἱ μὴ
 ἐπιστάμενοι καὶ οἱ ἐπιστάμενοι οἱ μὲν οἶονται αὐτοὶ
 15 οὕτως ἔχειν, οἱ δ' ἐπιστάμενοι καὶ ἔχουσιν· ὥστε

^a The reference is unknown.

^b The sophist's knowledge is called "accidental" because, not knowing the species as such, but only as qualified by accidental attributes, he has no conception of what is essential to it.

explanation by which certain thinkers ^a attempt to solve the difficulty. Supposing that a man is asked "Do you or do you not know that every pair is even?" When he says "Yes," his opponents produce some pair which he did not know to exist, and therefore did not know to be even. These thinkers solve the difficulty by saying that they do not know that every pair is even, but only that such things as they know to be pairs are even. But what they know to be even is that which they have proved to be such, *i.e.*, that which they have taken as the subject of their premiss : and that is not everything which they know to be a triangle or a number, but every number and every triangle, without qualification. No premiss is ever assumed with such a term as "what you know to be a number" or "what you know to be a rectilinear figure" ; the predication applies to every instance of the subject. But I presume that there is no reason why a man should not in one sense know, and in another not know, that which he is learning. The absurdity consists not in his knowing in some qualified sense that which he learns, but in his knowing it in a certain particular sense, *viz.*, in the exact way and manner in which he learns it.

II. We consider that we have unqualified knowledge of anything (as contrasted with the accidental knowledge of the sophist) ^b when we believe that we know (i) that the cause from which the fact results is the cause of that fact, and (ii) that the fact cannot be otherwise. Clearly knowledge is something of this sort ; for both those who do not know and those who do know agree on the subject ; but whereas the former merely think that they are in the condition described above, the latter are actually in it. Hence

Absolute
knowledge

71 b

οὐ ἀπλῶς ἔστιν ἐπιστήμη, τοῦτ' ἀδύνατον ἄλλως ἔχειν.

Εἰ μὲν οὖν καὶ ἕτερος ἔστι τοῦ ἐπίστασθαι τρόπος ὕστερον ἐροῦμεν, φαμέν δὲ καὶ δι' ἀποδείξεως εἰδέναι. ἀπόδειξιν δὲ λέγω συλλογισμόν ἐπιστημονικόν· ἐπιστημονικὸν δὲ λέγω καθ' ὃν τῷ ἔχειν αὐτὸν ἐπιστάμεθα.

- 20 Εἰ τοίνυν ἐστὶ τὸ ἐπίστασθαι οἷον ἔθεμεν, ἀνάγκη καὶ τὴν ἀποδεικτικὴν ἐπιστήμην ἐξ ἀληθῶν τ' εἶναι καὶ πρώτων καὶ ἀμέσων καὶ γνωριμωτέρων καὶ προτέρων καὶ αἰτίων τοῦ συμπεράσματος· οὕτω γὰρ ἔσονται καὶ αἱ ἀρχαὶ οἰκείαι τοῦ δεικνυμένου. συλλογισμὸς μὲν γὰρ ἔσται καὶ ἄνευ τούτων, ἀπό-
25 δειξις δ' οὐκ ἔσται· οὐ γὰρ ποιήσει ἐπιστήμην.

Ἀληθῇ μὲν οὖν δεῖ εἶναι, ὅτι οὐκ ἔστι τὸ μὴ ὄν ἐπίστασθαι, οἷον ὅτι ἡ διάμετρος σύμμετρος. ἐκ πρώτων δ' ἀναποδείκτων, ὅτι οὐκ ἐπιστήσεται μὴ ἔχων ἀπόδειξιν αὐτῶν· τὸ γὰρ ἐπίστασθαι ὣν ἀπό-
δειξις ἔστι μὴ κατὰ συμβεβηκὸς τὸ ἔχειν ἀπόδειξιν
30 ἔστιν. αἷτια τε καὶ γνωριμώτερα δεῖ εἶναι καὶ πρότερα, αἷτια μὲν ὅτι τότε ἐπιστάμεθα ὅταν τὴν αἷτιαν εἰδῶμεν, καὶ πρότερα, εἴπερ αἷτια, καὶ προ-
γινγνωσκόμενα οὐ μόνον τὸν ἕτερον τρόπον τῷ ξυνιέναι, ἀλλὰ καὶ τῷ εἰδέναι ὅτι ἔστιν.

Πρότερα δ' ἐστὶ καὶ γνωριμώτερα διχῶς· οὐ γὰρ ταῦτὸν πρότερον τῇ φύσει καὶ πρὸς ἡμᾶς πρότερον,

^a In ch. iii and Book II, ch. xix.

^b Cf. 71 a 11 ff.

POSTERIOR ANALYTICS, I. II

if any fact is the object of unqualified knowledge, that fact cannot be otherwise than it is.

Whether there is any other method of knowing will be discussed later.^a Our contention now is that we do at any rate obtain knowledge by demonstration. By demonstration I mean a syllogism which produces scientific knowledge, in other words one which enables us to know by the mere fact that we grasp it.

is acquired
(in one way)
by demon-
stration.

Now if knowledge is such as we have assumed, demonstrative knowledge must proceed from premisses which are true, primary, immediate, better known than, prior to, and causative of the conclusion. On these conditions only will the first principles be properly applicable to the fact which is to be proved. Syllogism indeed will be possible without these conditions, but not demonstration; for the result will not be knowledge.

The pre-
misses of
demonstra-
tion.

The premisses, then, must be true statements; because it is impossible to know that which is contrary to fact, *e.g.*, that the diagonal of a square is commensurable with the sides. They must be primary and indemonstrable, because otherwise we shall not know them unless we have proof of them; for to know (otherwise than accidentally) that which is capable of proof implies that one has proof of it. They must be causative, better known and prior: causative, because we only have knowledge of a thing when we know its cause; prior, inasmuch as they are causative; and already known, not merely in the one ^b sense that their meaning is understood, but also in the sense that they are known as facts.

There are two senses in which things are prior and more knowable. That which is prior in nature is not the same as that which is prior in relation to us, and

Sundry dis-
tinctions
and defini-
tions.

72 ^a οὐδὲ γνωριμώτερον καὶ ἡμῖν γνωριμώτερον. λέγω
 δὲ πρὸς ἡμᾶς μὲν πρότερα καὶ γνωριμώτερα τὰ
 ἐγγύτερον τῆς αἰσθήσεως, ἀπλῶς δὲ πρότερα καὶ
 γνωριμώτερα τὰ πορρωτέρων. ἔστι δὲ πορρωτάτω
 5 μὲν τὰ καθόλου μάλιστα, ἐγγυτάτω δὲ τὰ καθ' ἑ-
 καστα· καὶ ἀντίκειται ταῦτ' ἀλλήλοις.

Ἐκ πρώτων δ' ἐστὶ τὸ ἐξ ἀρχῶν οἰκείων· ταῦτὸ
 γὰρ λέγω πρῶτον καὶ ἀρχήν. ἀρχὴ δ' ἐστὶν ἀπο-
 δείξεως πρότασις ἄμεσος, ἄμεσος δὲ ἥς μὴ ἔστιν
 ἄλλη προτέρα. πρότασις δ' ἐστὶν ἀποφάνσεως τὸ
 ἕτερον μόνιον, ἓν καθ' ἑνός, διαλεκτικὴ μὲν ἢ
 10 ὁμοίως λαμβάνουσα ὅποτερον οὖν, ἀποδεικτικὴ δὲ ἢ
 ὠρισμένως θάτερον, ὅτι ἀληθές. ἀπόφανσις δὲ ἀντι-
 φάσεως ὅποτερον οὖν μόνιον. ἀντίφασις δὲ ἀντίθε-
 σις ἥς οὐκ ἔστι μεταξὺ καθ' αὐτήν. μόνιον δ'
 ἀντιφάσεως τὸ μὲν τι κατὰ τινὸς κατάφασις, τὸ
 15 δὲ τι ἀπὸ τινὸς ἀπόφασις. ἀμέσου δ' ἀρχῆς συλ-
 λογιστικῆς θέσιν μὲν λέγω ἣν μὴ ἔστι δεῖξαι μηδ'
 ἀνάγκη ἔχειν τὸν μαθησόμενόν τι· ἣν δ' ἀνάγκη
 ἔχειν τὸν ὁτιοῦν μαθησόμενον, ἀξίωμα· ἔστι γὰρ
 ἔνια τοιαῦτα· τοῦτο γὰρ μάλιστ' ἐπὶ τοῖς τοιούτοις
 εἰώθαμεν ὄνομα λέγειν. θέσεως δ' ἢ μὲν ὅποτε-
 20 ρονοῦν τῶν μορίων τῆς ἀποφάνσεως¹ λαμβάνουσα,
 οἷον λέγω τὸ εἶναί τι ἢ μὴ εἶναί τι, ὑπόθεσις, ἢ δ'

¹ ἀντιφάσεως n, Ross.

^a Cf. *Met.* 1029 b 3 ff.

^b Or simply "starting-point."

^c i.e., it is either affirmative or negative.

^d The dialectician is equally prepared to accept "A is B" or "A is not B" as the object of his attack.

POSTERIOR ANALYTICS, I. II

that which is <naturally> more knowable is not the same as that which is more knowable by us. By "prior" or "more knowable" in relation to us I mean that which is nearer to our perception, and by "prior" or "more knowable" in the absolute sense I mean that which is further from it. The most universal concepts are furthest from our perception, and particulars are nearest to it^a; and these are opposite to one another.

To argue from primary premisses is to argue from appropriate first principles; for by "primary premiss" and "first principle" I mean the same thing. The first principle^b of a demonstration is an immediate premiss; and an immediate premiss is one which has no other premiss prior to it. A premiss is one or the other part of a proposition,^c and consists of one term predicated of another. If dialectical, it assumes either part indifferently^d; if demonstrative, it definitely assumes that one part is true. A proposition is either part of a contradiction. A contradiction is an opposition which of its very nature excludes any middle. That part of a contradiction which affirms something of something else is an affirmation; that which denies something of something else is a negation. I apply the term *thesis* to an immediate indemonstrable first principle of syllogism the grasp of which is not necessary for the acquisition of certain kinds of knowledge; but that which must be grasped if any knowledge is to be acquired, I call an *axiom*; for there are certain things of this nature and we are accustomed to apply this name especially to them. A thesis which assumes one or the other part of a proposition, *i.e.*, that something does, or does not exist, is a *hypothesis*; a thesis which does

72 a

ἄνευ τούτου ὀρισμός. ὁ γὰρ ὀρισμὸς θέσις μὲν
 ἐστι· τίθεται γὰρ ὁ ἀριθμητικὸς μονάδα τὸ ἀδιαίρε-
 τον εἶναι κατὰ τὸ ποσόν· ὑπόθεσις δ' οὐκ ἔστι· τὸ
 25 γὰρ τί ἐστι μονὰς καὶ τὸ εἶναι μονάδα οὐ ταυτόν.

Ἐπεὶ δὲ δεῖ πιστεύειν τε καὶ εἰδέναι τὸ πρᾶγμα
 τῷ τοιοῦτον ἔχειν συλλογισμόν ὃν καλοῦμεν ἀπό-
 δεῖξιν, ἔστι δ' οὗτος τῷ ταδὶ¹ εἶναι ἐξ ὧν ὁ συλ-
 λογισμός, ἀνάγκη μὴ μόνον προγιγνώσκειν τὰ
 πρῶτα, ἢ πάντα ἢ ἓνια, ἀλλὰ καὶ μᾶλλον· αἰεὶ γὰρ
 30 δι' ὃ ὑπάρχει ἕκαστον, ἐκείνῳ² μᾶλλον ὑπάρχει,
 οἷον δι' ὃ φιλοῦμεν, ἐκείνο φίλον μᾶλλον· ὥστ'
 εἴπερ ἴσμεν διὰ τὰ πρῶτα καὶ πιστεύομεν, κακεῖνα
 ἴσμεν τε καὶ πιστεύομεν μᾶλλον, ὅτι δι' ἐκείνα καὶ
 τὰ ὕστερον. οὐχ οἷόν τε δὲ πιστεύειν μᾶλλον ὧν
 οἶδεν ἂ μὴ τυγχάνει μήτε εἰδώς μήτε βέλτιον δια-
 35 κείμενος ἢ εἰ ἐτύγχανεν εἰδώς. συμβήσεται δὲ
 τοῦτο εἰ μὴ τις προγνώσεται τῶν δι' ἀπόδειξιν
 πιστευόντων· μᾶλλον γὰρ ἀνάγκη πιστεύειν ταῖς
 ἀρχαῖς ἢ πάσαις ἢ τισὶ τοῦ συμπεράσματος. τὸν
 δὲ μέλλοντα ἔξιν τὴν ἐπιστήμην τὴν δι' ἀποδείξεως
 οὐ μόνον δεῖ τὰς ἀρχὰς μᾶλλον γνωρίζειν καὶ μάλ-

¹ ταδὶ n, Ross : τὰδ'.

² ἐκείνῳ Ross, habent comm. : ἐκείνο codd.

^a The latter part of this attempt to systematize terminology seems rather abortive. Elsewhere (*e.g.* 76 b 23 ff.) a *ὑπόθεσις* is not necessarily indemonstrable, and *θέσις* does not seem to be used technically at all. It is even difficult to be sure what Aristotle includes under *ἀξιώματα*. From a comparison of 76 b 11-22, 77 a 26-34, 88 a 31-b 29 it would seem that the term is convertible with *κοινὰ ἀρχαί* or *τὰ κοινά*, and covers not only principles like the Law of Contradiction, which are really "common," but also others, like the mathe-

not do this is a definition. A definition is a kind of thesis (or laying-down), because the arithmetician lays it down that to be a unit is to be quantitatively indivisible ; but it is not a hypothesis, because to define the nature of a unit is not the same as to assert its existence.^a

Now since the required condition of our knowledge or conviction of a fact consists in grasping a syllogism of the kind which we call demonstration, and since the syllogism depends upon the truth of its premisses, it is necessary not merely to know the primary premisses—either all or some of them—beforehand, but to know them better than the conclusion. For that which causes an attribute to apply to a subject always possesses that attribute in a still greater degree ; e.g., that which causes us to love something is itself still dearer to us. Hence if the primary premisses are the cause of our knowledge and conviction, we know and are convinced of them also in a higher degree, since they cause our knowledge of all that follows from them. But to believe in anything more than in the things which we know, if we neither actually know it nor are in a better situation than if we actually knew it, is impossible ; yet this is what will happen if anyone whose conviction rests upon demonstration is to have no prior knowledge ; because we must believe in the first principles (some if not all of them) more than in the conclusion. And if a man is to possess the knowledge which is effected by demonstration, not only must he recognize and

The primary premisses must be known before and better than the conclusion.

matical axioms about equals, which are at once common and special to a particular group of sciences. For a discussion of the use of such terms in logic and mathematics see H. D. P. Lee in *C.Q.* xxix, pp. 113-124, and Heath, *Mathematics in Aristotle*, pp. 53-57.

72 b λον αὐταῖς πιστεύειν ἢ τῷ δεικνυμένῳ, ἀλλὰ μὴδ' ἄλλο αὐτῷ πιστότερον εἶναι μὴδὲ γνωριμώτερον τῶν ἀντικειμένων ταῖς ἀρχαῖς ἐξ ὧν ἔσται συλλογισμὸς ὁ τῆς ἐναντίας ἀπάτης, εἴπερ δεῖ τὸν ἐπιστάμενον ἀπλῶς ἀμετάπειστον εἶναι.

5 III. Ἐνίοις μὲν οὖν διὰ τὸ δεῖν τὰ πρῶτα ἐπίστασθαι οὐ δοκεῖ ἐπιστήμη εἶναι, τοῖς δ' εἶναι μὲν, πάντων μέντοι ἀποδείξεις¹ εἶναι. ὧν οὐδέτερον οὐτ' ἀληθὲς οὐτ' ἀναγκαῖον. οἱ μὲν γὰρ ὑποθέμενοι μὴ εἶναι ὅλως ἐπίστασθαι, οὗτοι εἰς ἄπειρον ἀξιουῶσιν ἀνάγεσθαι ὡς οὐκ ἂν ἐπισταμένους τὰ ὕστερα διὰ
10 τὰ πρότερα, ὧν μὴ ἔστι πρῶτα, ὀρθῶς λέγοντες· ἀδύνατον γὰρ τὰ ἄπειρα διελθεῖν. εἴ τε ἴσταται καὶ εἰσὶν ἀρχαί, ταύτας ἀγνώστους εἶναι ἀποδείξεως γε μὴ οὔσης αὐτῶν, ὅπερ φασὶν εἶναι τὸ ἐπίστασθαι μόνον· εἰ δὲ μὴ ἔστι τὰ πρῶτα εἰδέναί, οὐδὲ τὰ ἐκ
15 τούτων εἶναι ἐπίστασθαι ἀπλῶς οὐδὲ κυρίως, ἀλλ' ἐξ ὑποθέσεως, εἰ ἐκεῖνα ἔστιν. οἱ δὲ περὶ μὲν τοῦ ἐπίστασθαι ὁμολογοῦσι· δι' ἀποδείξεως γὰρ εἶναι μόνον· ἀλλὰ πάντων εἶναι ἀπόδειξιν οὐδὲν κωλύειν· ἐνδέχεσθαι γὰρ κύκλῳ γίγνεσθαι τὴν ἀπόδειξιν καὶ ἐξ ἀλλήλων.

Ἡμεῖς δὲ φάμεν οὔτε πᾶσαν ἐπιστήμην ἀπο-
20 δεικτικὴν εἶναι, ἀλλὰ τὴν τῶν ἀμέσων ἀναπόδεικτον (καὶ τοῦθ' ὅτι ἀναγκαῖον, φανερόν· εἰ γὰρ ἀνάγκη

¹ ἀπόδειξις d.

^a Probably Antisthenes ; see Maier, *Syllogistik* II. ii. 15, n. 2.

^b Possibly "certain followers of Xenocrates" ; Cherniss, *Aristotle's Criticism of Plato and the Academy*, I. 68.

believe in the first principles more than in that which is being proved, but nothing which is opposed to the first principles and from which will result a syllogism of the contrary error, must be more credible or better known to him than those principles ; since one who has absolute knowledge should be unshakable in his belief.

III. The necessity of knowing the primary truths has led some persons ^a to think that there is no knowledge, and others, ^b admitting the possibility of knowledge, to think that all facts are demonstrable. Neither of these views is true or logically unavoidable. The former school, who assume that there is no knowledge at all, claim that there is an infinite regress, on the ground that we cannot know posterior by prior truths unless the latter themselves depend upon primary truths (in which they are right ; for it is impossible to traverse an infinite series) ; while if the series comes to an end, and there are first principles, they are unknowable, since they do not admit of demonstration, which these thinkers hold to be the sole condition of knowledge ; and if it is not possible to know the primary truths, neither is it possible to know in the strict and absolute sense that the inferences drawn from them are true ; we can only know them hypothetically, by assuming that the former are true. The other school agrees with this one as regards the conditions of knowledge, for they hold that it can only be secured by demonstration ; but they maintain that there is no reason why there should not be demonstration of everything, since the demonstration may be circular or reciprocal.

Two false views : (1) that scientific knowledge is impossible, (2) that all truths are demonstrable by circular proof.

We, however, hold that not all knowledge is demonstrative ; the knowledge of immediate premisses is not by demonstration. It is evident that this must

Answer to (1). There is no infinite regress,

μὲν ἐπίστασθαι τὰ πρότερα καὶ ἐξ ὧν ἡ ἀπόδειξις, ἴσταται δέ ποτε τὰ ἄμεσα, ταῦτ' ἀναπόδεικτα ἀνάγκη εἶναι)—ταῦτά τ' οὖν οὕτω λέγομεν, καὶ οὐ μόνον ἐπιστήμην ἀλλὰ καὶ ἀρχὴν ἐπιστήμης εἶναι
 25 τινὰ φάμεν ἥ τοὺς ὅρους γνωρίζομεν.

Κύκλω δ' ὅτι ἀδύνατον ἀποδείκνυσθαι ἀπλῶς, δῆλον, εἴπερ ἐκ προτέρων δεῖ τὴν ἀπόδειξιν εἶναι καὶ γνωριμωτέρων· ἀδύνατον γάρ ἐστι τὰ αὐτὰ τῶν αὐτῶν ἅμα πρότερα καὶ ὕστερα εἶναι, εἰ μὴ τὸν ἕτερον τρόπον, οἷον τὰ μὲν πρὸς ἡμᾶς τὰ δ' ἀπλῶς,
 30 ὥνπερ τρόπον ἡ ἐπαγωγὴ ποιεῖ γνωρίμον. εἰ δ' οὕτως, οὐκ ἂν εἴη τὸ ἀπλῶς εἰδέναι καλῶς ὠρισμένον, ἀλλὰ διττόν· ἢ οὐχ ἀπλῶς ἢ ἑτέρα ἀπόδειξις γιγνομένη ἐκ τῶν ἡμῖν γνωριμωτέρων.

Συμβαίνει δὲ τοῖς λέγουσι κύκλω τὴν ἀπόδειξιν εἶναι οὐ μόνον τὸ νῦν εἰρημένον, ἀλλ' οὐδὲν ἄλλο λέγειν ἢ ὅτι τοῦτ' ἐστὶν εἰ τοῦτ' ἐστὶν· οὕτω δέ
 35 πάντα ῥάδιον δεῖξαι. δῆλον δ' ὅτι τοῦτο συμβαίνει τριῶν ὅρων τεθέντων· τὸ μὲν γὰρ διὰ πολλῶν ἢ δι' ὀλίγων ἀνακάμπτειν φάναι οὐδὲν διαφέρει, δι'

^a *Viz.* νοῦς or intuition ; see Book II, ch. xix.

^b For this sense of ὅρος (= ἀρχή) cf. *Eth. Nic.* 1142 a 26, 1143 a 36, b 2.

^c Which proceeds from that which is "prior to us" to that which is "prior in nature."

^d As based on "prior" premisses (71 b 22).

^e Although the "terms" doubtless represent propositions, I suspect that (*pace* Ross *ad loc.*) Aristotle here really means "terms" by ὅροι, because he is primarily concerned with the form of the argument. He says that circular proof claims to establish by the propositions "if A is true, B is true" and "if B is true, A is true" (using two terms only) the absolute truth of A ; the fallacy can be easily seen if the argument is cast in the form of a normal syllogism (using three terms), in which the propositions "if A is true, B is true" and "if B

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be so ; for if it is necessary to know the prior premisses from which the demonstration proceeds, and if the regress ends with the immediate premisses, the latter must be indemonstrable. Such is our contention on this point. Indeed we hold not only that scientific knowledge is possible, but that there is a definite first principle of knowledge ^a by which we recognize ultimate truths.^b

because not all knowledge is demonstrative.

Demonstration in the absolute sense is obviously impossible by the circular method ; that is, if demonstration must proceed from premisses which are prior and better known ; for the same things cannot be at once prior and posterior to the same things, except in different senses,—I mean the distinction between “ prior to us ” and “ absolutely prior ”—with which we become familiar through induction.^c In this case our definition of absolute knowledge ^d will be unsatisfactory, because it will have a double meaning. But presumably the other mode of demonstration, proceeding from that which is better known to us, is not demonstration in the absolute sense.

Answer to (2). Circular proof (a) is not scientific,

Those who profess that demonstration is circular are faced not only by the consequence just described, but also by the following : their theory simply amounts to this, that a thing is so if it is so ; and it is easy to prove anything by this method. That this is all that follows will be clearly seen if we take three terms ; for it makes no difference whether we say that a circular proof is effected through many or few terms, provided that there are not fewer than two.^e

(b) proves nothing new,

is true, C is true ” give the conclusion “ *if A is true, C is true* ” ; because similarly the conclusion of “ *if A is true, B is true* ” and “ *if B is true, A is true* ” is “ *if A is true, A is true,* ” which proves nothing.

72 b

ὀλίγων δ' ἢ δυοῖν. ὅταν γὰρ τοῦ Α ὄντος ἐξ ἀνάγκης ἢ τὸ Β, τούτου δὲ τὸ Γ, τοῦ Α ὄντος ἔσται τὸ Γ. εἰ δὴ τοῦ Α ὄντος ἀνάγκη τὸ Β εἶναι, τούτου

73 a δ' ὄντος τὸ Α (τοῦτο γὰρ ἦν τὸ κύκλω), κείσθω τὸ Α ἐφ' οὗ τὸ Γ. τὸ οὖν τοῦ Β ὄντος τὸ Α εἶναι λέγειν ἐστὶ τὸ Γ εἶναι λέγειν, τοῦτο δ' ὅτι τοῦ Α ὄντος τὸ Γ ἐστί· τὸ δὲ Γ τῷ Α τὸ αὐτό. ὥστε
5 συμβαίνει λέγειν τοὺς κύκλω φάσκοντας εἶναι τὴν ἀπόδειξιν οὐδὲν ἕτερον πλὴν ὅτι τοῦ Α ὄντος τὸ Α ἐστίν. οὕτω δὲ πάντα δεῖξαι ράδιον.

Οὐ μὴν ἀλλ' οὐδὲ τοῦτο δυνατὸν πλὴν ἐπὶ τούτων ὅσα ἀλλήλοις ἔπεται, ὥσπερ τὰ ἴδια. ἐνὸς μὲν οὖν κειμένου δέδεικται ὅτι οὐδέποτ' ἀνάγκη τι εἶναι ἕτερον (λέγω δ' ἐνός, ὅτι οὔτε ὅρου ἐνός οὔτε
10 θέσεως μιᾶς τεθείσης), ἐκ δύο δὲ θέσεων πρώτων καὶ ἐλαχίστων ἐνδέχεται, εἴπερ καὶ συλλογίσασθαι. εἰ μὲν οὖν τό τε Α τῷ Β καὶ τῷ Γ ἔπεται, καὶ ταῦτ' ἀλλήλοις καὶ τῷ Α, οὕτω μὲν ἐνδέχεται ἐξ ἀλλήλων δεικνύναι πάντα τὰ αἰτηθέντα ἐν τῷ πρώτῳ σχήματι, ὥς δέδεικται ἐν τοῖς περὶ συλλογισμοῦ.
15 δέδεικται δὲ καὶ ὅτι ἐν τοῖς ἄλλοις σχήμασιν ἢ οὐ γίνεταί συλλογισμὸς ἢ οὐ περὶ τῶν ληφθέντων. τὰ δὲ μὴ ἀντικατηγορούμενα οὐδαμῶς ἔστι δεῖξαι κύκλω· ὥστ' ἐπειδὴ ὀλίγα τοιαῦτα ἐν ταῖς ἀποδείξεσι, φανερόν ὅτι κενόν τε καὶ ἀδύνατον τὸ

^a Sc. in conjunction with the major premiss "when A is, B is."

For when if A is, B must be, and if B is, C must be, then if A is, C must be. Then if when A is, B must be, and when B is, A must be (this is what is meant by circular proof), let A represent C in the first proof. Then to say that when B is, A is, is equivalent to saying that when B is, C is ; and this ^a is equivalent to saying that when A is, C is. But C is the same as A. Thus it follows that those who assert that demonstration is circular are merely maintaining that when A is, A is ; by which method it is easy to prove anything.

Moreover, even this mode of proof is impossible except in the case of attributes which are reciprocal consequents, *e.g.*, properties.^b It has been shown ^c that from the positing of one thing—by which I mean either one term or one proposition—nothing else ever necessarily follows ; two is the first and least number of propositions from which a necessary consequence is possible, since this is the minimum requirement for any logical conclusion. Thus if A is a consequent of B and of C, and the latter are consequents both of one another and of A, it is possible to prove reciprocally in the first figure all the assumptions which we have made. This has been shown in our discussion of syllogism.^d But it has also been shown ^e that in the other figures either no syllogism results or none which confirms our assumptions. Propositions whose terms are not reciprocally predicable cannot be proved at all by circular demonstration. Hence, since such terms rarely occur in demonstrations, it is evidently futile

^b Cf. *Top.* 102 a 18. Definition and differentia are also predicable convertibly.

^c *An. Pr.* I. xxv.

^d *Ibid.* II. v.

^e *Ibid.* vi, vii.

73 a

λέγειν ἐξ ἀλλήλων εἶναι τὴν ἀπόδειξιν καὶ διὰ
20 τοῦτο πάντων ἐνδέχεσθαι εἶναι ἀπόδειξιν.

IV. Ἐπεὶ δ' ἀδύνατον ἄλλως ἔχειν οὐ ἔστιν ἐπι-
στήμη ἀπλῶς, ἀναγκαῖον ἂν εἴη τὸ ἐπιστητὸν τὸ
κατὰ τὴν ἀποδεικτικὴν ἐπιστήμην. ἀποδεικτικὴ δ'
ἐστὶν ἣν ἔχομεν τῷ ἔχειν ἀπόδειξιν· ἐξ ἀναγκαίων
25 ἄρα συλλογισμός ἐστιν ἡ ἀπόδειξις. ληπτέον ἄρα
ἐκ τίνων καὶ ποίων αἱ ἀποδείξεις εἰσίν. πρῶτον δέ
διορίσωμεν τί λέγομεν τὸ κατὰ παντός καὶ τί τὸ
καθ' αὐτὸ καὶ τί τὸ καθόλου.

Κατὰ παντός μὲν οὖν τοῦτο λέγω ὃ ἂν ἦ μὴ ἐπὶ
τινὸς μὲν τινὸς δὲ μή, μηδὲ ποτὲ μὲν ποτὲ δὲ μή·
30 οἷον εἰ κατὰ παντός ἀνθρώπου ζῶον, εἰ ἀληθὲς τόνδ'
εἰπεῖν ἄνθρωπον, ἀληθὲς καὶ ζῶον, καὶ εἰ νῦν
θάτερον, καὶ θάτερον, καὶ εἰ ἐν πάσῃ γραμμῇ
στιγμῇ, ὡσαύτως. σημεῖον δέ· καὶ γὰρ τὰς ἐνστά-
σεις οὕτω φέρομεν ὥς κατὰ παντός ἐρωτῶμενοι, ἢ
εἰ ἐπὶ τινι μή, ἢ εἴ ποτε μή.

35 Καθ' αὐτὰ δ' ὅσα ὑπάρχει τε ἐν τῷ τί ἐστιν,
οἷον τριγώνῳ γραμμῇ καὶ γραμμῇ στιγμῇ (ἡ γὰρ
οὐσία αὐτῶν ἐκ τούτων ἐστί, καὶ ἐν τῷ λόγῳ τῷ
λέγοντι τί ἐστιν ἐνυπάρχει)· καὶ ὅσοις τῶν ὑπαρ-
χόντων¹ αὐτοῖς αὐτὰ ἐν τῷ λόγῳ ἐνυπάρχουσι τῷ τί

¹ Bonitz : ἐνυπαρχόντων.

^a Here καθόλου is used in a special sense : see 73 b 25 ff.

^b i.e., this will be true of any line at any time.

^c Although Aristotle's examples are of essential constituents, he obviously intends to include essential attributes.

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and impossible to maintain that demonstration is reciprocal and that therefore everything can be demonstrated.

IV. Since the object of scientific knowledge in the absolute sense cannot be otherwise than it is, the notion reached by demonstrative knowledge will be necessarily true. Now knowledge is demonstrative when we possess it in virtue of having a demonstration ; therefore the premisses from which demonstration is inferred are necessarily true. Therefore we must comprehend the nature and character of the premisses from which demonstrations proceed. Let us first define what we mean by the terms "predicated of all" and "*per se*" and "universal" ^a (as applied to attributes).

Before discussing the premisses we must define certain terms.

I apply the term "predicated of all" to whatever is *not* predicated of one instance but not of another, or predicated at one time but not at another. *E.g.*, if "animal" is predicated of all "man," if it is true to call X a man, it is also true to call him an animal ; and if the former statement is true now, so is the latter. Similarly too if every line contains a point.^b There is evidence to corroborate this definition ; for the objection which we adduce against a proposition which involves "predication of all" implies either an example to which or a time at which the predicate does not apply.

"Predicated of all."

I describe one thing as "belonging *per se*" to another (i) if it is an element in the essential nature of the other,^c as, *e.g.*, a line belongs to a triangle and a point to a line (for the line or point is a constituent of the being of the triangle or line, and is an element in the formula which describes its essence) ; (ii) if it is an attribute the formula of whose essence includes

"Per se" as applied to attributes.

73 a

ἔστι δηλοῦντι, οἷον τὸ εὐθὺ ὑπάρχει γραμμῇ καὶ
 40 τὸ περιφερές, καὶ τὸ περιττὸν καὶ ἄρτιον ἀριθμῶ,
 73 b καὶ τὸ πρῶτον καὶ σύνθετον καὶ ἰσόπλευρον καὶ
 ἑτερόμηκες· καὶ πᾶσι τούτοις ἐνυπάρχουσιν ἐν τῷ
 λόγῳ τῷ τί ἐστι λέγοντι ἔνθα μὲν γραμμῇ ἔνθα δ'
 ἀριθμός. ὁμοίως δὲ καὶ ἐπὶ τῶν ἄλλων τὰ τοιαῦθ'
 ἐκάστοις καθ' αὐτὰ λέγω, ὅσα δὲ μηδετέρως ὑπάρ-
 5 χει συμβεβηκότα, οἷον τὸ μουσικὸν ἢ λευκὸν τῷ
 ζῳῳ. ἔτι ὁ μὴ καθ' ὑποκειμένου λέγεται ἄλλον
 τινός, οἷον τὸ βαδίζον ἕτερόν τι ὃν βαδίζον ἐστί, καὶ
 τὸ¹ λευκόν, ἢ δ' οὐσία καὶ ὅσα τόδε τι σημαίνει οὐχ
 ἕτερόν τι ὄντα ἐστὶν ὅπερ ἐστί. τὰ μὲν δὴ μὴ καθ'
 ὑποκειμένου καθ' αὐτὰ λέγω, τὰ δὲ καθ' ὑποκει-
 10 μένου συμβεβηκότα. ἔτι δ' ἄλλον τρόπον τὸ μὲν
 δι' αὐτὸ ὑπάρχον ἐκάστω καθ' αὐτό, τὸ δὲ μὴ δι'
 αὐτὸ συμβεβηκός, οἷον εἰ βαδίζοντος ἤστραψε, συμ-
 βεβηκός· οὐ γὰρ διὰ τὸ βαδίζειν ἤστραψεν, ἀλλὰ
 συνέβη, φαμέν, τοῦτο. εἰ δὲ δι' αὐτό, καθ' αὐτό,
 οἷον εἴ τι σφαττόμενον ἀπέθανε καὶ κατὰ τὴν
 15 σφαγὴν, ὅτι διὰ τὸ σφάττεσθαι, ἀλλ' οὐ συνέβη
 σφαττόμενον ἀποθανεῖν. τὰ ἄρα λεγόμενα ἐπὶ τῶν
 ἀπλῶς ἐπιστητῶν καθ' αὐτὰ οὕτως ὡς ἐνυπάρχειν

¹ τὸ om. ABCd.

^a An oblong number is a compound number that is not a square. Both names refer to the geometrical patterns in which pebbles or other objects representing the units can be arranged.

^b Although in Greek a participle or adjective can be used as an apparent substantive, it is still an attribute predicated of an unexpressed subject apart from which it has no separate existence.

^c We should call them attributes.

^d (iii) and (iv) are irrelevant for Aristotle's present pur-

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the subject to which the attribute itself belongs. *E.g.*, "straight" and "curved" belong to "line," "odd" and "even," "prime" and "compound," "square" and "oblong"^a belong to number; and the formula of the essence of each one of these includes line or number respectively. Similarly in all other cases I describe all terms of either of the kinds just described as belonging *per se* to their several subjects; whereas such as belong in neither of these senses—as *e.g.*, "cultured" or "white" belongs to "animal"—I call accidents. (iii) I also describe as *individual substances*, *<existing> per se* whatever is not stated of something else as subject. I mean, *e.g.*, that "the walking" is something else which walks, and similarly "the white"^b; whereas substance, or whatever denotes an individual, is not anything other than just itself. Thus I call *per se* those terms which are not predicated of a subject; those which are so predicated I call accidents.^c (iv) Again in another sense that which *and events*, happens to something else in virtue of the latter's own nature is said to happen to it *per se*; while that which does not so happen is called an accident. *E.g.*, if it lightens while a man is walking, it is an accident; for it was not because he was walking that it lightened; it was, as we say, an accident. But an event which happens in virtue of a thing's own nature happens to it *per se*, *e.g.*, if something dies while being slaughtered and in accordance with the act of slaughtering, since it died because it was slaughtered, it was not an accident that it died while being slaughtered. Thus^d in the sphere of what is knowable in the absolute sense, attributes which are called *per se*

pose; they may even have been added by another hand; at any rate Aristotle treats them as parenthetical.

73 b

τοῖς κατηγορουμένοις ἢ ἐνυπάρχεσθαι δι' αὐτά τέ
 ἐστι καὶ ἐξ ἀνάγκης. οὐ γὰρ ἐνδέχεται μὴ ὑπάρχειν
 20 ἢ ἀπλῶς ἢ τὰ ἀντικείμενα, οἷον γραμμῇ τὸ εὐθύ ἢ
 τὸ καμπύλον καὶ ἀριθμῶ τὸ περιττὸν ἢ τὸ ἄρτιον.
 ἔστι γὰρ τὸ ἐναντίον ἢ στέρησις ἢ ἀντίφασις ἐν τῷ
 αὐτῷ γένει, οἷον ἄρτιον τὸ μὴ περιττὸν ἐν ἀριθμοῖς
 ἢ ἔπεται. ὥστ' εἰ ἀνάγκη φάναι ἢ ἀποφάναι, ἀν-
 ἀγκη καὶ τὰ καθ' αὐτὰ ὑπάρχειν.

25 Τὸ μὲν οὖν κατὰ παντὸς καὶ καθ' αὐτὸ διωρίσθω
 τὸν τρόπον τοῦτον· καθόλου δὲ λέγω ὃ ἂν κατὰ
 παντός τε ὑπάρχῃ καὶ καθ' αὐτὸ καὶ ἡ αὐτό.
 φανερόν ἄρα ὅτι ὅσα καθόλου ἐξ ἀνάγκης ὑπάρχει
 τοῖς πράγμασιν. τὸ καθ' αὐτὸ δὲ καὶ ἡ αὐτὸ ταυ-
 30 τόν, οἷον καθ' αὐτὴν τῇ γραμμῇ ὑπάρχει στιγμῇ καὶ
 τὸ εὐθύ· καὶ γὰρ ἡ γραμμὴ καὶ τῷ τριγώνῳ ἢ
 τρίγωνον δύο ὀρθαί· καὶ γὰρ καθ' αὐτὸ τὸ τρίγωνον
 δύο ὀρθαῖς ἴσον. τὸ καθόλου δὲ ὑπάρχει τότε, ὅταν
 ἐπὶ τοῦ τυχόντος καὶ πρώτου δεικνύηται. οἷον τὸ
 δύο ὀρθὰς ἔχειν οὔτε τῷ σχήματί ἐστι καθόλου
 35 (καίτοι ἐστι δεῖξαι κατὰ σχήματος ὅτι δύο ὀρθὰς

^a Type (i).

^b Type (ii).

^c A colour is either white or not-white in the sense that it is either pure white or a colour containing little or no white (privation); number is either odd or not-odd in the sense that if it is not odd it must be even (contradictory).

^d By the Law of Excluded Middle.

^e This limitation of the meaning of καθ' αὐτό by equating it with ἡ αὐτό comes in oddly here. The point is that strictly an attribute only belongs *per se* to the highest class to which it is essential. The same idea is expressed in a different way by πρώτου below.

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as implying or implied by their subjects belong to those subjects in virtue of their own nature and of necessity. It is impossible that they should not belong to their subjects—either absolutely^a or in the way that opposite attributes belong,^b *e.g.*, either straight or curved to a line and either odd or even to a number ; because the contrary of an attribute is either the privation or the contradictory of that attribute in the same genus ; *e.g.*, in number the not-odd is even, inasmuch as evenness is a consequent of non-oddness.^c Thus since an attribute must be either asserted or denied of a subject,^d *per se* attributes must belong to their subjects of necessity.

So much for the definition of what is meant by “ predication of all ” and “ *per se*.” By a “ universal ” attribute I mean one which belongs as “ predicated of all ” to its subject, and belongs to that subject *per se* and *qua* itself. Thus it is evident that all universal attributes belong to their subjects of necessity. A *per se* attribute is identical with that which belongs to its subject *qua itself*^e ; *e.g.*, “ point ” and “ straight ” belong *per se* to “ line,” for they also belong to it *qua* line ; and “ having the sum of its interior angles equal to two right angles ” belongs to triangle *qua* triangle ; for a triangle *per se* has the sum of its interior angles equal to two right angles. An attribute only belongs to a subject universally when it can be shown to belong to any chance instance of that subject, and to belong to that subject primarily.^f (i) *E.g.*, “ having the sum of its interior angles equal to two right angles ” is not universally applicable to “ figure.” It is indeed possible to prove of a figure that the sum of its interior angles is equal to

“ Universal ” attributes.

^f See previous note.

73 b

ἔχει, ἀλλ' οὐ τοῦ τυχόντος σχήματος, οὐδὲ χρήται
 τῷ τυχόντι σχήματι δεικνύς¹. τὸ γὰρ τετράγωνον
 σχῆμα μέν, οὐκ ἔχει δὲ δύο ὀρθαῖς ἴσας). τὸ δ'
 ἰσοσκελὲς ἔχει μέν τὸ τυχόν δύο ὀρθαῖς ἴσας, ἀλλ'
 οὐ πρῶτον, ἀλλὰ τὸ τρίγωνον πρότερον. ὁ τοίνυν τὸ
 40 τυχόν πρῶτον δείκνυται δύο ὀρθὰς ἔχον ἢ ὅτιοῦν
 74 a ἄλλο, τούτῳ πρῶτῳ ὑπάρχει καθόλου, καὶ ἡ ἀπό-
 δειξις καθ' αὐτὸ τούτου καθόλου ἐστί, τῶν δ' ἄλλων
 τρόπον τινὰ οὐ καθ' αὐτό· οὐδὲ τοῦ ἰσοσκελοῦς οὐκ
 ἔστι καθόλου ἀλλ' ἐπὶ πλέον.

V. Δεῖ δὲ μὴ λανθάνειν ὅτι πολλάκις συμβαίνει
 5 διαμαρτάνειν καὶ μὴ ὑπάρχειν τὸ δεικνύμενον πρῶ-
 τον καθόλου, ἥ δοκεῖ δεικνυσθαι καθόλου πρῶτον.
 ἀπατώμεθα δὲ ταύτην τὴν ἀπάτην ὅταν ἡ μηδὲν ἡ
 λαβεῖν ἀνώτερον παρὰ τὸ καθ' ἕκαστον ἡ τὰ καθ'
 ἕκαστα,² ἡ ἡ μέν, ἀλλ' ἀνώνυμον ἡ ἐπὶ διαφόροις
 10 εἶδει πράγμασιν, ἡ τυγχάνη ὃν ὡς ἐν μέρει ὅλον ἐφ'
 ᾧ δεικνυται· τοῖς γὰρ ἐν μέρει ὑπάρξει μέν ἡ ἀπό-
 δειξις, καὶ ἔσται κατὰ παντός, ἀλλ' ὁμῶς οὐκ ἔσται
 τούτου πρῶτου καθόλου ἡ ἀπόδειξις. λέγω δὲ

¹ δεικνύς] ὁ δεικνύς Bekker.

² ἡ τὰ καθ' ἕκαστα secl. Ross.

^a Unless Aristotle is writing very carelessly ἡ τὰ καθ' ἕκαστα is a mistaken gloss, which Ross rightly brackets. καθ'

two right angles, but this cannot be proved of any chance figure ; nor does one use any chance figure for the proof, for a square is a figure, but it does not contain angles equal to the sum of two right angles. Again, any chance isosceles triangle has angles equal to the sum of two right angles, but it is not the first figure to fulfil this requirement ; the triangle is prior to it. Thus that which can be shown in any chance instance primarily to fulfil the condition of containing the sum of two right angles, or any other requirement, is the subject to which that universal attribute primarily belongs ; and the demonstration that this predicate is true universally of its subject establishes a *per se* relation between them, whereas the relation established for other predicates is in a sense not *per se*. (ii) Nor again is " containing angles equal to the sum of two right angles " a universal attribute of " isosceles " ; it has a wider extension.

V. We must not overlook the fact that a mistake often occurs, and the attribute which we are trying to prove does not apply primarily and universally in the sense in which we think that it is being proved. We fall into this error either (i) when we cannot find any higher term apart from the individual [or individuals] ^a ; or (ii) when there is such a term, but it has no name as applied to objects which differ in species ; or (iii) when the subject of the demonstration happens to be a whole which is a part of some other ; for although the demonstration will hold good of the particulars contained in it and will be predicated of all of it, still the demonstration will not apply to it primarily and universally. When I say

Error may vitiate the proof of universal attributes. Three causes for this error.

ἕκαστον seems here to mean not an individual but a single species the genus of which is unrecognizable.

74 a

τούτου πρώτου, ἥ τοῦτο, ἀπόδειξιν ὅταν ἡ πρώτου καθόλου.

Εἰ οὖν τις δείξειεν ὅτι αἱ ὀρθαὶ οὐ συμπίπτουσι, 15 δόξειεν ἂν τούτου εἶναι ἡ ἀπόδειξις διὰ τὸ ἐπὶ πασῶν εἶναι τῶν ὀρθῶν· οὐκ ἔστι δέ, εἴπερ μὴ ὅτι ὠδὶ ἴσαι γίγνεται τοῦτο, ἀλλ' ἡ ὁπωσοῦν ἴσαι.

Καὶ εἰ τρίγωνον μὴ ἦν ἄλλο ἢ ἰσοσκελές, ἡ ἰσοσκελές ἂν ἐδόκει ὑπάρχειν.

Καὶ τὸ ἀνάλογον ὅτι ἐναλλάξ, ἡ ἀριθμοὶ καὶ ἡ γραμμαὶ καὶ ἡ στερεὰ καὶ ἡ χρόνοι, ὥσπερ 20 ἐδείκνυτο ποτε χωρὶς, ἐνδεχόμενόν γε κατὰ πάντων μιᾷ ἀποδείξει δειχθῆναι· ἀλλὰ διὰ τὸ μὴ εἶναι ὠνομασμένον τι πάντα ταῦτα ἓν, ἀριθμοὶ μήκη χρόνος στερεά, καὶ εἶδει διαφέρειν ἀλλήλων, χωρὶς ἐλαμβάνετο· νῦν δὲ καθόλου δείκνυται· οὐ γὰρ ἡ γραμμαὶ ἢ ἡ ἀριθμοὶ ὑπῆρχεν ἀλλ' ἡ τοδί, ὃ 25 καθόλου ὑποτίθενται ὑπάρχειν. διὰ τοῦτο οὐδ' ἂν τις δείξη καθ' ἕκαστον τὸ τρίγωνον ἀποδείξει ἢ μιᾷ ἢ ἑτέρα ὅτι δύο ὀρθὰς ἔχει ἕκαστον, τὸ ἰσόπλευρον χωρὶς καὶ τὸ σκαληνές καὶ τὸ ἰσοσκελές, οὐπω οἶδε τὸ τρίγωνον ὅτι δύο ὀρθαῖς εἰ μὴ τὸν

^a An example of (iii). The fact is true of the lines primarily *qua* parallel, only secondarily *qua* perpendicular.

^b An example of (i).

^c *i.e.*, that if $A : B = C : D$, $A : C = B : D$. The illustration which follows is an example of (ii); but *cf.* Heath, *Mathematics in Aristotle*, pp. 41-44.

^d *i.e.*, with the unco-ordinated unscientific knowledge of the sophist.

POSTERIOR ANALYTICS, I. v

that demonstration applies to a subject primarily and universally, I mean that it applies to that subject primarily as such.

Thus if one were to prove that perpendiculars (to the same straight line) never meet, it might be supposed that this quality of perpendiculars was the proper subject of the demonstration, since it holds good of all perpendiculars. But it is not ; inasmuch as the result follows, not because the (alternate) angles are equal in this particular way, but if they are equal at all.^a

Again, if there were no triangle except the isosceles, the proof that it contains angles equal to the sum of two right angles would be supposed to apply to it *qua* isosceles.^b

Again, the law that *proportionals alternate* ^c might be supposed to apply to numbers *qua* numbers, and similarly to lines, solids and periods of time ; as indeed it used to be demonstrated of these subjects separately. It could, of course, have been proved of them all by a single demonstration, but since there was no single term to denote the common quality of numbers, lengths, time and solids, and they differ in species from one another, they were treated separately ; but now the law is proved universally ; for the property did not belong to them *qua* lines or *qua* numbers, but *qua* possessing this special quality which they are assumed to possess universally. Hence, even if a man proves separately—whether by the same demonstration or not—of each kind of triangle, equilateral, scalene and isosceles, that it contains angles equal to the sum of two right angles, he still does not know, except in the sophistical sense,^d that a triangle has its angles equal to the sum of two right angles, or

74 a

σοφιστικὸν τρόπον, οὐδὲ καθόλου τρίγωνον, οὐδ' εἰ
 30 μηδὲν ἐστὶ παρὰ ταῦτα τρίγωνον ἕτερον· οὐ γὰρ ἢ
 τρίγωνον οἶδεν, οὐδὲ πᾶν τρίγωνον ἄλλ' ἢ κατ'
 ἀριθμόν· κατ' εἶδος δ' οὐ πᾶν, καὶ εἰ μηδὲν ἔστιν ὃ
 οὐκ οἶδεν.

Πότ' οὖν οὐκ οἶδε καθόλου, καὶ πότ' οἶδεν ἀπ-
 λῶς; δῆλον δὴ ὅτι εἰ ταῦτόν ἦν τριγώνῳ εἶναι καὶ
 ἰσοπλεύρῳ ἢ ἐκάστῳ ἢ πᾶσιν· εἰ δὲ μὴ ταῦτόν ἄλλ'
 35 ἕτερον, ὑπάρχει δ' ἢ τρίγωνον, οὐκ οἶδεν. πότερον
 δ' ἢ τρίγωνον ἢ ἢ ἰσοσκελὲς ὑπάρχει; καὶ πότε
 κατὰ τοῦθ' ὑπάρχει πρῶτον; καὶ καθόλου τίνος
 ἢ ἀποδείξεις; δῆλον ὅτι ὅταν ἀφαιρουμένων ὑπάρξῃ
 πρῶτῳ. οἷον τῷ ἰσοσκελεῖ χαλκῷ τριγώνῳ ὑπ-
 74 b ἀρξουσὶ δύο ὀρθαί, ἀλλὰ καὶ τοῦ χαλκοῦν εἶναι
 ἀφαιρεθέντος καὶ τοῦ ἰσοσκελὲς. ἀλλ' οὐ τοῦ σχή-
 ματος ἢ πέρατος. ἀλλ' οὐ πρῶτων. τίνος οὖν
 πρῶτου; εἰ δὴ τριγώνου, κατὰ τοῦτο ὑπάρχει
 καὶ τοῖς ἄλλοις, καὶ τούτου καθόλου ἐστὶν ἢ ἀπό-
 δεῖξις.

5 VI. Εἰ οὖν ἐστὶν ἡ ἀποδεικτικὴ ἐπιστήμη ἐξ
 ἀναγκαίων ἀρχῶν (ὃ γὰρ ἐπίσταται οὐ δυνατόν
 ἄλλως ἔχειν), τὰ δὲ καθ' αὐτὰ ὑπάρχοντα ἀναγκαῖα

^a i.e., through induction by simple enumeration.

POSTERIOR ANALYTICS, I. V-VI

that this is a universal property of triangles, even if there is no other kind of triangle besides these ; for he does not know that this property belongs to a triangle *qua* triangle, nor that it belongs to every triangle, except numerically^a ; for he does not know that it belongs to every triangle specifically, even if there is no triangle which he does not know to possess it.

When, then, do we not know universally, and when do we know absolutely ? Clearly, if " triangle " were essentially the same as " equilateral " in each or every instance, we should have absolute knowledge ; but if it is not the same but different, and the property belongs to the equilateral *qua* triangle, our knowledge is not universal. We must ask " Does the property belong to its subject *qua* triangle or *qua* isosceles ? When does it apply to its subject primarily ? What is the subject of which it can be demonstrated universally ? " Clearly the first subject to which it applies as the differentiae are removed. *E.g.*, the property of having angles equal to the sum of two right angles will apply to " bronze isosceles triangle " ; and it will still apply when " bronze " and " isosceles " are removed. " But not if you remove ' figure ' or ' limit. ' " No, but these are not the first differentiae whose removal makes the attribute inapplicable. " Then what is the first ? " If it is " triangle, " then it is with respect to triangularity that the attribute applies to all the rest of the subjects, and it is of " triangle " that the attribute can be universally demonstrated.

VI. If, then, demonstrative knowledge proceeds from necessary first principles (because that which we know cannot possibly be otherwise), and essential

Criterion of
" univer-
sal " attri-
butes.

Arguments
to show that
the pre-
misses of

τοῖς πράγμασιν (τὰ μὲν γὰρ ἐν τῷ τί ἐστιν ὑπάρχει· τοῖς δ' αὐτὰ ἐν τῷ τί ἐστιν ὑπάρχει κατηγορουμένοις αὐτῶν, ὧν θάτερον τῶν ἀντικειμένων ἀνάγκη
 10 ὑπάρχειν), φανερόν ὅτι ἐκ τοιούτων τινῶν ἂν εἴη ὁ ἀποδεικτικὸς συλλογισμός· ἅπαν γὰρ ἢ οὕτως ὑπάρχει ἢ κατὰ συμβεβηκός, τὰ δὲ συμβεβηκότα οὐκ ἀναγκαῖα.

Ἡ δὲ οὕτω λεκτέον, ἢ ἀρχὴν θεμένοις ὅτι ἡ ἀποδειξίς ἀναγκαῖόν¹ ἐστι, καὶ εἰ ἀποδέδεικται, οὐχ
 15 οἷόν τ' ἄλλως ἔχειν· ἐξ ἀναγκαίων ἄρα δεῖ εἶναι τὸν συλλογισμόν. ἐξ ἀληθῶν μὲν γὰρ ἔστι καὶ μὴ ἀποδεικνύντα συλλογίσασθαι, ἐξ ἀναγκαίων δ' οὐκ ἔστιν ἀλλ' ἢ ἀποδεικνύντα· τοῦτο γὰρ ἤδη ἀποδείξεώς ἐστι.

Σημεῖον δ' ὅτι ἡ ἀπόδειξις ἐξ ἀναγκαίων ὅτι καὶ τὰς ἐνστάσεις οὕτω φέρομεν πρὸς τοὺς οἰομένους
 20 ἀποδεικνύναι, ὅτι οὐκ ἀνάγκη, ἂν οἰώμεθα ἢ ὅλως ἐνδέχεσθαι ἄλλως ἢ ἔνεκά γε τοῦ λόγου.

Δῆλον δ' ἐκ τούτων καὶ ὅτι εὐήθεις οἱ λαμβάνειν οἰόμενοι καλῶς τὰς ἀρχὰς εἰς ἐνδοξος ἢ ἡ πρότασις καὶ ἀληθής, οἷον οἱ σοφισταὶ ὅτι τὸ ἐπίστασθαι τὸ ἐπιστήμην ἔχειν. οὐ γὰρ τὸ ἐνδοξον ἢ μὴ² ἀρχή

¹ ἀναγκαίων Philoponus (?), Ross : ἀναγκαίου Mure.

² ἢ μὴ] ἡμῖν n¹, Ross.

^a e.g., 'nose' is part of the definition of 'snubness' (*Met.* 1064 a 25), and every nose is either snub or not snub.

^b i.e., necessary.

^c This sense can, I think, be extracted from the vulgate without having recourse to emendation.

attributes are necessary to their subjects (for some of them inhere in the essence of their subjects, while others have the subjects of which they are predicated inherent in their own essence, and in this latter class one member of the pair of opposite attributes must apply),^a it is evident that the premisses from which demonstrative syllogisms are drawn will be of this nature ^b; for every attribute applies either in this or in the accidental sense, and accidental attributes are not necessary.

demonstration are necessary.

We may either argue in this way, or lay down the principle that demonstration implies necessity,^c i.e., that if a thing has been proved, it cannot be otherwise. Then it follows that the premisses of the <demonstrative> syllogism must be necessary; for whereas it is possible to draw a conclusion from true premisses without demonstrating anything, it is impossible to draw one from necessary premisses without doing so; for necessity directly implies demonstration.

Evidence that the premisses from which demonstration proceeds are necessary may be found in the fact that the way in which we raise objections against those who imagine that they are demonstrating is by saying "it is not *necessary*," that is if we think that it is possible, either without qualification or for the purposes of the argument, that the fact should be otherwise.

(It is also clear from these arguments that it is foolish to think that one is choosing the right starting-point if the premiss is <merely> generally accepted and true; as the sophists assume that to know is to have knowledge.^d The starting-point is not that which is generally accepted or the reverse, but that

^a Cf. Plato, *Euthydemus* 277 B.

74 b

25 ἔστιν, ἀλλὰ τὸ πρῶτον τοῦ γένους περὶ ὃ δείκνυται·
καὶ τὰληθές οὐ πᾶν οἰκείον.

“Ὅτι δ’ ἐξ ἀναγκαίων εἶναι δεῖ τὸν συλλογισμὸν
φανερὸν καὶ ἐκ τῶνδε. εἰ γὰρ ὁ μὴ ἔχων λόγον τοῦ
διὰ τί οὔσης ἀποδείξεως οὐκ ἐπιστήμων, εἴη δ’ ἂν
ὥστε τὸ Α κατὰ τοῦ Γ ἐξ ἀνάγκης ὑπάρχειν, τὸ δὲ
30 Β τὸ μέσον δι’ οὗ ἀπεδείχθη μὴ ἐξ ἀνάγκης, οὐκ
οἶδε διότι. οὐ γάρ ἐστι τοῦτο διὰ τὸ μέσον· τὸ μὲν
γὰρ ἐνδέχεται μὴ εἶναι, τὸ δὲ συμπέρασμα ἀναγ-
καῖον.

“Ἐτι εἴ τις μὴ οἶδε νῦν ἔχων τὸν λόγον καὶ σωζό-
μενος, σωζομένου τοῦ πράγματος, μὴ ἐπιλεησ-
μένος, οὐδὲ πρότερον ᾔδει. φθαρείη δ’ ἂν τὸ μέσον
35 εἰ μὴ ἀναγκαῖον, ὥστε ἔξει μὲν τὸν λόγον σωζό-
μενος σωζομένου τοῦ πράγματος, οὐκ οἶδε δέ· οὐδ’
ἄρα πρότερον ᾔδει. εἰ δὲ μὴ ἐφθαρται, ἐνδέχεται
δὲ φθαρῆναι, τὸ συμβαῖνον ἂν εἴη δυνατόν καὶ
ἐνδεχόμενον. ἀλλ’ ἔστιν ἀδύνατον οὕτως ἔχοντα
εἰδέναι.

75 a “Ὅταν μὲν οὖν τὸ συμπέρασμα ἐξ ἀνάγκης ᾔη,
οὐδὲν κωλύει τὸ μέσον μὴ ἀναγκαῖον εἶναι δι’ οὗ
ἐδείχθη· ἔστι γὰρ τὸ ἀναγκαῖον καὶ μὴ ἐξ ἀναγ-
καίων¹ συλλογίσασθαι, ὥσπερ καὶ ἀληθές μὴ ἐξ
5 ἀληθῶν· ὅταν δὲ τὸ μέσον ἐξ ἀνάγκης, καὶ τὸ

¹ ἀναγκαίων n, Philoponus : ἀναγκαίου.

^a But in neither case is the conclusion proved. This paragraph is a parenthetical comment on the main argument.

POSTERIOR ANALYTICS, I. VI

which is primarily true of the genus with which the demonstration deals ; and not every true fact is peculiar to a given genus.)

That our syllogism must be based upon necessary premisses is evident also from the following argument. Since the man who cannot give an account of the reason for a fact, although there is a proof available, is not possessed of scientific knowledge, if we assume a syllogism such that while A necessarily applies as predicate to C, B, the middle term by which the conclusion was proved, is not in a necessary relation to the other terms, then he does not know the reason. For the conclusion does not depend upon the middle term, since the latter may not be true, whereas the conclusion is necessary.

Again, if a man does not know a fact now, although he can give an account of it and both he himself and the fact are unchanged, and he has not forgotten it, then he was also ignorant of it before. But if the middle term is not necessary, it may cease to operate. In that case, although the man himself and the fact are unchanged, and he will still have his account of it, he does not know the fact. Therefore he was also ignorant of it before. Even if the middle term has not actually ceased, if it *may* cease, the conclusion will be problematic and contingent ; and under such conditions knowledge is impossible.

(When the conclusion is necessary, it is not essential that the middle term by which it was proved should be necessary, for it is possible to reach a necessary conclusion even from premisses which are not necessary, just as it is possible to reach a true conclusion from premisses which are not true.^a But when the middle term is necessarily true, the con-

Parenthe-
sis : Non-
necessary
premisses
may give,
but neces-
sary pre-
misses must
give, a
necessary
conclusion.

75 a

συμπέρασμα ἐξ ἀνάγκης, ὥσπερ καὶ ἐξ ἀληθῶν ἀληθὲς αἰεί· ἔστω γὰρ τὸ Α κατὰ τοῦ Β ἐξ ἀνάγκης, καὶ τοῦτο κατὰ τοῦ Γ· ἀναγκαῖον τοίνυν καὶ τὸ Α τῷ Γ ὑπάρχειν· ὅταν δὲ μὴ ἀναγκαῖον ᾗ τὸ συμπέρασμα, οὐδὲ τὸ μέσον ἀναγκαῖον οἶόν τ' εἶναι· ἔστω γὰρ τὸ Α τῷ Γ μὴ ἐξ ἀνάγκης ὑπάρχειν, τῷ
 10 δὲ Β, καὶ τοῦτο τῷ Γ ἐξ ἀνάγκης· καὶ τὸ Α ἄρα τῷ Γ ἐξ ἀνάγκης ὑπάρξει· ἀλλ' οὐχ ὑπέκειτο.

Ἐπεὶ τοίνυν εἰ ἐπίσταται ἀποδεικτικῶς, δεῖ ἐξ ἀνάγκης ὑπάρχειν, δηλὸν ὅτι καὶ διὰ μέσου ἀναγκαίου δεῖ ἔχειν τὴν ἀπόδειξιν· ἢ οὐκ ἐπιστήσεται
 15 οὔτε διότι οὔτε ὅτι ἀνάγκη ἐκείνο εἶναι, ἀλλ' ἢ οἰήσεται οὐκ εἰδώς, ἐὰν ὑπολάβῃ ὡς ἀναγκαῖον τὸ μὴ ἀναγκαῖον, ἢ οὐδ' οἰήσεται, ὁμοίως ἐὰν τε τὸ ὅτι εἰδῇ διὰ μέσων ἐὰν τε τὸ διότι καὶ δι' ἀμέσων.

Τῶν δὲ συμβεβηκότων μὴ καθ' αὐτά, ὃν τρόπον διωρίσθη τὰ καθ' αὐτά, οὐκ ἔστιν ἐπιστήμη
 20 ἀποδεικτική. οὐ γὰρ ἔστιν ἐξ ἀνάγκης δεῖξαι τὸ συμπέρασμα· τὸ συμβεβηκὸς γὰρ ἐνδέχεται μὴ ὑπάρχειν· περὶ τοῦ¹ τοιούτου γὰρ λέγω συμβεβηκός· καίτοι ἀπορήσειεν ἂν τις ἴσως τίνος ἕνεκα ταῦτα δεῖ ἐρωτᾶν περὶ τούτων, εἰ μὴ ἀνάγκη τὸ συμπέρασμα εἶναι· οὐδὲν γὰρ διαφέρει εἴ τις ἐρόμενος τὰ
 25 τυχόντα εἶτα εἴπειεν τὸ συμπέρασμα. δεῖ δ' ἐρωτᾶν οὐχ ὡς ἀναγκαῖον εἶναι διὰ τὰ ἡρωτημένα, ἀλλ'

¹ om. Ad.

clusion is also necessary ; just as the conclusion from true premisses is always true. For let A be necessarily predicated of B, and B of C ; then the conclusion that A applies to C is also necessary. But when the conclusion is not necessary, neither can the middle term be necessary. For suppose that A applies necessarily to B but not to C, and that B necessarily applies to C. Then A will also apply necessarily to C. But this was not the original assumption.)

Therefore since, if we have demonstrative knowledge of a proposition, the predicate must apply necessarily to the subject, it is obvious that the middle term upon which the proof depends must also be necessary. Otherwise we shall recognize neither the fact of the conclusion nor the reason for it as necessary ; we shall either think that we know, although we do not—that is if we assume as necessary that which is not necessary—or we shall not even think that we know, alike whether we know the fact by intermediate terms or whether we know the reason immediately.

Attributes which are not essential in the sense which we have defined ^a do not admit of demonstrative knowledge, since it is not possible to give a necessary proof of the conclusion ; for an accidental attribute may not apply to its subject, and it is of this kind of attribute that I am speaking. At the same time it might be questioned why (in dialectic), if the conclusion is not necessarily true, we should ask for the concession of such premisses for such a conclusion ; one might as well suggest any premisses at random, and then state the conclusion. The answer is that we should put definite questions, not because the answers affect the necessity of the conclusion, but

Thus in demonstration the middle term must be necessary.

No demonstrative knowledge of non-essential attributes.

75 a

ὅτι λέγειν ἀνάγκη τῷ ἐκείνῳ λέγοντι, καὶ ἀληθῶς λέγειν, ἐὰν ἀληθῶς ᾗ ὑπάρχοντα.

Ἐπεὶ δ' ἐξ ἀνάγκης ὑπάρχει περὶ ἕκαστον γένος ὅσα καθ' αὐτὰ ὑπάρχει, καὶ ᾗ ἕκαστον, φανερόν ὅτι
 30 περὶ τῶν καθ' αὐτὰ ὑπαρχόντων αἱ ἐπιστημονικαὶ ἀποδείξεις καὶ ἐκ τῶν τοιούτων εἰσὶν. τὰ μὲν γὰρ συμβεβηκότα οὐκ ἀναγκαῖα, ὥστ' οὐκ ἀνάγκη τὸ συμπέρασμα εἰδέναι διότι ὑπάρχει, οὐδ' εἰ ἀεὶ εἴη, μὴ καθ' αὐτὸ δέ, οἷον οἱ διὰ σημείων συλλογισμοί. τὸ γὰρ καθ' αὐτὸ οὐ καθ' αὐτὸ ἐπιστήσεται, οὐδὲ
 35 διότι. τὸ δὲ διότι ἐπίστασθαί ἐστι τὸ διὰ τοῦ αἰτίου ἐπίστασθαι. δι' αὐτὸ ἄρα δεῖ καὶ τὸ μέσον τῷ τρίτῳ καὶ τὸ πρῶτον τῷ μέσῳ ὑπάρχειν.

VII. Οὐκ ἄρα ἔστιν ἐξ ἄλλου γένους μεταβάντα δεῖξαι, οἷον τὸ γεωμετρικὸν ἀριθμητικῇ. τρία γάρ
 40 ἔστι τὰ ἐν ταῖς ἀποδείξεσιν, ἐν μὲν τὸ ἀποδεικνύμενον τὸ συμπέρασμα (τοῦτο δ' ἐστὶ τὸ ὑπάρχον γένει τινὶ καθ' αὐτό), ἐν δὲ τὰ ἀξιώματα (ἀξιώματα
 75 b δ' ἔστιν ἐξ ὧν), τρίτον τὸ γένος τὸ ὑποκείμενον, οὗ τὰ πάθη καὶ τὰ καθ' αὐτὰ συμβεβηκότα δηλοῖ ἡ ἀπόδειξις. ἐξ ὧν μὲν οὖν ἡ ἀπόδειξις, ἐνδέχεται τὰ αὐτὰ εἶναι· ὧν δὲ τὸ γένος ἕτερον, ὥσπερ ἀριθμητικῆς καὶ γεωμετρίας, οὐκ ἔστι τὴν ἀριθμητικὴν
 5 ἀπόδειξιν ἐφαρμόσαι ἐπὶ τὰ τοῖς μεγέθεσι συμβεβηκότα, εἰ μὴ τὰ μεγέθη ἀριθμοὶ εἰσι· τοῦτο δ' ὥς

^a Even the syllogisms of dialectic should be formally valid.

^b Where the connexion is neither causal nor necessary ; cf. *An. Pr.* 70 a 7 ff.

^c To describe the common axioms as ἐξ ὧν suggests that they serve as premisses ; but this is true only of such as are

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because in stating them our opponent must state the conclusion, and state it truly if the attributes apply truly.^a

Since in each genus it is the attributes that belong essentially to that particular genus that belong to it of necessity, it is evident that scientific demonstrations are concerned with essential attributes and proceed from them. For accidental attributes are not necessary, and therefore we do not necessarily know why the conclusion is true; not even if the attributes belong always, but not *per se*, as in syllogisms through signs.^b For we shall not have knowledge of the essential *fact* as essential, nor shall we know its reason. To know the reason of a thing is to know it through its cause. Therefore the middle term must apply *per se* to the third, and also the first *per se* to the middle.

Hence our
premisses
must state
per se
connexions.

VII. Hence it is not possible to prove a fact by passing from one genus to another—*e.g.*, to prove a geometrical proposition by arithmetic. There are three factors in a demonstration: (1) The conclusion which is required to be proved, *i.e.*, the application of an essential attribute to some genus; (2) the axioms, on which the proof is based^c; (3) the underlying genus, whose modifications or essential attributes are disclosed by the demonstration. Now where different genera, *e.g.*, arithmetic and geometry, are involved, although the basis of proof may be the same, it is not possible to apply the arithmetical demonstration to the attributes of extended magnitudes, unless extended magnitudes are numbers.^d How transference is possible in some cases

They must
state them
of attri-
butes be-
longing to
the same
genus as
the proposi-
tion to be
proved.

quantitative. Normally the axioms are $\delta\iota' \omega\nu$ (*cf.* 76 b 10, 88 a 36 ff.). ^a For Aristotle they are not; *cf.* *Cat.* 4 b 22 ff.

75 b

ἐνδέχεται ἐπὶ τινων, ὕστερον λεχθήσεται. ἡ δ' ἀριθμητικὴ ἀπόδειξις αἰεὶ ἔχει τὸ γένος περὶ ὃ ἡ ἀπόδειξις, καὶ αἱ ἄλλαι ὁμοίως· ὥστ' ἡ ἀπλῶς ἀνάγκη τὸ αὐτὸ εἶναι γένος ἢ πῆ, εἰ μέλλει ἡ ἀπό-
 10 δειξις μεταβαίνειν· ἄλλως δ' ὅτι ἀδύνατον δῆλον· ἐκ γὰρ τοῦ αὐτοῦ γένους ἀνάγκη τὰ ἄκρα καὶ τὰ μέσα εἶναι. εἰ γὰρ μὴ καθ' αὐτά, συμβεβηκότα ἔσται. διὰ τοῦτο τῇ γεωμετρίᾳ οὐκ ἔστι δεῖξαι ὅτι τῶν ἐναντίων μία ἐπιστήμη, ἀλλ' οὐδ' ὅτι οἱ δύο κύβοι κύβος· οὐδ' ἄλλη ἐπιστήμη τὸ ἐτέρας, ἀλλ' ἡ
 15 ὅσα οὕτως ἔχει πρὸς ἄλληλα ὥστ' εἶναι θάτερον ὑπὸ θάτερον, οἷον τὰ ὀπτικά πρὸς γεωμετρίαν καὶ τὰ ἀρμονικά πρὸς ἀριθμητικὴν. οὐδ' εἴ τι ὑπάρχει ταῖς γραμμαῖς μὴ ἢ γραμμαὶ καὶ ἢ ἐκ τῶν ἀρχῶν τῶν ιδίων, οἷον εἰ καλλίστη τῶν γραμμῶν ἢ εὐθεία
 20 ἢ εἰ ἐναντίως ἔχει τῇ περιφερείᾳ· οὐ γὰρ ἢ τὸ ἴδιον γένος αὐτῶν ὑπάρχει, ἀλλ' ἢ κοινόν τι.

VIII. Φανερόν δὲ καὶ ἐὰν ᾧσιν αἱ προτάσεις καθόλου ἐξ ᾧν ὁ συλλογισμός, ὅτι ἀνάγκη καὶ τὸ συμπέρασμα αἰδῖον εἶναι τῆς τοιαύτης ἀποδείξεως καὶ τῆς ἀπλῶς εἰπεῖν ἀποδείξεως. οὐκ ἔστιν ἄρα
 25 ἀπόδειξις τῶν φθαρτῶν οὐδ' ἐπιστήμη ἀπλῶς, ἀλλ' οὕτως ὥσπερ κατὰ συμβεβηκός, ὅτι οὐ καθόλου αὐτοῦ ἐστὶν ἀλλὰ ποτὲ καὶ πῶς. ὅταν δ' ἢ, ἀνάγκη τὴν ἐτέραν μὴ καθόλου εἶναι πρότασιν καὶ φθαρτὴν,

^a 76 a 9 ff., 78 b 34 ff.

^b In the case of subaltern sciences.

^c The reference is to cube numbers ; cf. Euclid, *Elementa* ix. 4.

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will be explained later.^a Arithmetical demonstration always keeps to the genus which is the subject of the demonstration, and similarly with all other sciences. Thus the genus must be the same, either absolutely or in some respect,^b if the demonstration is to be *transferable*. Clearly this is impossible in any other way; the extreme and middle terms must belong to the same genus; if the connexion is not essential it must be accidental. This is why we cannot prove by geometry that contraries are studied by the same science, nor even that the product of two cubes is a cube.^c Nor can a proposition of one science be proved by another science, except when the relation is such that the propositions of the one are subordinate to those of the other, as the propositions of optics are subordinate to geometry and those of harmonics to arithmetic. Nor can geometry decide whether a given attribute applies to lines otherwise than *qua* lines and derived from their own peculiar principles, *e.g.*, whether the straight line is the most beautiful of lines, or whether it is the contrary of the curved; for these attributes apply to lines not in virtue of their peculiar genus, but in virtue of a characteristic common to other genera.

VIII. It is also evident that if the premisses of the syllogism are universal, the conclusion of a demonstration of this kind—demonstration in the strict sense—must be eternal. Hence of connexions that are not eternal, there is no demonstration or knowledge in the strict sense, but only in the accidental sense that the attribute belongs to the subject not universally but at a given time or under given conditions. When this is so, the minor premiss must be non-eternal and non-universal: non-eternal because

Only
eternal con-
nexions can
be demon-
strated.

75 b

φθαρτὴν μὲν ὅτι καὶ¹ τὸ συμπέρασμα οὕσης, μὴ
καθόλου δὲ ὅτι τῷ² μὲν ἔσται τῷ δὲ οὐκ ἔσται ἐφ'
30 ὧν, ὥστε οὐκ ἔστι συλλογίσασθαι καθόλου, ἀλλ'
ὅτι νῦν. ὁμοίως δ' ἔχει καὶ περὶ ὁρισμούς, ἐπεὶ περ
ἐστὶν ὁ ὁρισμὸς ἢ ἀρχὴ ἀποδείξεως ἢ ἀπόδειξις
θέσει διαφέρουσα ἢ συμπέρασμα τι ἀποδείξεως. αἱ
δὲ τῶν πολλάκις γιγνομένων ἀποδείξεις καὶ ἐπι-
στῆμαι, οἷον σελήνης ἐκλείψεως, δῆλον ὅτι ἡ μὲν
35 τοιοῦδ'³ εἰσὶν, αἰεὶ εἰσιν, ἡ δ' οὐκ αἰεὶ, κατὰ μέρος
εἰσὶν. ὥσπερ δ' ἡ ἐκλείψις, ὡσαύτως τοῖς ἄλλοις.

IX. Ἐπεὶ δὲ φανερόν ὅτι ἕκαστον ἀποδείξαι οὐκ
ἔστιν ἀλλ' ἢ ἐκ τῶν ἐκάστου ἀρχῶν, ἂν τὸ δεικνύ-
μενον ὑπάρχη ἢ ἐκείνο, οὐκ ἔστι τὸ ἐπίστασθαι
40 τοῦτο, ἂν ἐξ ἀληθῶν καὶ ἀναποδείκτων δειχθῇ καὶ
ἀμέσων. ἔστι γὰρ οὕτω δεῖξαι, ὥσπερ Βρύσων τὸν
τετραγωνισμόν. κατὰ κοινόν τε γὰρ δεικνύουσιν
οἱ τοιοῦτοι λόγοι, ὃ καὶ ἐτέρῳ ὑπάρξει· διὸ καὶ
76 a ἐπ' ἄλλων ἐφαρμόττουσιν οἱ λόγοι οὐ συγγενῶν.
οὐκοῦν οὐχ ἡ ἐκείνο ἐπίσταται, ἀλλὰ κατὰ συμβε-
βηκός· οὐ γὰρ ἂν ἐφήρμοττεν ἡ ἀπόδειξις καὶ ἐπ'
ἄλλο γένος.

¹ καὶ] ἔσται καὶ n, Ross.

² τῷ . . . τῷ C¹: τὸ . . . τὸ C² n: ᾧ . . . ᾧ ABd.

³ τοιοῦδ' B, Philoponus: (μέν)τοι οὐδ' A: τοιαῖδ' C: alii alia.

^a If the minor premiss stated an eternal connexion the conclusion would also be eternal.

^b Cf. Book II, ch. x.

^c What Bryson actually tried to prove is not clear (though the attempt is also described—guardedly—as 'squaring the circle' in *Soph. Elench.* 171 b 16, 172 a 3); but he seems to have used the comparative areas of inscribed and circumscribed figures, whether squares or polygons. The objection, however, is to his 'sophistical' method of starting from a

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only so will the conclusion also be non-eternal,^a and non-universal because the conclusion will be true in some cases but not in others, and so cannot be proved to be true universally, but only at a given time. Similarly too with respect to definitions, inasmuch as a definition is either a starting-point of demonstration, or a demonstration in a different form, or a conclusion of a demonstration.^b It is clear that demonstration and knowledge of intermittent events, such as an eclipse of the moon, are eternal in so far as they refer to events of a specific kind ; but in so far as they are not eternal, they are particular. Attributes may apply intermittently to other subjects just as an eclipse does to the moon.

IX. Since it is evidently impossible to demonstrate the application of a particular attribute as such to its subject except from the first principles proper to its genus, scientific knowledge does not consist in proof from principles which are merely true, indemonstrable and immediate. I say this because one can conduct a proof in this way, just as Bryson, for example, proved his theory of squaring the circle ^c ; for such arguments prove the conclusion by using a common middle term which will refer equally to a different subject ; hence they are also applicable to subjects of other genera. Thus they enable us to know the attribute as applying to its subject not *qua* itself but only accidentally ; otherwise the demonstration would not be applicable to another genus also.

The premisses of demonstration must be peculiar to their own science,

general postulate of the form ' Things which are both greater than the same <set of> things and less than the same <set of> things are equal to one another ' (obviously invalid, by the way, unless the two sets taken together exhaust all the possibilities) instead of a geometrical axiom. See Heath, *Greek Mathematics*, I. 223-225 ; *Mathematics in Aristotle*, 48-50.

76 a

Ἐκαστον δ' ἐπιστάμεθα μὴ κατὰ συμβεβηκός,
 5 ὅταν κατ' ἐκείνο γιννώσκωμεν καθ' ὃ ὑπάρχει, ἐκ
 τῶν ἀρχῶν τῶν ἐκείνου ἢ ἐκείνο, οἷον τὸ δυσὶν
 ὀρθαῖς ἴσας ἔχειν, ὧ ὑπάρχει καθ' αὐτὸ τὸ εἰρη-
 μένον, ἐκ τῶν ἀρχῶν τῶν τούτου. ὥστ' εἰ καθ'
 αὐτὸ καὶ ἐκείνο ὑπάρχει ὧ ὑπάρχει, ἀνάγκη τὸ μέσον
 10 ἐν τῇ αὐτῇ συγγενείᾳ εἶναι. εἰ δὲ μή, ἀλλ' ὡς τὰ
 ἀρμονικὰ δι' ἀριθμητικῆς. τὰ δὲ τοιαῦτα δείκνυνται
 μὲν ὡσαύτως, διαφέρει δέ· τὸ μὲν γὰρ ὅτι ἐτέρας
 ἐπιστήμης (τὸ γὰρ ὑποκείμενον γένος ἕτερον), τὸ
 δὲ διότι τῆς ἄνω, ἧς καθ' αὐτὰ τὰ πάθη ἐστίν.
 ὥστε καὶ ἐκ τούτων φανερόν ὅτι οὐκ ἔστιν ἀποδεί-
 15 ξαι ἕκαστον ἀπλῶς, ἀλλ' ἢ ἐκ τῶν ἐκάστου ἀρχῶν.
 ἀλλὰ τούτων αἱ ἀρχαὶ ἔχουσι τὸ κοινόν.

Εἰ δὲ φανερόν τοῦτο, φανερόν καὶ ὅτι οὐκ ἔστι
 τὰς ἐκάστου ἰδίας ἀρχὰς ἀποδείξαι· ἔσονται γὰρ
 ἐκεῖναι ἀπάντων ἀρχαί, καὶ ἐπιστήμη ἢ ἐκείνων
 κυρία πάντων. καὶ γὰρ ἐπίσταται μᾶλλον ὁ ἐκ τῶν
 20 ἀνώτερον¹ αἰτίων εἰδώς· ἐκ τῶν προτέρων γὰρ
 οἶδεν ὅταν ἐκ μὴ αἰτιατῶν εἰδῇ αἰτίων. ὥστ' εἰ
 μᾶλλον οἶδε καὶ μάλιστα, καὶ ἐπιστήμη ἐκείνη εἴη
 καὶ μᾶλλον καὶ μάλιστα. ἢ δ' ἀπόδειξις οὐκ ἐφαρ-
 μόττει ἐπ' ἄλλο γένος, ἀλλ' ἢ ὡς εἴρηται αἱ γεω-

¹ ἀνωτέρων A²d : ἀνωτέρω B².

^a The middle term, subject of the major, predicate of the minor premiss.

^b e.g., Plato's dialectic, which Aristotle repudiates.

^c 75 b 14 ff., 76 a 9 ff.

POSTERIOR ANALYTICS, I. IX

Our knowledge of any given attribute is only non-accidental when we recognize it in respect of the subject in virtue of which it is an attribute, and from the principles proper to that subject as such ; *e.g.*, the attribute of "having the sum of its angles equal to two right angles" as belonging to the subject to which it applies *per se*, and from the principles proper to this subject. Therefore if this latter term ^a applies *per se* to its own subject, the middle must belong to the same genus as the extreme terms. The only exceptions are such as the propositions of harmonics which are proved by arithmetic. Such propositions are proved in the same way, but with this difference ; that while the fact proved belongs to a different science (for the subject genus is different), the grounds of the fact belong to the superior science, to which the attributes belong *per se*. Thus it is evident from these considerations also that absolute demonstration of any attribute is impossible except from its own principles. In the examples just given, however, the principles have a common element.

If this is evident, it is evident also that the special principles of each genus cannot be demonstrated ; for the principles from which they would be demonstrable would be principles of all existing things, and the science of those principles would be supreme over all.^b For a man knows a fact in a truer sense if he knows it from more ultimate causes, since he knows it from prior premisses when he knows it from causes which are themselves uncaused. Thus if he knows in a truer or the truest sense, his knowledge will be science in a truer or the truest sense. However, demonstration is not applicable to a different genus, except as we have explained ^c that geometrical proofs

except in the case of subaltern sciences.

Hence the special principles of the sciences are indemonstrable.

76 a

μετρικαὶ ἐπὶ τὰς μηχανικὰς ἢ ὀπτικὰς καὶ αἱ
25 ἀριθμητικαὶ ἐπὶ τὰς ἀρμονικάς.

Χαλεπὸν δ' ἐστὶ τὸ γινῶναι εἰ οἶδεν ἢ μή. χαλε-
πὸν γὰρ τὸ γινῶναι εἰ ἐκ τῶν ἐκάστου ἀρχῶν ἴσμεν
ἢ μή· ὅπερ ἐστὶ τὸ εἰδέναι. οἰόμεθα δ', ἂν ἔχωμεν
ἐξ ἀληθινῶν τινῶν συλλογισμόν καὶ πρώτων, ἐπί-
30 στασθαι. τὸ δ' οὐκ ἔστιν, ἀλλὰ συγγενῇ δεῖ εἶναι
τοῖς πρώτοις.

Χ. Λέγω δ' ἀρχὰς ἐν ἐκάστῳ γένει ταύτας ἃς
ὅτι ἔστι μὴ ἐνδέχεται δεῖξαι. τί μὲν οὖν σημαίνει
καὶ τὰ πρῶτα καὶ τὰ ἐκ τούτων, λαμβάνεται, ὅτι
δ' ἔστι, τὰς μὲν ἀρχὰς ἀνάγκη λαμβάνειν, τὰ δ'
35 ἄλλα δεικνύναι, οἷον τί μονὰς ἢ τί τὸ εὐθύ καὶ τρί-
γωνον· εἶναι δὲ τὴν μὲν μονάδα λαβεῖν καὶ μέγεθος,
τὰ δ' ἕτερα δεικνύναι.

Ἔστι δ' ὧν χρῶνται ἐν ταῖς ἀποδεικτικαῖς ἐπιστή-
μας τὰ μὲν ἴδια ἐκάστης ἐπιστήμης τὰ δὲ κοινά,
κοινὰ δὲ κατ' ἀναλογίαν, ἐπεὶ χρήσιμόν γε ὅσον ἐν
40 τῷ ὑπὸ τὴν ἐπιστήμην γένει. ἴδια μὲν οἷον γραμμὴν
εἶναι τοιανδί, καὶ τὸ εὐθύ, κοινὰ δὲ οἷον τὸ ἴσα ἀπὸ
ἴσων ἂν ἀφέλῃ ὅτι ἴσα τὰ λοιπά. ἱκανὸν δ' ἕκαστον
76 b τούτων ὅσον ἐν τῷ γένει· ταῦτ' οὖν ποιήσῃ, κὰν
μὴ κατὰ πάντων λάβῃ ἀλλ' ἐπὶ μεγέθων μόνον, τῷ

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apply to the propositions of mechanics or optics, and arithmetical proofs to those of harmonics.

It is difficult to be certain whether one knows or not ; for it is difficult to be certain whether our knowledge is based upon the principles appropriate to each case—it is this that constitutes true knowledge—or not. We suppose that we have scientific knowledge if we draw an inference from any true and primary premisses, but it is not so ; the inference must be homogeneous with the primary truths of the science.

X. I call “ first principles ” in each genus those facts which cannot be proved. Thus the meaning both of the primary truths and of the attributes demonstrated from them is assumed ; as for their existence, that of the principles must be assumed, but that of the attributes must be proved. *E.g.*, we assume the meaning of “ unit,” “ straight ” and “ triangular ” ; but while we assume the existence of the unit and geometrical magnitude, that of the rest must be proved.

Every science assumes certain principles.

Of the first principles used in the demonstrative sciences some are special to particular sciences, and some are common ; but only in the analogical sense, since each is only to be employed in so far as it is contained in the genus which falls under the science concerned. Special principles are such as that a line, or straightness, is of such-and-such a nature ; common principles are such as that when equals are taken from equals the remainders are equal. Each of these latter truths need only be assumed for the given genus. The effect will be the same for the geometrician if he assumes the truth not universally but only of magnitudes, and for the arithmetician if he assumes

which are either special to it, or special aspects of a common principle.

76 b

δ' ἀριθμητικῶ ἐπ' ἀριθμῶν. ἔστι δ' ἴδια μὲν καὶ
 ᾧ λαμβάνεται εἶναι, περὶ ᾧ ἡ ἐπιστήμη θεωρεῖ τὰ
 5 ὑπάρχοντα καθ' αὐτά, οἷον μονάδας ἢ ἀριθμητική, ἡ
 δὲ γεωμετρία σημεῖα καὶ γραμμάς. ταῦτα γὰρ
 λαμβάνουσι τὸ εἶναι καὶ τοδὶ εἶναι. τὰ δὲ τούτων
 πάθη καθ' αὐτά, τί μὲν σημαίνει ἕκαστον, λαμβά-
 νουσιν, οἷον ἡ μὲν ἀριθμητικὴ τί περιττὸν ἢ ἄρτιον
 ἢ τετράγωνον ἢ κύβος, ἡ δὲ γεωμετρία τί τὸ ἄλογον
 10 ἢ τὸ κεκλάσθαι ἢ νεύειν, ὅτι δ' ἔστι δεικνύουσι διὰ
 τε τῶν κοινῶν καὶ ἐκ τῶν ἀποδεδειγμένων. καὶ ἡ
 ἀστρολογία ὡσαύτως.

Πᾶσα γὰρ ἀποδεικτικὴ ἐπιστήμη περὶ τρία ἐστίν,
 ὅσα τε εἶναι τίθεται (ταῦτα δ' ἐστὶ τὸ γένος, οὗ τῶν
 καθ' αὐτὰ παθημάτων ἐστὶ θεωρητική), καὶ τὰ
 κοινὰ λεγόμενα ἀξιώματα, ἐξ ὧν πρώτων ἀποδείκ-
 15 ννσι, καὶ τρίτον τὰ πάθη, ὧν τί σημαίνει ἕκαστον
 λαμβάνει. ἐνίας μέντοι ἐπιστήμας οὐδὲν κωλύει
 ἔνια τούτων παρορᾶν, οἷον τὸ γένος μὴ ὑποτίθεσθαι
 εἶναι ἂν ἢ φανερόν ὅτι ἔστιν (οὐ γὰρ ὁμοίως δῆλον
 ὅτι ἀριθμὸς ἔστι καὶ ὅτι ψυχρὸν καὶ θερμόν), καὶ
 20 τὰ πάθη μὴ λαμβάνειν τί σημαίνει ἂν ἢ δῆλα·
 ὥσπερ οὐδὲ τὰ κοινὰ οὐ λαμβάνει τί σημαίνει τὸ
 ἴσα ἀπὸ ἴσων ἀφελεῖν, ὅτι γνώριμον. ἀλλ' οὐδὲν
 ἦττον τῇ γε φύσει τρία ταῦτά ἐστι, περὶ ὃ τε δείκ-
 ννσι καὶ ᾧ δείκννσι καὶ ἐξ ὧν.

Οὐκ ἔστι δ' ὑπόθεσις οὐδ' αἴτημα ὃ ἀνάγκη
 εἶναι δι' αὐτὸ καὶ δοκεῖν ἀνάγκη. οὐ γὰρ πρὸς τὸν

^a νεύειν is used technically of a straight line's tending, when produced, to pass through a given point. The term is unimportant and scarcely appropriate here; I suggest a more general sense.

^b They are common only by analogy; cf. 75 a 38. Ross compares *Met.* 1005 a 20 τὰ ἐν τοῖς μαθήμασι καλούμενα ἀξιώ-

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it only of numbers. Also special to each science are those subjects whose existence it assumes, and whose essential attributes it studies, as arithmetic studies units and geometry points and lines. Of these subjects both the existence and the meaning are assumed; but of their essential attributes only the meaning is assumed. *E.g.*, arithmetic assumes the meaning of odd or even or square or cube, and geometry that of incommensurable or of deflection or inclination^a; but their existence is proved by means of the common principles and from conclusions already demonstrated. The same is true of astronomy.

Every demonstrative science is concerned with three things: the subjects which it posits (*i.e.*, the genus whose essential attributes it studies), the so-called^b common axioms upon which the demonstration is ultimately based, and thirdly the attributes whose several meanings it assumes. There is no reason, however, why certain sciences should not disregard some of these three things; *e.g.*, omit to posit the existence of the genus if its existence is evident (for the existence of number is not so obvious as that of hot and cold), or to assume the meaning of the attributes if it is quite clear; just as in the case of the common principles the meaning of "when equals are subtracted from equals the remainders are equal" is not assumed, because it is well known. Nevertheless there holds good this natural threefold division into the subject, the object, and the basis of demonstration.

That which is in itself necessarily true and must be thought to be so is not a hypothesis nor a postulate; *ματα*. If the term was generally accepted by mathematicians in Aristotle's time, it was abandoned by Euclid.

Thus there are three kinds of primary premiss, though not all need be explicitly assumed.

Axioms, hypotheses and postulates.

76 b

- 25 ἔξω λόγον ἢ ἀπόδειξις, ἀλλὰ πρὸς τὸν ἐν τῇ ψυχῇ,
ἐπεὶ οὐδὲ συλλογισμός. αἰεὶ γὰρ ἔστιν ἐνστήναι
πρὸς τὸν ἔξω λόγον, ἀλλὰ πρὸς τὸν ἔσω λόγον οὐκ
αἰεὶ. ὅσα μὲν οὖν δεικτὰ ὄντα λαμβάνει αὐτὸς μὴ
δείξας, ταῦτ', ἐὰν μὲν δοκοῦντα λαμβάνῃ τῷ μαν-
θάνοντι, ὑποτίθεται, καὶ ἔστιν οὐχ ἀπλῶς ὑπόθεσις
30 ἀλλὰ πρὸς ἐκείνον μόνον, ἃν δὲ ἡ μηδεμιᾶς ἐνούσης
δόξης ἢ καὶ ἐναντίας ἐνούσης λαμβάνῃ τὸ αὐτό,
αἰτεῖται. καὶ τούτῳ διαφέρει ὑπόθεσις καὶ αἴτημα.
ἔστι γὰρ αἴτημα τὸ ὑπεναντίον τοῦ μανθάνοντος τῇ
δόξῃ, ἢ ὃ ἂν τις ἀποδεικτὸν ὄν λαμβάνῃ καὶ χρήται
μὴ δείξας.
- 35 Οἱ μὲν οὖν ὅροι οὐκ εἰσὶν ὑποθέσεις (οὐδὲν¹ γὰρ
εἶναι ἢ μὴ εἶναι λέγεται²), ἀλλ' ἐν ταῖς προτάσεσιν
αἱ ὑποθέσεις. τοὺς δ' ὅρους μόνον ξυνίεσθαι δεῖ.
τοῦτο δ' οὐχ ὑπόθεσις, εἰ μὴ καὶ τὸ ἀκούειν ὑπό-
θεσίν τις φήσειεν εἶναι, ἀλλ' ὅσων ὄντων τῷ ἐκείνα
εἶναι γίγνεται τὸ συμπέρασμα. οὐδ' ὁ γεωμέτρης
40 ψευδῇ ὑποτίθεται, ὥσπερ τινὲς ἔφασαν, λέγοντες ὡς
οὐ δεῖ τῷ ψεύδει χρῆσθαι, τὸν δὲ γεωμέτρην ψεύδε-
σθαι λέγοντα ποδιαίαν τὴν οὐ ποδιαίαν ἢ εὐθείαν
77 a τὴν γεγραμμένην οὐκ εὐθείαν οὖσαν. ὁ δὲ γεωμέ-
τρης οὐδὲν συμπεραίνεται τῷ τήνδε εἶναι γραμμὴν
ἣν αὐτὸς ἔφθεγκται, ἀλλὰ τὰ διὰ τούτων δηλούμενα.

¹ οὐδὲν ABdn, Philoponus : οὐδὲ B²C.² Ross : λέγονται.

^a The axioms used in demonstration appeal directly to the inner reason and are accepted by it, but the assumptions of spoken argument or instruction are always open to verbal objection.

^b There is perhaps a reference to the narrower sense of hypothesis given in 72 a 18 ff.

^c I doubt whether " two definitions of αἴτημα are offered "

for demonstration, like syllogism, is concerned not with external but with internal discourse ; and it is always possible to object to the former, but not always possible to do so to the latter.^a Thus any provable proposition that a teacher assumes without proving it, if the student accepts it, is a hypothesis—a hypothesis not absolutely but relatively to the student^b ; but the same assumption, if it is made when the student has no opinion or a contrary opinion about it, is a postulate. This is the difference between a hypothesis and a postulate ; the latter is the contrary of the student's opinion, or any provable proposition that is assumed and used without being proved.^c

Definitions are not hypotheses, because they make no assertion of existence or non-existence. Hypotheses have their place among propositions, whereas definitions only need to be understood ; and this does not constitute a hypothesis, unless it is claimed that listening is a kind of hypothesis.^d Hypotheses consist of assumptions from which the conclusion follows in virtue of their being what they are. Thus the geometrician's hypotheses are not false, as some have maintained, saying that one should not make use of falsehood, and that the geometrician is guilty of falsehood in asserting that the line which he has drawn is a foot long, or straight, when it is not ; the geometrician does not infer anything from the existence of the particular line which he himself has mentioned, but only from the facts which his diagrams

Definition
disting-
guished
from hypo-
thesis.

here, as Ross concludes. What Aristotle appears to say is that any provable but unproved assumption is a postulate unless it is accepted by the respondent, when it becomes (relatively to him) a hypothesis.

^a If the qualification is not entirely sarcastic it may hint that listening implies some degree of acceptance.

77 a

ἔτι τὸ αἴτημα καὶ ὑπόθεσις πᾶσα ἢ ὡς ὅλον ἢ ὡς ἐν μέρει, οἱ δ' ὅροι οὐδέτερον τούτων.

- 5 XI. Εἶδη μὲν οὖν εἶναι ἢ ἐν τι παρὰ τὰ πολλὰ οὐκ ἀνάγκη, εἰ ἀπόδειξις ἔσται, εἶναι μέντοι ἐν κατὰ πολλῶν ἀληθὲς εἰπεῖν ἀνάγκη· οὐ γὰρ ἔσται τὸ καθόλου ἂν μὴ τοῦτο ἦ· ἐὰν δὲ τὸ καθόλου μὴ ἦ, τὸ μέσον οὐκ ἔσται, ὥστ' οὐδ' ἀπόδειξις. δεῖ ἄρα τι ἐν καὶ τὸ αὐτὸ ἐπὶ πλειόνων εἶναι μὴ ὁμώ-
νυμον.¹
- 10 Τὸ δὲ μὴ ἐνδέχεσθαι ἅμα φάναι καὶ ἀποφάναι οὐδεμία λαμβάνει ἀπόδειξις ἀλλ' ἢ ἐὰν δέῃ δεῖξαι καὶ τὸ συμπέρασμα οὕτως. δείκνυται δὲ λαβοῦσι τὸ πρῶτον κατὰ τοῦ μέσου ὅτι ἀληθές, ἀποφάναι δ' οὐκ ἀληθές. τὸ δὲ μέσον οὐδὲν διαφέρει εἶναι καὶ
- 15 μὴ εἶναι λαβεῖν, ὡς δ' αὐτως καὶ τὸ τρίτον. εἰ γὰρ ἐδόθη καθ' οὗ ἄνθρωπον ἀληθὲς εἰπεῖν—εἰ καὶ μὴ ἄνθρωπον ἀληθές, ἀλλ' εἰ μόνον ἄνθρωπον—ζῶον εἶναι, μὴ ζῶον δὲ μὴ, ἔσται [γὰρ]² ἀληθὲς εἰπεῖν Καλλίαν, εἰ καὶ μὴ Καλλίαν, ὅμως ζῶον, μὴ ζῶον δ' οὐ. αἴτιον δ' ὅτι τὸ πρῶτον οὐ μόνον κατὰ τοῦ
- 20 μέσου λέγεται ἀλλὰ καὶ κατ' ἄλλου διὰ τὸ εἶναι ἐπὶ πλειόνων, ὥστ' οὐδ' εἰ τὸ μέσον καὶ αὐτό ἐστι καὶ μὴ αὐτό, πρὸς τὸ συμπέρασμα οὐδὲν διαφέρει.

¹ εἶδη μὲν οὖν . . . ὁμώνυμον ad 83 a 35 transponenda ci. Ross.

² secluserit Ross.

^a Cf. *An. Pr.* 49 b 35, *Met.* 1078 a 20.

^b Aristotle's objection to the Platonic Forms is that they exist independently of particulars, whereas his own universals are abstractions. The paragraph seems to be displaced. Ross would transfer it to 83 a 35.

^c Because the middle must be distributed in at least one premiss.

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illustrate.^a Further, all postulates and hypotheses are either universal or particular, whereas definitions are neither.

✓ XI. It is not necessary, in order to make demonstration possible, that there should be Forms or some One apart from the Many^b; but it is necessary that it should be true to state a single predicate of a plurality of subjects. Otherwise there will be no universal term; and if there is no universal there will be no middle term,^c and hence no demonstration. Therefore there must be something which is one and the same above the several particulars, and does not merely share a common name with them.^d

Demonstration needs universals, but not Forms.

No demonstration makes use of the principle that simultaneous assertion and negation are impossible, unless it is required to prove the conclusion also in this form.^e The proof is effected by assuming that it is true to assert and not true to deny the first term of the middle. It makes no difference to add the negation of the contradictory to the middle or to the third term. For if it is granted that whatever is truly called "man" is truly called an animal—even if "not-man" is also truly called an animal, provided only that it is true that man is an animal, and not true that he is not an animal—it will be true to call Callias an animal even if it is true to call not-Callias an animal, and it will not be true to call him not-animal. The reason for this is that the first term is stated not only of the middle but also of another term or terms, because it has a wider extension; so that even if the middle term is both itself and its contradictory the conclusion is unaffected.

How demonstration uses the Law of Contradiction

^a Sc., without sharing their common character.

^e In the form "C is A and not not-A."

77 a

Τὸ δ' ἅπαν φάναι ἢ ἀποφάναι ἢ εἰς τὸ ἀδύνατον ἀποδείξαι λαμβάνει, καὶ ταῦτα οὐδ' αἰεὶ καθόλου, ἀλλ' ὅσον ἱκανόν, ἱκανὸν δ' ἐπὶ τοῦ γένους. λέγω
 25 δ' ἐπὶ τοῦ γένους οἷον περὶ ὃ γένος τὰς ἀποδείξεις φέρει, ὥσπερ εἴρηται καὶ πρότερον.

Ἐπικοινωνοῦσι δὲ πᾶσαι αἱ ἐπιστήμαι ἀλλήλαις κατὰ τὰ κοινὰ (κοινὰ δὲ λέγω οἷς χρῶνται ὡς ἐκ τούτων ἀποδεικνύντες, ἀλλ' οὐ περὶ ὧν δεικνύουσιν οὐδ' ὃ δεικνύουσι), καὶ ἡ διαλεκτικὴ πᾶσαις, καὶ εἴ
 30 τις καθόλου πειρῶτο δεικνύναι τὰ κοινὰ, οἷον ὅτι ἅπαν φάναι ἢ ἀποφάναι, ἢ ὅτι ἴσα ἀπὸ ἴσων, ἢ τῶν τοιούτων ἄττα. ἡ δὲ διαλεκτικὴ οὐκ ἔστιν οὕτως ὀρισμένων τινῶν, οὐδὲ γένους τινὸς ἐνός. οὐ γὰρ ἂν ἡρώτα· ἀποδεικνύντα γὰρ οὐκ ἔστιν ἐρωτᾶν διὰ τὸ τῶν ἀντικειμένων ὄντων μὴ δείκνυσθαι τὸ αὐτό.
 35 δέδεικται δὲ τοῦτο ἐν τοῖς περὶ συλλογισμοῦ.

XII. Εἰ δὲ τὸ αὐτὸ ἔστιν ἐρώτημα συλλογιστικὸν καὶ πρότασις ἀντιφάσεως, προτάσεις δὲ καθ' ἑκάσ-

^a 76 a 42.

^b The reference is probably to *An. Pr.* 57 b 4 ff. Dialectic proceeds by interrogation, giving the opponent an open choice between opposite answers, either of which it is prepared to attack. Science is concerned with the proof of facts; and since the same conclusion cannot be correctly inferred from opposite data, the "questions" of science offer no real choice, because only the right answer will furnish a true premiss for the required proof.

^c By "syllogistic question" Aristotle means the interrogative form of an affirmative or negative premiss from which it is proposed to draw a scientific conclusion. Since (as we

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The law that either the assertion or the negation of every predicate must be true is used in demonstration by *reductio ad impossibile*. It is not always applied universally, but only so far as is sufficient, *i.e.*, in reference to the genus. By "in reference to the genus" I mean, *e.g.*, as regards the genus which is the subject of the demonstrations in question, as we have observed above.^a

and the Law
of Excluded
Middle.

All the sciences share with one another in the use of the common principles. By "common principles" I mean what they use for the purpose of demonstration, not the subjects about which they conduct their proofs, nor the connexions which they prove. Dialectic shares the principles of all the other sciences; and so too would any science which might attempt to prove universally the common principles, *e.g.*, that either the assertion or the negation of every predicate is true, or that equals subtracted from equals leave equal remainders, or any other axioms of this kind. But dialectic has no sphere thus defined, nor is it concerned with any one class of objects. If it were, it would not proceed by interrogation; for interrogation is impossible in demonstration, since the opposite facts do not allow proof of the same result. This has been explained in my treatise on the syllogism.^b

All the
sciences,
and dia-
lectic too,
use the
common
axioms.

XII. If a syllogistic question is the same as a proposition stating one half of a contradiction,^c and every science has its own premisses from which are

Every
science has
its proper
questions.

have seen) only the right answer will serve, Ross regards *ἐρώτημα* as meaning "assumption" in this chapter. But Aristotle seems (to judge from the context and the examples quoted below) to be thinking of discussion rather than formal demonstration, so that the normal sense should perhaps be preferred.

77 a

την ἐπιστήμην ἐξ ὧν ὁ συλλογισμὸς ὁ καθ' ἐκάστην,
 εἷη ἂν τι ἐρώτημα ἐπιστημονικόν, ἐξ ὧν ὁ καθ'
 40 ἐκάστην οἰκείως γίνγεται συλλογισμός. δῆλον ἄρα
 ὅτι οὐ πᾶν ἐρώτημα γεωμετρικὸν ἂν εἷη οὐδ' ἰατρι-
 77 b κόν, ὁμοίως δὲ καὶ ἐπὶ τῶν ἄλλων· ἀλλ' ἐξ ὧν¹
 δείκνυται τι περὶ ὧν ἡ γεωμετρία ἐστίν, ἢ ἃ² ἐκ
 τῶν αὐτῶν δείκνυται τῇ γεωμετρίας, ὥσπερ τὰ ὀπ-
 τικά. ὁμοίως δὲ καὶ ἐπὶ τῶν ἄλλων. καὶ περὶ
 μὲν τούτων καὶ λόγον ὑφεκτέον ἐκ τῶν γεωμετρικῶν
 5 ἀρχῶν καὶ συμπερασμάτων, περὶ δὲ τῶν ἀρχῶν
 λόγον οὐχ ὑφεκτέον τῷ γεωμέτρῃ ἢ γεωμέτρῃς·
 ὁμοίως δὲ καὶ ἐπὶ τῶν ἄλλων ἐπιστημῶν.

Οὐτε πᾶν ἄρα ἕκαστον ἐπιστήμονα ἐρώτημα ἐρω-
 τητέον, οὔθ' ἅπαν τὸ ἐρωτώμενον ἀποκριτέον περὶ
 ἐκάστου, ἀλλὰ τὰ κατὰ τὴν ἐπιστήμην διορισθέντα.
 10 εἰ δὲ διαλέξεται γεωμέτρῃ ἢ γεωμέτρῃς οὕτως,
 φανερόν ὅτι καὶ καλῶς, εἰς ἐκ τούτων τι δεικνύη·
 εἰ δὲ μή, οὐ καλῶς. δῆλον δ' ὅτι οὐδ' ἐλέγχει
 γεωμέτρην ἀλλ' ἢ κατὰ συμβεβηκός· ὥστ' οὐκ ἂν
 εἷη ἐν ἀγεωμετρήτοις περὶ γεωμετρίας διαλεκτέον·
 λήσει γὰρ ὁ φαύλως διαλεγόμενος. ὁμοίως δὲ καὶ
 15 ἐπὶ τῶν ἄλλων ἔχει ἐπιστημῶν.

Ἐπεὶ δ' ἔστι γεωμετρικὰ ἐρωτήματα, ἂρ' ἔστι
 καὶ ἀγεωμέτρητα; καὶ παρ' ἐκάστην ἐπιστήμην
 τὰ κατὰ τὴν ἄγνοιαν τὴν ποίαν³ γεωμετρικά

¹ ὧν ἢ ABCd.² om. ABC²d.³ ποίαν A², Philoponus : ποιάν.

^a Because the principles of a science are assumed, not proved, by that science.

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drawn the conclusions proper to that science, then there must be a scientific question corresponding to the premisses from which the conclusions proper to science are drawn. Hence it is clear that not every question will be geometrical (or medical, and similarly with the other sciences), but only those which correspond to the grounds for the proof of geometrical theorems, or the theorems of any science, such as optics, which uses for its proofs the same axioms as geometry (and similarly with the other sciences). Of these questions the geometrician must give an account, based upon the principles and conclusions of geometry; but he need not, as a geometrician, account for the principles ^a (and similarly with the other sciences).

Hence we must not ask every question of each individual expert, nor is the expert bound to answer everything that is asked him about each given subject, but only such questions as fall within the scope of his own science. If in arguing with a geometrician *qua* geometrician one argues by proving any given point from geometrical principles, evidently he will be arguing properly; otherwise he will not. It is clear also that in the latter case one cannot refute a geometrician, except accidentally.^b Therefore one should not discuss geometry among people who are not geometricians, because they will not recognize an unsound argument. The same applies to all other sciences.

Since there are geometrical questions, are there also ungeometrical questions? In any given science (*e.g.* geometry), what sort of ignorance is it that

Sources of
Error in
scientific
reasoning.

^b Because *qua* geometrician he can only be refuted by a geometrical argument.

77 b

ἐστιν;¹ καὶ πότερον ὁ κατὰ τὴν ἄγνοιαν συλλογισ-
 20 μὸς ὁ ἐκ τῶν ἀντικειμένων συλλογισμὸς, ἢ ὁ² παρα-
 λογισμὸς, κατὰ γεωμετρίαν δέ; ἢ ἐξ ἄλλης τέχνης,
 οἷον τὸ μουσικόν ἐστιν ἐρώτημα ἀγεωμέτρητον
 περὶ γεωμετρίας, τὸ δὲ τὰς παραλλήλους συμπί-
 πτειν οἶεσθαι γεωμετρικόν πως καὶ ἀγεωμέτρητον
 25 μόν, καὶ τὸ μὲν ἕτερον ἀγεωμέτρητον τῷ μὴ ἔχειν
 [ὥσπερ τὸ ἄρρυθμον],³ τὸ δ' ἕτερον τῷ φαύλως
 ἔχειν· καὶ ἡ ἄγνοια αὕτη καὶ⁴ ἡ ἐκ τῶν τοιούτων
 ἀρχῶν ἐναντία. ἐν δὲ τοῖς μαθήμασιν οὐκ ἔστιν
 ὁμοίως ὁ παραλογισμὸς, ὅτι τὸ μέσον ἐστὶν αἰεὶ τὸ⁵
 διττόν· κατὰ τε γὰρ τούτου παντός, καὶ τοῦτο πάλιν
 30 κατ' ἄλλου λέγεται παντός· τὸ δὲ κατηγορούμενον
 οὐ λέγεται πᾶν. ταῦτα δ' ἐστὶν οἷον ὁρᾶν τῇ νοήσει,
 ἐν δὲ τοῖς λόγοις λανθάνει. ἄρα πᾶς κύκλος σχῆμα;
 ἂν δὲ γράψῃ, δῆλον. τί δέ; τὰ ἔπη κύκλος; φανε-
 ρὸν ὅτι οὐκ ἔστιν.

Οὐ δεῖ δ' ἔνστασιν εἰς αὐτὸ φέρειν ἐν ᾧ⁶ ἡ πρό-

¹ ἐστιν καὶ ἀγεωμέτρητα *f*: ἐστιν ἢ ἀγεωμέτρητα Bekker.

² ὁ om. Cn.

³ secl. Mure.

⁴ καὶ om. Aldina, Bekker.

⁵ om. C²d.

⁶ ἐν ᾧ ci. Ross, leg. fort. comm.: ἂν ᾧ.

^a i.e. relevant although mistaken. A "question" may be (a) proper to a given science, but "ignorant" because based (1) on false premisses or (2) false inference from true premisses, or (b) proper to a quite different science.

^b Cf. *Met.* 1022 b 35.

makes questions still geometrical? ^a Is an ignorant conclusion one which is drawn from premisses opposite to the true ones, or an inference which though invalid is nevertheless geometrical? Or is it an inference drawn from a different science, as, *e.g.*, a musical question is ungeometrical with reference to geometry, while to think that parallel lines meet is in a sense geometrical, although in another sense ungeometrical? (For "ungeometrical," like "unrhythmical," has two senses; in one sense a thing is ungeometrical because it lacks the quality altogether, and in another sense because it possesses the quality but slightly.^b) It is ignorance in this latter sense, *i.e.*, ignorance which proceeds from premisses of this kind,^c which is contrary to scientific knowledge. In mathematics formal invalidity is not so common, because it is always the middle term that provides the ambiguity (for one term is predicated of all the middle, and this in turn is predicated of all another, but the predicate is not distributed^d); and in mathematics middle terms are clearly visualized whereas ambiguities pass unnoticed in dialectical argument. "Is every circle a figure?" If one draws a circle the answer is obvious. "Well, are the epic poems ^e a circle?" Evidently they are not.

One should not meet an argument with an objec- Objections

^a Exhibiting defective knowledge of the right science.

^d Aristotle is thinking of a syllogism in Barbara, the only figure useful for demonstration.

^e The Epic Cycle was the name given to a sequence of early epic poems which, supplementing the *Iliad* and *Odyssey*, narrated the whole story of the Trojan War (and perhaps also the legends connected with Thebes). To call this "cycle" a "circle" would be an absurd quibble, although the words are the same in Greek.

77 b

35 τασις ἐπακτική. ὥσπερ γὰρ οὐδὲ πρότασις ἐστὶν ἢ μὴ ἐστὶν ἐπὶ πλειόνων (οὐ γὰρ ἔσται ἐπὶ πάντων, ἐκ τῶν καθόλου δ' ὁ συλλογισμός), δῆλον ὅτι οὐδ' ἐνστασις. αἱ αὐταὶ γὰρ προτάσεις καὶ ἐνστάσεις· ἦν γὰρ φέρει ἐνστασιν, αὕτη γένοιτ' ἂν πρότασις ἢ ἀποδεικτική ἢ διαλεκτική.

40 Συμβαίνει δ' ἐνίοις ἀσυλλογίστως λέγειν διὰ τὸ λαμβάνειν ἀμφοτέροις τὰ ἐπόμενα, οἷον καὶ ὁ

78 a Καίνεὺς ποιεῖ, ὅτι τὸ πῦρ ἐν τῇ πολλαπλασίᾳ ἀναλογία· καὶ γὰρ τὸ πῦρ ταχὺ γεννᾶται, ὥς φησι, καὶ αὕτη ἡ ἀναλογία. οὕτω δ' οὐκ ἔστι συλλογισμός· ἀλλ' εἰ τῇ ταχίστῃ ἀναλογίᾳ ἔπεται ἡ πολλαπλάσιος καὶ τῷ πυρὶ ἡ ταχίστῃ ἐν τῇ κινήσει ἀναλογία. ἐνίστε μὲν οὖν οὐκ ἐνδέχεται συλλογίσασθαι ἐκ τῶν εἰλημμένων, ὅτε δ' ἐνδέχεται, ἀλλ' οὐχ ὁράται.

Εἰ δ' ἦν ἀδύνατον ἐκ ψεύδους ἀληθὲς δεῖξαι, ῥάδιον ἂν ἦν τὸ ἀναλύειν· ἀντέστρεφε γὰρ ἂν ἔξ ἀνάγκης. ἔστω γὰρ τὸ Α ὄν· τούτου δ' ὄντος ταδὶ

10 ἔστιν, ἃ οἶδα ὅτι ἔστιν, οἷον τὸ Β. ἐκ τούτων ἄρα δείξω ὅτι ἔστιν ἐκεῖνο. ἀντιστρέφει δὲ μᾶλλον τὰ

^a For "objections" see *An. Pr.* 69 a 37 ff. There particular objections are admitted as logically possible; here they are excluded because we are dealing with scientific demonstration, in which any objection must be capable of serving as premiss in a fresh proof. The reading adopted here seems to be that of the commentators and gives a better sense than the vulgate.

^b Sc. "as middles in the second figure," and undistributed middles at that. It is in fact a common type of paralogism. Aristotle goes on to show how the terms must be related to give a valid conclusion in the first figure. Caeneus may be the Lapith in Antiphanes' play of that name, but he may

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tion in which the <minor> premiss is inductive.^a Just as a premiss which does not hold good of more than one case is no true premiss (because it will not hold good of all cases, and syllogism proceeds from universal judgements), so an objection of this nature is no true objection. Premises and objections are the same, in that any objection which is brought may become a premiss, either demonstrative or dialectical.

must not be inductive.

We find that some persons argue fallaciously through taking consequents of both terms^b; as Caeneus does in maintaining that fire spreads in geometrical progression, on the ground that both fire and this kind of progression increase rapidly. But with these conditions there is no syllogism; only if the most rapid rate of increase implies geometrical proportion, and fire in its motion implies the most rapid rate of increase. Sometimes it is not possible to draw an inference from the assumptions; sometimes it is possible,^c but the method of procedure is overlooked.

Paralogism in the second figure.

If it were impossible to prove a true conclusion from false premisses,^d analysis would be easy; because conclusion and premisses would necessarily reciprocate. Let A be a real fact, whose reality implies that of certain other facts, *e.g.*, B, which I know to be real; then from the latter I will prove the existence of A. Reciprocation is more usual in

Error in the analysis of problems.

equally well have been a real person, though unknown to us.

^c If the major premiss is convertible.

^d But it is not: *An. Pr.* II. ii-iv. The analysis in question is the analysis of a problem, *i.e.* the discovery of the premisses necessary to prove a given conclusion. *Cf. Eth. Nic.* 1112 b 20 ff.

78 a

ἐν τοῖς μαθήμασιν, ὅτι οὐδὲν συμβεβηκὸς λαμβάνουσιν (ἀλλὰ καὶ τούτῳ διαφέρουσι τῶν ἐν τοῖς διαλόγοις) ἀλλ' ὀρισμούς.

Αὐξεται δ' οὐ διὰ τῶν μέσων, ἀλλὰ τῷ προσλαμ-
 15 βάνειν, οἷον τὸ Α τοῦ Β, τοῦτο δὲ τοῦ Γ, πάλιν
 τοῦτο τοῦ Δ, καὶ τοῦτ' εἰς ἄπειρον· καὶ εἰς τὸ
 πλάγιον, οἷον τὸ Α καὶ κατὰ τοῦ Γ καὶ κατὰ τοῦ
 Ε, οἷον ἔστιν ἀριθμὸς ποσὸς ἢ καὶ ἄπειρος τοῦτο
 ἐφ' ᾧ Α, ὁ περιττὸς ἀριθμὸς ποσὸς ἐφ' οὗ Β,
 ἀριθμὸς περιττὸς ἐφ' οὗ Γ· ἔστιν ἄρα τὸ Α κατὰ
 20 τοῦ Γ. καὶ ἔστιν ὁ ἄρτιος ποσὸς ἀριθμὸς ἐφ' οὗ
 Δ, ὁ ἄρτιος ἀριθμὸς ἐφ' οὗ Ε· ἔστιν ἄρα τὸ Α
 κατὰ τοῦ Ε.

XIII. Τὸ δ' ὅτι διαφέρει καὶ τὸ διότι ἐπίστασθαι,
 πρῶτον μὲν ἐν τῇ αὐτῇ ἐπιστήμῃ, καὶ ἐν ταύτῃ
 διχῶς, ἓνα μὲν τρόπον ἔαν μὴ δι' ἀμέσων γίγνηται
 25 ὁ συλλογισμὸς (οὐ γὰρ λαμβάνεται τὸ πρῶτον αἷτιον,
 ἢ δὲ τοῦ διότι ἐπιστήμη κατὰ τὸ πρῶτον αἷτιον),
 ἄλλον δὲ εἰ δι' ἀμέσων μὲν, ἀλλὰ μὴ διὰ τοῦ αἰτίου
 ἀλλὰ τῶν ἀντιστρεφόντων διὰ τοῦ γνωριμωτέρου.
 κωλύει γὰρ οὐδὲν τῶν ἀντικατηγορουμένων γνω-
 ριμώτερον εἶναι ἐνίοτε τὸ μὴ αἷτιον, ὥστ' ἔσται διὰ
 30 τούτου ἢ ἀπόδειξις, οἷον ὅτι ἐγγὺς οἱ πλάνητες διὰ
 τοῦ μὴ στίλβειν. ἔστω ἐφ' ᾧ Γ πλάνητες, ἐφ' ᾧ Β
 τὸ μὴ στίλβειν, ἐφ' ᾧ Α τὸ ἐγγὺς εἶναι. ἀληθὲς δὴ
 τὸ Β κατὰ τοῦ Γ εἰπεῖν· οἱ γὰρ πλάνητες οὐ στίλ-
 βουσιν. ἀλλὰ καὶ τὸ Α κατὰ τοῦ Β· τὸ γὰρ μὴ

^a Cf. 77 b 27.

^b Sc. lower than any which have hitherto been used. In this way the system can be extended downwards. The middle terms of the main system are already established; otherwise it would not be scientific. But it is also possible

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mathematical problems, because mathematics never assumes an accident but only definitions. This is another ^a respect in which mathematics differs from dialectical reasoning.

A science expands not by the interpolation of middle terms but by the addition of extreme terms ^b; Expansion of a science.
e.g., A is predicated of B, and the latter of C, and this again of D, and so *ad infinitum*. It may also be extended laterally; *e.g.*, A may be predicated of both C and E. For example, A is number (determinate or indeterminate), B is determinate odd number, C is a particular odd number; then A is predicable of C. Again, D is determinate even number, and E a particular even number; then A is predicable of E.

✓ XIII. Knowledge of a fact and knowledge of the reason for it differ when both fall under the same science, under several conditions: (1) if the conclusion is not drawn from immediate premisses (for then the proximate cause is not contained in them, and knowledge of the reason depends upon the proximate cause); (2) if the premisses are immediate, but the conclusion is drawn not from the cause but from the more familiar of two convertible terms; for it may well be that of two reciprocally predicable terms that which is not the cause is sometimes the more familiar, so that the demonstration will proceed by it; *e.g.*, the proof that the planets are near because they do not twinkle. Let C stand for "planets," B for "not twinkling," and A for "being near." Then it is true to state B of C; because the planets do not twinkle. But it is also true to state A of B; because that which

Knowledge of a fact and knowledge of its reason may differ although both fall under one science.

to extend the system laterally at any stage, as in the example, by linking a fresh minor (E) to a given major (A) by a fresh middle (D).

78 a

35 στίλβον ἐγγύς ἐστι· τοῦτο δ' εἰλήφθω δι' ἐπαγωγῆς ἢ δι' αἰσθήσεως. ἀνάγκη οὖν τὸ Α τῷ Γ ὑπάρχειν, ὥστ' ἀποδέδεικται ὅτι οἱ πλάνητες ἐγγύς εἰσιν. οὗτος οὖν ὁ συλλογισμὸς οὐ τοῦ διότι ἀλλὰ τοῦ ὅτι ἐστίν· οὐ γὰρ διὰ τὸ μὴ στίλβειν ἐγγύς εἰσιν, ἀλλὰ διὰ τὸ ἐγγὺς εἶναι οὐ στίλβουσιν. ἐγχωρεῖ δέ καὶ

40 διὰ θατέρου θάτερον δειχθῆναι, καὶ ἔσται τοῦ διότι
78 b ἢ ἀπόδειξις, οἷον ἔστω τὸ Γ πλάνητες, ἐφ' ᾧ Β τὸ ἐγγύς εἶναι, τὸ Α τὸ μὴ στίλβειν· ὑπάρχει δὴ καὶ τὸ Β τῷ Γ καὶ τὸ Α τῷ Β [τὸ μὴ στίλβειν],¹ ὥστε καὶ τῷ Γ τὸ Α. καὶ ἔστι τοῦ διότι ὁ συλλογισμὸς· εἴληπται γὰρ τὸ πρῶτον αἷτιον. πάλιν ὡς τὴν
5 σελήνην δεικνύουσιν ὅτι σφαιροειδῆς, διὰ τῶν ἀν-
ξήσεων· εἰ γὰρ τὸ αὐξανόμενον οὕτω σφαιροειδές, αὐξάνει δ' ἡ σελήνη, φανερόν ὅτι σφαιροειδῆς· οὕτω μὲν οὖν τοῦ ὅτι γέγονεν ὁ συλλογισμὸς, ἀνάπαλιν δὲ τεθέντος τοῦ μέσου τοῦ διότι· οὐ γὰρ διὰ τὰς αὐξήσεις σφαιροειδῆς ἐστιν, ἀλλὰ διὰ τὸ σφαι-
10 ροειδῆς εἶναι λαμβάνει τὰς αὐξήσεις τοιαύτας. σελήνη ἐφ' ᾧ Γ, σφαιροειδῆς ἐφ' ᾧ Β, αὐξήσεις ἐφ' ᾧ Α.

Ἐφ' ὧν δὲ τὰ μέσα μὴ ἀντιστρέφει καὶ ἔστι γνωριμώτερον τὸ ἀναίτιον, τὸ ὅτι μὲν δείκνυται, τὸ διότι δ' οὔ. ἔτι ἐφ' ὧν τὸ μέσον ἔξω τίθεται· καὶ γὰρ ἐν τούτοις τοῦ ὅτι καὶ οὐ τοῦ διότι ἢ ἀπόδειξις·
15 οὐ γὰρ λέγεται τὸ αἷτιον. οἷον διὰ τί οὐκ ἀναπνεῖ

¹ secl. Ross.^a Sc. as middle.^b Sc. with the majors. This is a corollary to the foregoing case, the difference being that it is no longer possible to establish the reason by converting the major premiss.

does not twinkle is near (this may have been assumed either by induction or through sense-perception). Then A must apply to C ; and so it has been proved that the planets are near. Thus this syllogism proves not the reason but the fact ; for it is not because the planets do not twinkle that they are near, but because they are near that they do not twinkle. (It is possible, however, to prove the middle by means of the major term, and then the demonstration will establish the reason. *E.g.*, let C stand for “ planets,” B for “ being near ” and A for “ not twinkling.” Then B applies to C, and A—[“ not twinkling ”]—to B, and so A also applies to C ; and the syllogism establishes the reason, because the proximate cause has been assumed.^a) Or again as the moon is proved to be spherical from its phases ; for if that which exhibits phases of this kind is spherical, and the moon exhibits phases, it is evident that the moon is spherical. In this form the syllogism proves the fact, but when the middle term is interchanged with the major, we can establish the reason ; for it is not on account of its phases that the moon is spherical, but because it is spherical that it exhibits phases of this kind. C stands for “ moon,” B for “ spherical ” and A for “ phase.”

(3) Where the middle terms are not convertible ^b and that which is not the cause is better known than the cause, the fact can be proved but the reason cannot. (4) This is true also of syllogisms whose middle term falls outside ^c ; in these too the demonstration establishes the fact and not the reason, since the cause is not stated. *E.g.*, why does the wall not

^a In the second figure ; the third, giving no universal conclusion, is useless for demonstration.

78 b

ὁ τοίχος; ὅτι οὐ ζῶον. εἰ γὰρ τοῦτο τοῦ μὴ
 ἀναπνεῖν αἷτιον, ἔδει τὸ ζῶον εἶναι αἷτιον τοῦ ἀνα-
 πνεῖν, οἷον εἰ ἡ ἀπόφασις αἰτία τοῦ μὴ ὑπάρχειν, ἡ
 20 κατὰφασις τοῦ ὑπάρχειν, ὥσπερ εἰ τὸ ἀσύμμετρα
 εἶναι τὰ θερμὰ καὶ ψυχρὰ τοῦ μὴ ὑγιαίνειν, τὸ σύμ-
 μετρα εἶναι τοῦ ὑγιαίνειν· ὁμοίως δὲ καὶ εἰ ἡ κατὰ-
 φασις τοῦ ὑπάρχειν, ἡ ἀπόφασις τοῦ μὴ ὑπάρχειν.
 ἐπὶ δὲ τῶν οὕτως ἀποδοδομένων οὐ συμβαίνει τὸ
 λεχθέν· οὐ γὰρ ἅπαν ἀναπνεῖ ζῶον. ὁ δὲ συλλογισ-
 μὸς γίγνεται τῆς τοιαύτης αἰτίας ἐν τῷ μέσῳ σχή-
 25 ματι. οἷον ἔστω τὸ A ζῶον, ἐφ' οὗ τὸ B τὸ
 ἀναπνεῖν, ἐφ' ᾧ Γ τοίχος. τῷ μὲν οὖν B παντὶ
 ὑπάρχει τὸ A (πάν γὰρ τὸ ἀναπνέον ζῶον), τῷ δὲ
 Γ οὐθενί, ὥστε οὐδὲ τὸ B τῷ Γ οὐθενί· οὐκ ἄρα
 ἀναπνεῖ ὁ τοίχος. εἰκόασι δ' αἱ τοιαῦται τῶν
 αἰτιῶν τοῖς καθ' ὑπερβολὴν εἰρημένοις· τοῦτο δ'
 30 ἔστι τὸ πλέον ἀποστήσαντα τὸ μέσον εἰπεῖν, οἷον
 τὸ τοῦ Ἀναχάρσιος, ὅτι ἐν Σκύθαις οὐκ εἰσὶν αὐλη-
 τρίδες,¹ οὐδὲ γὰρ ἄμπελοι.

Κατὰ μὲν δὴ τὴν αὐτὴν ἐπιστήμην καὶ κατὰ τὴν
 τῶν μέσων θέσιν αὐται διαφοραὶ εἰσιν τοῦ ὅτι πρὸς
 τὸν τοῦ διότι συλλογισμόν· ἄλλον δὲ τρόπον διαφέρει
 35 τὸ διότι τοῦ ὅτι τῷ² δι' ἄλλης ἐπιστήμης ἐκάτερον
 θεωρεῖν. τοιαῦτα δ' ἐστὶν ὅσα οὕτως ἔχει πρὸς

¹ αὐλητρίδες np, Philoponus, Themistius : αὐληταὶ ABCd.

² τῷ np : τὸ.

^a But it is not ; see below.

^b According to Aristotle only warm-blooded animals breathe (cf. *De Resp.* 478 a 28 ff.), so in the example "animal" is too wide a middle term.

breathe? Because it is not an animal. If this were the reason for its not breathing, "being an animal" ought to be the reason for breathing^a; on the principle that if a negative statement gives the reason for an attribute's not applying, the corresponding affirmative statement will give the reason for its applying; *e.g.*, if the disproportion of the hot and cold elements in us is the cause of our not being healthy, their due proportion is the cause of our being healthy. Similarly too if the affirmative statement gives the reason for an attribute's applying, the negative statement will give the reason for its not applying. But in the given instance the conclusion does not follow; for not every animal breathes.^b A syllogism which proves this sort of cause occurs in the middle figure. *E.g.*, let A stand for "animal," B for "respiration" and C for "wall." Then A applies to all B (for everything that breathes is an animal), but to no C, and so neither does B apply to any C. Hence the wall does not breathe. Such causes as these are like far-fetched explanations; I mean stating the middle term in too remote a form, *e.g.*, the dictum of Anacharsis that there are no flute-players among the Scythians because there are no vines.^c

These, then, are the differences between the syllogism which proves the fact and that which proves the reason, within the same science and according to the position of the middle terms. But there is another way in which the fact and the reason differ, *viz.*, in each being studied by a different science. This is true of all subjects which are so related that one is

A fact and its reason may belong to different sciences.

^c The full chain of implication is something like "flute-playing—thirsty work—heavy drinking—wine—grapes—vines." Anacharsis was a Scythian ethnologist of the sixth century B.C. (Herodotus iv. 76).

78 b

ἄλληλα ὥστ' εἶναι θάτερον ὑπὸ θάτερον, οἷον τὰ
 ὀπτικά πρὸς γεωμετρίαν καὶ τὰ μηχανικά πρὸς
 στερεομετρίαν καὶ τὰ ἁρμονικά πρὸς ἀριθμητικὴν
 καὶ τὰ φαινόμενα πρὸς ἀστρολογικὴν. σχεδὸν δὲ
 40 συνώνυμοί εἰσιν εἶναι τούτων τῶν ἐπιστημῶν, οἷον
 79 a ἀστρολογία ἢ τε μαθηματικὴ καὶ ἡ ναυτικὴ, καὶ
 ἁρμονικὴ ἢ τε μαθηματικὴ καὶ ἡ κατὰ τὴν ἀκοήν.
 ἐνταῦθα γὰρ τὸ μὲν ὅτι τῶν αἰσθητικῶν εἰδέναι, τὸ
 δὲ διότι τῶν μαθηματικῶν· οὗτοι γὰρ ἔχουσι τῶν
 αἰτίων τὰς ἀποδείξεις, καὶ πολλάκις οὐκ ἴσασι τὸ
 5 ὅτι, καθάπερ οἱ τὸ καθόλου θεωροῦντες πολλάκις
 εἶναι τῶν καθ' ἕκαστον οὐκ ἴσασι δι' ἀνεπισκεψίαν.
 ἔστι δὲ ταῦτα ὅσα ἕτερόν τι ὄντα τὴν οὐσίαν κέχρη-
 ται τοῖς εἶδεσιν. τὰ γὰρ μαθήματα περὶ εἶδη ἐστίν·
 οὐ γὰρ καθ' ὑποκειμένου τινός· εἰ γὰρ καὶ καθ'
 ὑποκειμένου τινὸς τὰ γεωμετρικά ἐστίν, ἀλλ' οὐχ
 10 ἢ γε καθ' ὑποκειμένου. ἔχει δὲ καὶ πρὸς τὴν
 ὀπτικὴν, ὡς αὕτη πρὸς τὴν γεωμετρίαν, ἄλλη πρὸς
 ταύτην, οἷον τὸ περὶ τῆς ἱριδος· τὸ μὲν γὰρ ὅτι
 φυσικοῦ εἰδέναι, τὸ δὲ διότι ὀπτικοῦ, ἢ ἀπλῶς ἢ
 τοῦ κατὰ τὸ μάθημα. πολλαὶ δὲ καὶ τῶν μὴ ὑπ'
 ἀλλήλας ἐπιστημῶν ἔχουσιν οὕτως, οἷον ἰατρικὴ
 15 πρὸς γεωμετρίαν· ὅτι μὲν γὰρ τὰ ἔλκη τὰ περιφερῆ
 βραδύτερον ὑγιάζεται τοῦ ἱατροῦ εἰδέναι, διότι δὲ
 τοῦ γεωμέτρου.

^a i.e., studied by more than one science.

^b Up to this point it might be supposed that Aristotle recognizes two "levels" of science, concerned respectively with form and with informed matter. It now appears that there are three "levels," the highest studying universals, the lowest particulars, and the other mediating between them.

^c Philoponus offers two explanations: (1) because such

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subordinate to the other, as is the relation of optical problems to plane and of mechanical problems to solid geometry and of harmonical problems to arithmetic and of the study of phenomena to astronomy. Some of these sciences have practically the same name ; *e.g.*, both mathematical and nautical astronomy are called astronomy, and both mathematical and acoustic harmonics are called harmonics. In these cases it is for the collectors of data to know the fact, and for the mathematicians to establish the reason. The latter can demonstrate the causes, whereas they are often ignorant of the fact ; just as those who are studying the universal are often ignorant of some of the particular instances, through lack of thorough investigation. Of this kind ^a are all objects which, while having a separate substantial existence, yet exhibit certain specific forms. For the mathematical sciences are concerned with forms ; they do not confine their demonstrations to a particular substrate. Even if geometrical problems refer to a particular substrate, they do so only incidentally. As optics is related to geometry, so is another science to optics, namely, the study of the rainbow.^b To know the fact of the rainbow's existence is for the natural scientist ; to know the reason is for the optician, either simply as such or as a mathematical optician. Many of the sciences which are not strictly subordinate stand in this relation ; *e.g.*, medicine to geometry. It is for the doctor to know the fact that circular wounds heal more slowly, but it is for the geometrician to know the reason for the fact.^c

wounds have the greatest area in relation to their perimeter, (2) because the healing surfaces are farther apart and nature has difficulty in joining them.

XIV. Τῶν δὲ σχημάτων ἐπιστημονικὸν μάλιστα τὸ πρῶτόν ἐστιν. αἱ τε γὰρ μαθηματικαὶ τῶν ἐπιστημῶν διὰ τούτου φέρουσι τὰς ἀποδείξεις, οἷον
 20 ἀριθμητικὴ καὶ γεωμετρία καὶ ὀπτική, καὶ σχεδὸν ὥς εἰπεῖν ὅσαι τοῦ διότι ποιοῦνται τὴν σκέψιν· ἢ γὰρ ὅλως ἢ ὥς ἐπὶ τὸ πολὺ καὶ ἐν τοῖς πλείστοις διὰ τούτου τοῦ σχήματος ὁ τοῦ διότι συλλογισμός. ὥστε καὶ διὰ τοῦτ' εἶη μάλιστα ἐπιστημονικόν· κυριώτατον γὰρ τοῦ εἰδέναι τὸ διότι θεωρεῖν. εἶτα
 25 τὴν τοῦ τί ἐστιν ἐπιστήμην διὰ μόνου τούτου θηρεῦσαι δυνατόν. ἐν μὲν γὰρ τῷ μέσῳ σχήματι οὐ γίγνεται κατηγορικὸς συλλογισμός, ἢ δὲ τοῦ τί ἐστιν ἐπιστήμη καταφάσεως· ἐν δὲ τῷ ἐσχάτῳ γίγνεται μὲν ἀλλ' οὐ καθόλου, τὸ δὲ τί ἐστὶ τῶν καθόλου ἐστίν· οὐ γὰρ πῇ ἐστὶ ζῶον δίπουν ὁ ἄν-
 30 θρωπος. ἔτι τοῦτο μὲν ἐκείνων οὐδὲν προσδεῖται, ἐκεῖνα δὲ διὰ τούτου καταπυκνοῦνται καὶ αὔξεται, ἕως ἂν εἰς τὰ ἅμεσα ἔλθῃ. φανερόν οὖν ὅτι κυριώτατον τοῦ ἐπίστασθαι τὸ πρῶτον σχῆμα.

XV. Ὡς περ δὲ ὑπάρχειν τὸ A τῷ B ἐνεδέχeto ἀτόμως, οὕτω καὶ μὴ ὑπάρχειν ἐγχωρεῖ. λέγω δὲ
 35 τὸ ἀτόμως ὑπάρχειν ἢ μὴ ὑπάρχειν τὸ μὴ εἶναι αὐτῶν μέσον· οὕτω γὰρ οὐκέτι ἔσται κατ' ἄλλο τὸ ὑπάρχειν ἢ μὴ ὑπάρχειν. ὅταν μὲν οὖν ἢ τὸ A ἢ τὸ B ἐν ὅλῳ τινὶ ᾗ, ἢ καὶ ἁμφῶ, οὐκ ἐνδέχεται τὸ

^a *An. Pr.* I. v.

^b *Ibid.* vi.

^c *Cf. An. Pr.* 29 a 30 ff.

^d 72 b 18-25.

^e i.e., immediately.

^f Aristotle means when (a) A belongs to a genus which excludes B, or (b) B belongs to a genus which excludes A, or (c) A and B belong to different genera. It is not clear whether he intends the fourth case—when A and B belong to the same

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XIV. The most scientific of the figures is the first. Not only do the mathematical sciences, such as arithmetic, geometry and optics, advance their demonstrations by means of this figure, but so, broadly speaking, do practically all sciences which investigate reasons; for it is by this figure, if not universally, at least as a general rule and in most cases, that the syllogism establishing the reason is effected. Hence on this account too the first figure may be regarded as the most scientific; for the most essential part of knowledge is the study of reasons. Further, by this figure alone is it possible to pursue knowledge of the essence; for in the middle figure we get no affirmative conclusion,^a and the knowledge of a thing's essence must be affirmative; while in the last figure we get an affirmative conclusion, but it is not universal,^b whereas the essence belongs to the category of universals; it is not in any particular sense that man is a two-footed animal. Finally the first figure is independent of the others, whereas they are supplemented and augmented by it until immediate premisses are obtained.^c Thus it is evident that the first figure is most essential to knowledge.

XV. Just as A may (as we saw^d) apply atomically^e to B, so also it may not-apply atomically. By applying or not-applying atomically I mean that there is no middle term between them; for in this case the applying or not-applying will no longer depend upon some other term. (1) When either A or B or both are contained in some whole,^f it is impossible that A
 genus—to be included in his formula, or whether he dismisses it as self-evident. He is probably thinking of A and B as species; and if they are different species of the same proximate genus their disconnexion can be proved through one or other of their differentiae.

The first figure is supreme for purposes of science.

Immediate negative propositions, impossible if either term is, or both terms are, contained in a genus,

79 a

Α τῷ Β πρώτως μὴ ὑπάρχειν. ἔστω γὰρ τὸ Α ἐν ὅλῳ τῷ Γ. οὐκοῦν εἰ τὸ Β μὴ ἔστιν ἐν ὅλῳ τῷ Γ
 40 (ἐγχωρεῖ γὰρ τὸ μὲν Α εἶναι ἐν τινι ὅλῳ, τὸ δὲ Β μὴ εἶναι ἐν τούτῳ), συλλογισμὸς ἔσται τοῦ μὴ ὑπάρ-
 79 b χεῖν τὸ Α τῷ Β· εἰ γὰρ τῷ μὲν Α παντὶ τὸ Γ τῷ δὲ Β μηδενί, οὐδενὶ τῷ Β τὸ Α. ὁμοίως δὲ καὶ εἰ τὸ μὲν Β ἐν ὅλῳ τινὶ ἔστιν, οἷον ἐν τῷ Δ· τὸ μὲν γὰρ Δ παντὶ τῷ Β ὑπάρχει, τὸ δὲ Α οὐδενὶ τῷ Δ, ὥστε τὸ Α οὐδενὶ τῷ Β ὑπάρξει διὰ συλλογισμοῦ.
 5 τὸν αὐτὸν δὲ τρόπον δειχθήσεται καὶ εἰ ἄμφω ἐν ὅλῳ τινὶ ἔστιν.

Ὅτι δ' ἐνδέχεται τὸ Β μὴ εἶναι ἐν ᾧ ὅλῳ ἐστὶ τὸ Α, ἢ πάλιν τὸ Α ἐν ᾧ τὸ Β, φανερόν ἐκ τῶν συστοιχιῶν, ὅσαι μὴ ἐπαλλάττουσιν ἀλλήλαις. εἰ γὰρ μηδὲν τῶν ἐν τῇ ΑΓΔ συστοιχία κατὰ μη-
 10 δενὸς κατηγορεῖται τῶν ἐν τῇ ΒΕΖ, τὸ δ' Α ἐν ὅλῳ ἐστὶ τῷ Θ συστοίχῳ ὄντι, φανερόν ὅτι τὸ Β οὐκ ἔσται ἐν τῷ Θ· ἐπαλλάξουσιν γὰρ αἱ συστοιχίαι. ὁμοίως δὲ καὶ εἰ τὸ Β ἐν ὅλῳ τινὶ ἔστιν.

Ἐὰν δὲ μηδέτερον ἢ ἐν ὅλῳ μηδενί, μὴ ὑπάρχειν δὲ τὸ Α τῷ Β, ἀνάγκη ἀτόμως μὴ ὑπάρχειν. εἰ
 15 γὰρ ἔσται τι μέσον, ἀνάγκη θάτερον αὐτῶν ἐν ὅλῳ τινὶ εἶναι· ἢ γὰρ ἐν τῷ πρώτῳ σχήματι ἢ ἐν τῷ μέσῳ ἔσται ὁ συλλογισμός. εἰ μὲν οὖν ἐν τῷ πρώτῳ, τὸ Β ἔσται ἐν ὅλῳ τινὶ (καταφατικὴν γὰρ δεῖ τὴν πρὸς τοῦτο γίνεσθαι πρότασιν), εἰ δ' ἐν τῷ μέσῳ, ὁπότερον ἔτυχεν· πρὸς ἀμφοτέροις γὰρ

¹ τῶν n, Bekker.

^a This again means "immediately."

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should not-apply in the primary sense ^a to B. For let A be contained in the whole of C. Then if B is not contained in the whole of C (for it is possible for A to be contained in a whole although B is not also contained in it), there will be a syllogism proving that A does not apply to B.^b For if C applies to all A but to no B, A will apply to no B. Similarly too if B is contained in some whole, *e.g.*, D; for D applies to all B, and A to no D,^c so that by syllogism A will apply to no B. The proof will take the same form also if both terms are contained in some whole.

That B may not be contained in the whole which contains A, and *vice versa*, will be evident from the consideration of series ^d of mutually exclusive predicates. For if none of the terms in the series ACD is predicable of any of the terms in the series BEF, and A is wholly contained in H, a term in the former series, obviously B will not be contained in H; for then the series would not be mutually exclusive. Similarly too if B is wholly contained in some other term.

On the other hand if neither is wholly contained in any term, and A does not apply to B, it must not-apply atomically. For if there is to be a middle term, one of the terms A and B must be wholly contained in some genus. The syllogism will occur either in the first or in the middle figure. If it occurs in the first, it will be B that is wholly contained in some genus (for the premiss relating to B must be affirmative); if in the middle figure, it will be either A or B indifferently, since we get a syllogism when the negative statement

are possible
if neither
term is so
contained.

^b So the relation of A to B is not atomic.

^c By conversion.

^d Consisting of genera with their species and sub-species.

79 b

20 ληφθέντος τοῦ στερητικοῦ γίνεται συλλογισμός· ἀμφοτέρων δ' ἀποφατικῶν οὐσῶν οὐκ ἔσται.

Φανερόν οὖν ὅτι ἐνδέχεται τε ἄλλο¹ ἄλλω μὴ ὑπάρχειν ἀτόμως, καὶ πότ' ἐνδέχεται καὶ πῶς εἰρήκαμεν.

XVI. Ἄγνοια δ' ἢ μὴ κατ' ἀπόφασιν ἀλλὰ κατὰ διάθεσιν λεγομένη ἔστι μὲν ἢ διὰ συλλογισμοῦ γιγ-
 25 νομένη ἀπάτη, αὕτη δ' ἐν μὲν τοῖς πρώτως ὑπάρ-
 χουσιν ἢ μὴ ὑπάρχουσι συμβαίνει διχῶς· ἢ γὰρ ὅταν ἀπλῶς ὑπολάβῃ ὑπάρχειν ἢ μὴ ὑπάρχειν, ἢ ὅταν διὰ συλλογισμοῦ λάβῃ τὴν ὑπόληψιν. τῆς μὲν οὖν ἀπλῆς ὑπολήψεως ἀπλῇ ἢ ἀπάτῃ, τῆς δὲ διὰ συλλογισμοῦ πλείους. μὴ ὑπαρχέτω γὰρ τὸ Α μῆ-
 30 δενὶ τῷ² Β ἀτόμως· οὐκοῦν ἐὰν συλλογίζηται ὑπάρ-
 χειν τὸ Α τῷ Β, μέσον λαβὼν τὸ Γ, ἡπατημένος ἔσται διὰ συλλογισμοῦ. ἐνδέχεται μὲν οὖν ἀμφο-
 τέρας τὰς προτάσεις εἶναι ψευδεῖς, ἐνδέχεται δὲ τὴν ἑτέραν μόνον. εἰ γὰρ μήτε τὸ Α μῆδεσιν τῶν Γ
 35 ὑπάρχει μήτε τὸ Γ μῆδεσιν τῶν Β, εἴληπται δ' ἑκατέρα ἀνάπαλιν, ἄμφω ψευδεῖς ἔσονται. ἐγχωρεῖ δ' οὕτως ἔχειν τὸ Γ πρὸς τὸ Α καὶ Β ὥστε μήτε ὑπὸ τὸ Α εἶναι μήτε καθόλου τῷ Β. τὸ μὲν γὰρ Β ἀδύνατον εἶναι ἐν ὅλῳ τινί (πρώτως γὰρ ἐλέγετο αὐτῷ τὸ Α μὴ ὑπάρχειν), τὸ δὲ Α οὐκ ἀνάγκη πᾶσι
 40 τοῖς οὖσιν εἶναι καθόλου, ὥστ' ἀμφοτέραι ψευδεῖς. ἀλλὰ καὶ τὴν ἑτέραν ἐνδέχεται ἀληθῆ λαμβάνειν, οὐ
 80 a μέντοι ὅποτέραν ἔτυχεν, ἀλλὰ τὴν ΑΓ· ἢ γὰρ ΓΒ πρότασις αἰεὶ ψευδὴς ἔσται διὰ τὸ ἐν μῆδεσιν εἶναι τὸ Β, τὴν δὲ ΑΓ ἐγχωρεῖ, οἷον εἰ τὸ Α καὶ τῷ Γ

¹ om. Bekker.² τῶν ABCd, Bekker.

is assumed in connexion with either of them, but when both are negative there will be no syllogism.

Thus it is evident that one term may not-apply atomically to another ; and we have explained when and how this is possible.

XVI. Ignorance, considered not in a negative sense but as a positive disposition of mind, is error reached through inference.^a In propositions stating an immediate positive or negative relation it arises in two ways : (a) when we directly suppose ^b that one term applies or does not apply to another, and (b) when we reach this supposition by inference. The error arising from direct supposition is simple, but that which is based on inference takes more than one form. Let A apply atomically to no B. Then if we infer, taking C as the middle, that A applies to B, our error will be based on inference. It is possible either for both premisses or for one only to be false. (i) For if A applies to no C and C to no B, and we have assumed the contrary in each case, both premisses will be false (it is possible for C to be so related to A and B that it neither falls under A nor applies universally to B. For B cannot be wholly contained in a genus, since we stated above ^c that A is directly inapplicable to it ; and A need not necessarily apply universally to everything : hence both premisses are false.) (ii) It is also possible to assume one true premiss : not either premiss indifferently, but AC (the premiss CB will always be false, because B is contained in no genus ; but AC may be true) ; *e.g.*, if A applies

Error in respect of terms immediately related.

(1) Negative relation.

(i) Both premisses false.

(ii) Major true, minor false.

^a This is a hasty statement, and Aristotle proceeds at once to correct it ; but since the direct misapprehension described under (a) does not admit logical analysis he says no more about it and confines his attention to (b).

^b *Sc.* wrongly.

^c b 29.

80 a

καὶ τῷ B ὑπάρχει ἀτόμως. ὅταν γὰρ πρώτως
κατηγορηται ταὐτὸ πλειόνων οὐδέτερον ἐν¹ οὐδε-
5 τέρῳ ἔσται. διαφέρει δ' οὐδέν, οὐδ' εἰ μὴ ἀτόμως
ὑπάρχει.

Ἡ μὲν οὖν τοῦ ὑπάρχειν ἀπάτη διὰ τούτων τε
καὶ οὕτω γίγνεται μόνως (οὐ γὰρ ἦν ἐν ἄλλῳ σχή-
ματι τοῦ ὑπάρχειν συλλογισμός), ἡ δὲ τοῦ μὴ ὑπάρ-
χειν ἐν τε τῷ πρώτῳ καὶ ἐν τῷ μέσῳ σχήματι.
10 πρῶτον οὖν εἰπώμεν ποσαχῶς ἐν τῷ πρώτῳ γιγ-
νεται, καὶ πῶς ἐχουσῶν τῶν προτάσεων.

Ἐνδέχεται μὲν οὖν ἀμφοτέρων ψευδῶν οὐσῶν,
οἷον εἰ τὸ A καὶ τῷ Γ καὶ τῷ B ὑπάρχει ἀτόμως·
ἐὰν γὰρ ληφθῇ τὸ μὲν A τῷ Γ μηδενί, τὸ δὲ Γ
παντὶ τῷ B, ψευδεῖς αἱ προτάσεις. ἐνδέχεται δὲ
15 καὶ τῆς ἐτέρας ψευδοῦς οὔσης, καὶ ταύτης ὅποτέρας
ἔτυχεν. ἐγχωρεῖ γὰρ τὴν μὲν ΑΓ ἀληθῆ εἶναι, τὴν
δὲ ΓΒ ψευδῇ, τὴν μὲν ΑΓ ἀληθῆ, ὅτι οὐ πᾶσι
τοῖς οὐσιν ὑπάρχει τὸ A, τὴν δὲ ΓΒ ψευδῇ ὅτι
ἀδύνατον ὑπάρχειν² τῷ B τὸ Γ, ᾧ μηδενὶ ὑπάρχει
τὸ A· οὐ γὰρ ἔτι ἀληθὴς ἔσται ἡ ΑΓ πρότασις·
20 ἅμα δέ, εἰ καὶ εἰσιν ἀμφοτέραι ἀληθεῖς, καὶ τὸ συμ-
πέρασμα ἔσται ἀληθές. ἀλλὰ καὶ τὴν ΓΒ ἐνδέ-
χεται ἀληθῆ εἶναι τῆς ἐτέρας οὔσης ψευδοῦς, οἷον
εἰ τὸ B καὶ ἐν τῷ Γ καὶ ἐν τῷ A ἐστίν· ἀνάγκη
γὰρ θάτερον ὑπὸ θάτερον εἶναι, ὥστ' ἂν λάβῃ τὸ A
μηδενὶ τῷ Γ ὑπάρχειν, ψευδὴς ἔσται ἡ πρότασις.
25 φανερόν οὖν ὅτι καὶ τῆς ἐτέρας ψευδοῦς οὔσης καὶ
ἀμφοῖν ἔσται ψευδὴς ὁ συλλογισμός.

¹ ἐν om. ABCd, Bekker.

² ὑπάρχει Bekker.

atomically both to C and to B ; for when the same term is immediately predicated of more than one subject, neither of these latter terms will apply to the other. It makes no difference to the result if the relation <of A to C> is not atomic.

Thus erroneous affirmative attribution arises only from these causes and in these conditions (for we have seen ^a that a syllogism proving the <universal> affirmative relation occurs in no other figure); but erroneous negative attribution occurs in the second figure as well as in the first. Let us first state in how many forms it occurs in the first figure and how the premisses are related.

Error is possible (i) when both premisses are false, *e.g.*, if A applies immediately to both C and B ; for if A is assumed to apply to no C, and C to all B, the premisses will be false. (ii) It is possible when either premiss indifferently is false. For AC may be true and CB false : AC true because A does not apply to all things, and CB false because C cannot apply to B when A applies to no C ; for the premiss AC will no longer be true, and moreover, if both premisses are true, the conclusion will also be true. Again, CB may be true, the other premiss being false ; *e.g.*, if B is contained in both C and A. For one of these terms must be subordinate to the other ^b ; so that if we assume that A applies to no C, the premiss will be false. Thus it is evident that the syllogism will be false whether only one of the premisses is false or both are false.

^a *An. Pr.* I. v-vi.

^b A to C ; in the other case A would apply to all C, and therefore by inference to B, whereas it applies immediately to B. In fact, as Ross points out, A and C might be co-ordinate and overlapping.

(2) Affirmative relation.

A. Syllogism in first figure.

(i) Both premisses false.

(ii) One premiss false.

80 a

Ἐν δὲ τῷ μέσῳ σχήματι ὅλας μὲν εἶναι τὰς προ-
τάσεις ἀμφοτέρας ψευδεῖς οὐκ ἐνδέχεται (ὅταν γὰρ
τὸ Α παντὶ τῷ Β ὑπάρχῃ, οὐδὲν ἔσται λαβεῖν ὃ τῷ
30 μὲν ἑτέρῳ παντὶ θατέρῳ δ' οὐδενὶ ὑπάρξει, δεῖ δ'
οὕτω λαμβάνειν τὰς προτάσεις ὥστε τῷ μὲν ὑπάρ-
χειν τῷ δὲ μὴ ὑπάρχειν, εἴπερ ἔσται συλλογισμός·
εἰ οὖν οὕτω λαμβανόμεναι ψευδεῖς, δῆλον ὡς ἐναν-
τίως ἀνάπαλιν ἔξουσι· τοῦτο δ' ἀδύνατον), ἐπὶ τι δ'
ἐκατέραν οὐδὲν κωλύει ψευδῇ εἶναι, οἷον εἰ τὸ Γ
35 καὶ τῷ Α καὶ τῷ Β τινὶ ὑπάρχοι· ἂν γὰρ τῷ μὲν Α
παντὶ ληφθῇ ὑπάρχον τῷ δὲ Β μηδενί, ψευδεῖς μὲν
ἀμφοτέραι αἱ προτάσεις, οὐ μέντοι ὅλαι ἀλλ' ἐπὶ τι.
καὶ ἀνάπαλιν δὲ τεθέντος τοῦ στερητικοῦ ὡσαύτως.
τὴν δ' ἑτέραν εἶναι ψευδῇ καὶ ὅποτερανοῦν ἐν-
40 δέχεται. ὃ γὰρ ὑπάρχει τῷ Α παντί, καὶ τῷ Β
80 b ὑπάρξει· ἐὰν οὖν ληφθῇ τῷ μὲν Α ὅλῳ ὑπάρχειν τὸ
Γ τῷ δὲ Β ὅλῳ μὴ ὑπάρχειν, ἢ μὲν ΓΑ ἀληθὴς
ἔσται, ἢ δὲ ΓΒ ψευδής. πάλιν ὃ τῷ Β μηδενὶ
ὑπάρχει οὐδὲ τῷ Α παντὶ ὑπάρξει· εἰ γὰρ τῷ Α,
καὶ τῷ Β· ἀλλ' οὐχ ὑπῆρχεν. ἐὰν οὖν ληφθῇ τὸ Γ
5 τῷ μὲν Α ὅλῳ ὑπάρχειν τῷ δὲ Β μηδενί, ἢ μὲν ΓΒ
πρότασις ἀληθής, ἢ δ' ἑτέρα ψευδής. ὁμοίως δὲ
καὶ μετατεθέντος τοῦ στερητικοῦ. ὃ γὰρ μηδενὶ
ὑπάρχει τῷ Α, οὐδὲ τῷ Β οὐδενὶ ὑπάρξει· ἐὰν οὖν
ληφθῇ τὸ Γ τῷ μὲν Α ὅλῳ μὴ ὑπάρχειν τῷ δὲ Β
ὅλῳ ὑπάρχειν, ἢ μὲν ΑΓ πρότασις ἀληθὴς ἔσται,
10 ἢ ἑτέρα δὲ ψευδής. καὶ πάλιν, ὃ παντὶ τῷ Β
ὑπάρχει, μηδενὶ λαβεῖν τῷ Α ὑπάρχον ψεῦδος. ἀν-
ἀγκη γάρ, εἰ τῷ Β παντί, καὶ τῷ Α τινὶ ὑπάρχειν·

^a For a valid syllogism the premisses must be either AaC,

POSTERIOR ANALYTICS, I. XVI

In the middle figure (i) it is impossible for both premisses to be wholly false ; for when A applies to all B we shall not be able to find any term which will apply to all of the one and to none of the other, yet we must assume the premisses in such a way that the middle applies to one but not the other extreme term, if there is to be a syllogism. If, then, the premisses so assumed are false, clearly if their contraries are assumed the converse result should follow ; but this is impossible.^a But (ii) there is no reason why both premisses should not be partly false ; *e.g.*, supposing that C should apply to some of both A and B ; for if it is assumed to apply to all A and to no B, both premisses will be false : not wholly, however, but partly. So too if the negative is posited in the other premiss. (iii) Either premiss singly may be (wholly) false. For that which applies to all A will also apply to B ; then if C is assumed to apply to the whole of A but to be inapplicable to the whole of B, CA will be true, and CB false. Again, that which applies to no B will not apply to all A ; for if it applies to A it will apply to B, which *ex hypothesi* it does not. Then if C is assumed to apply to the whole of A but to none of B, the premiss CB will be true, and the other will be false. Similarly too when the negative premiss is transposed ; for that which applies to no A will not apply to any B. Thus if C is assumed to be inapplicable to the whole of A, but to apply to the whole of B, the premiss AC will be true, and the other false. Again, it is false to assume that that which applies to all B applies to no A ; for if it applies to all B it must also apply to some

B. Syllogism in second figure.

(i) Both premisses cannot be wholly false,

(ii) but may be partly false,

(iii) and one may be wholly false.

BeC or Aec, BaC ; and if both premisses are wholly false, either BeC, BaC or AaC, BeC must be true ; but neither pair is compatible with BaA.

80 b

ἐὰν οὖν ληφθῇ τῷ μὲν Β παντὶ ὑπάρχειν τὸ Γ τῷ δὲ Α μηδενί, ἢ μὲν ΓΒ ἀληθῆς ἔσται, ἢ δὲ ΓΑ ψευδής.

- 15 Φανερόν οὖν ὅτι καὶ ἀμφοτέρων οὐσῶν ψευδῶν καὶ τῆς ἐτέρας μόνον ἔσται συλλογισμὸς ἀπατητικὸς ἐν τοῖς ἀτόμοις.

XVII. Ἐν δὲ τοῖς μὴ ἀτόμως ὑπάρχουσιν ἢ μὴ ὑπάρχουσιν,¹ ὅταν μὲν διὰ τοῦ οἰκείου μέσου γίγνηται τοῦ ψεύδους ὁ συλλογισμὸς, οὐχ οἷόν τε ἀμφο-
 20 τέρας ψευδεῖς εἶναι τὰς προτάσεις, ἀλλὰ μόνον τὴν πρὸς τῷ μείζονι ἄκρῳ. (λέγω δ' οἰκεῖον μέσον δι' οὗ γίνεται τῆς ἀντιφάσεως ὁ συλλογισμός.) ὑπαρχέτω γὰρ τὸ Α τῷ Β διὰ μέσου τοῦ Γ. ἐπεὶ οὖν ἀνάγκη τὴν ΓΒ καταφατικὴν λαμβάνεσθαι συλλογισμοῦ γιγνομένου, δῆλον ὅτι αἰεὶ αὕτη ἔσται ἀλη-
 25 θής· οὐ γὰρ ἀντιστρέφεται. ἢ δὲ ΑΓ ψευδής· ταύτης γὰρ ἀντιστρεφομένης ἐναντίος γίγνεται ὁ συλλογισμός. ὁμοίως δὲ καὶ εἰ ἐξ ἄλλης συστοιχίας ληφθεῖη τὸ μέσον, οἷον τὸ Δ εἰ καὶ ἐν τῷ Α ὅλω ἔστι καὶ κατὰ τοῦ Β κατηγορεῖται παντός· ἀνάγκη
 30 γὰρ τὴν μὲν ΔΒ πρότασιν μένειν, τὴν δ' ἐτέραν ἀντιστρέφεσθαι, ὥσθ' ἢ μὲν αἰεὶ ἀληθής, ἢ δ' αἰεὶ ψευδής. καὶ σχεδὸν ἢ γε τοιαύτη ἀπάτη ἢ αὐτὴ ἔστι τῇ διὰ τοῦ οἰκείου μέσου. ἐὰν δὲ μὴ διὰ τοῦ οἰκείου μέσου γίγνηται ὁ συλλογισμός, ὅταν μὲν ὑπὸ τὸ Α ἢ τὸ μέσον τῷ δὲ Β μηδενὶ ὑπάρχη, ἀνάγκη
 35 ψευδεῖς εἶναι ἀμφοτέρας. ληπτέαι γὰρ ἐναντίως ἢ ὥς ἔχουσιν αἱ προτάσεις, εἰ μέλλει συλλογισμὸς ἔσεσθαι· οὕτω δὲ λαμβανομένων ἀμφοτέραι γίγ-

¹ ἢ μὴ ὑπάρχουσιν om. ABn.

POSTERIOR ANALYTICS, I. XVI–XVII

A. Thus if C is assumed to apply to all B but to no A, CB will be true and CA false.

Thus it is evident that in atomic propositions erroneous inference will be possible when both premisses are false and when only one is false.

XVII. In non-atomic attribution, whether affirmative or negative,^a when the false conclusion is reached by means of the proper middle term, it is not possible for both premisses to be false, but only for the major premiss. (By “proper” middle I mean that by which the contradictory^b conclusion is reached.) Let A apply to B through C as middle term. Then since the premiss BC must be assumed as affirmative to produce a syllogism, clearly it must always be true; for it is not converted.^c But AC is false; for it is upon the conversion of this that the contrary conclusion results. Similarly too supposing that the middle term should be taken from another series of predicates^d; e.g., if D is both wholly contained in A and also predicated of all B; for the premiss DB must remain unchanged while the other is converted, so that the former is always true and the latter always false. Error of this kind is practically the same as that which is inferred by the proper middle. If, however, the syllogism is not effected by means of the proper middle, when the middle is subordinate to A but applies to no B, both premisses must be false; for the premisses must be assumed in the contrary sense if there is to be a syllogism, and when they are

Error in respect of terms mediately related.

(1) Affirmative relation.

A. First figure.

(i) Inference by the proper middle.

(ii) Inference by a middle not proper but valid.

(iii) Inference by an improper middle.

^a The latter is first considered at 81 a 15.

^b i.e. the true conclusion.

^c i.e. changed in quality. Throughout this section ἀντιστρέφειν refers to qualitative change, not interchange of subject and predicate. Cf. *An. Pr.* 45 b 6, and II. viii-x.

^d Non-essential attributes.

80 b

- νονται ψευδεῖς. οἷον εἰ τὸ μὲν Α ὅλῳ τῷ Δ ὑπάρχει τὸ δὲ Δ μηδενὶ τῶν Β· ἀντιστραφέντων γὰρ τούτων συλλογισμὸς τ' ἔσται καὶ αἱ προτάσεις ἀμ-
 40 φότεραι ψευδεῖς. ὅταν δὲ μὴ ᾖ ὑπὸ τὸ Α τὸ μέσον,
 81 a οἷον τὸ Δ, ἢ μὲν ΑΔ ἀληθὴς ἔσται, ἢ δὲ ΔΒ ψευδής. ἢ μὲν γὰρ ΑΔ ἀληθής, ὅτι οὐκ ἦν ἐν τῷ Α τὸ Δ, ἢ δὲ ΔΒ ψευδής, ὅτι εἰ ἦν ἀληθής, καὶ τὸ συμπέρασμα ἦν ἀληθές· ἀλλ' ἦν ψεῦδος.
- 5 Διὰ δὲ τοῦ μέσου σχήματος γιγνομένης τῆς ἀπάτης, ἀμφοτέρας μὲν οὐκ ἐνδέχεται ψευδεῖς εἶναι τὰς προτάσεις ὅλας (ὅταν γὰρ ᾖ τὸ Β ὑπὸ τὸ Α, οὐδὲν ἐνδέχεται τῷ μὲν παντὶ τῷ δὲ μηδενὶ ὑπάρχειν, καθάπερ ἐλέχθη καὶ πρότερον), τὴν ἑτέραν δ'
 10 ἐγχωρεῖ, καὶ ὁποτέραν ἔτυχεν. εἰ γὰρ τὸ Γ καὶ τῷ Α καὶ τῷ Β ὑπάρχει, ἐὰν ληφθῇ τῷ μὲν Α ὑπάρχειν τῷ δὲ Β μὴ ὑπάρχειν, ἢ μὲν ΓΑ¹ ἀληθὴς ἔσται, ἢ δ' ἑτέρα ψευδής. πάλιν δ' εἰ τῷ μὲν Β ληφθεῖν τὸ Γ ὑπάρχον τῷ δὲ Α μηδενί, ἢ μὲν ΓΒ ἀληθὴς ἔσται, ἢ δ' ἑτέρα ψευδής.
- 15 Ἐὰν μὲν οὖν στερητικὸς ᾖ τῆς ἀπάτης ὁ συλλογισμὸς, εἴρηται πότε καὶ διὰ τίνων ἔσται ἡ ἀπάτη· ἐὰν δὲ καταφατικός, ὅταν μὲν διὰ τοῦ οἰκείου μέσου, ἀδύνατον ἀμφοτέρας εἶναι ψευδεῖς· ἀνάγκη γὰρ τὴν ΓΒ μένειν, εἴπερ ἔσται συλλογισμὸς,
 20 καθάπερ ἐλέχθη καὶ πρότερον· ὥστε ἡ ΑΓ² αἰετὶ ἔσται ψευδής, αὕτη γάρ ἐστίν ἡ ἀντιστρεφόμενη. ὁμοίως δὲ καὶ εἰ ἐξ ἄλλης συστοιχίας λαμβάνοιτο τὸ μέσον, ὥσπερ ἐλέχθη καὶ ἐπὶ τῆς στερητικῆς ἀπάτης· ἀνάγκη γὰρ τὴν μὲν ΔΒ μένειν τὴν δ'

¹ ΓΑ Mure, Ross : ΑΓ.² ΑΓ Mure, Ross : ΓΑ.

so assumed, both become false : *e.g.*, if A applies to the whole of D, and D applies to no B ; for when these propositions are converted, there will be a syllogism and both premisses will be false. But when the middle term, *e.g.* D, is not subordinate to A, the premiss AD will be true and DB false. AD will be true because D was not contained in A ; DB will be false because if it had been true, the conclusion would have been true too ; whereas it is *ex hypothesi* false.

When the error arises in the middle figure, it is impossible that both premisses should be wholly false (for when B is subordinate to A, nothing can apply to all of the one and to none of the other, as we observed above ^a), but one premiss, and that either one indifferently, may be false. For when C applies to both A and B, if it is assumed to apply to A but not to B, the premiss CA will be true, but the other will be false. Again, supposing that C is assumed as applying to B, but to no A, CB will be true but the other will be false.

Thus we have stated when and from what sort of premisses the error will arise if the erroneous conclusion is negative. If it is affirmative, when (i) it is reached through the proper middle term, it is impossible that both premisses should be false ; for the premiss CB must remain unchanged, if there is to be a syllogism, as we observed above.^b Hence AC will always be false ; for this is the premiss whose quality is converted. Similarly too (ii) supposing that the middle term is taken from another predicate-series, as we observed with reference to negative error ^c ; for DB must remain unchanged, and AD must be

B. Second figure. Either premiss may be false, but both cannot be wholly false.

(2) Negative relation. (First figure.) (i) Inference by the proper middle.

(ii) Inference by a middle not proper but valid.

^a 80 a 29.

^b 80 b 23.

^c 80 b 26.

81 a

ΑΔ ἀντιστρέφεισθαι, καὶ ἡ ἀπάτη ἡ αὐτὴ τῇ πρό-
 25 τερον. ὅταν δὲ μὴ διὰ τοῦ οἰκείου, εἰ μὲν ἡ τὸ
 Δ ὑπὸ τὸ Α, αὕτη μὲν ἔσται ἀληθής, ἡ ἑτέρα δὲ
 ψευδής· ἐγχωρεῖ γὰρ τὸ Α πλείοσιν ὑπάρχειν ἢ
 οὐκ ἔστιν ὑπ' ἄλληλα. εἰ μὲν δὲ μὴ ἡ τὸ Δ ὑπὸ τὸ Α,
 αὕτη μὲν αἰεὶ δῆλον ὅτι ἔσται ψευδής (καταφατική
 γὰρ λαμβάνεται), τὴν δὲ ΔΒ¹ ἐνδέχεται καὶ ἀληθῆ
 30 εἶναι καὶ ψευδῆ· οὐδὲν γὰρ κωλύει τὸ μὲν Α τῷ Δ
 μηδενὶ ὑπάρχειν τὸ δὲ Δ τῷ Β παντί, οἷον ζῶον
 ἐπιστήμη, ἐπιστήμη δὲ μουσικῇ. οὐδ' αὖ μήτε τὸ
 Α μηδενὶ τῶν Δ μήτε τὸ Δ μηδενὶ τῶν² Β. [φανερ-
 ρὸν οὖν ὅτι μὴ ὄντος τοῦ μέσου ὑπὸ τὸ Α καὶ
 ἀμφοτέρας ἐγχωρεῖ ψευδεῖς εἶναι καὶ ὁποτέραν
 ἔτυχεν.]³

35 Ποσαχῶς μὲν οὖν καὶ διὰ τίνων ἐγχωρεῖ γίγνε-
 σθαι τὰς κατὰ συλλογισμὸν ἀπάτας ἐν τε τοῖς
 ἀμέσοις καὶ ἐν τοῖς δι' ἀποδείξεως, φανερόν.

XVIII. Φανερόν δὲ καὶ ὅτι, εἴ τις αἰσθησις ἐκ-
 λέλοιπεν, ἀνάγκη καὶ ἐπιστήμην τινὰ ἐκλελοιπέναι,
 40 ἣν ἀδύνατον λαβεῖν, εἴπερ μανθάνομεν ἢ ἐπαγωγῇ
 81 b ἢ ἀποδείξει, ἔστι δ' ἡ μὲν ἀπόδειξις ἐκ τῶν καθόλου
 ἢ δ' ἐπαγωγὴ ἐκ τῶν κατὰ μέρος, ἀδύνατον δὲ τὰ
 καθόλου θεωρῆσαι μὴ δι' ἐπαγωγῆς (ἐπεὶ καὶ τὰ ἐξ
 ἀφαιρέσεως λεγόμενα ἔσται δι' ἐπαγωγῆς γνώριμα
 ποιεῖν, ὅτι ὑπάρχει ἐκάστῳ γένει ἓν, καὶ εἰ μὴ

¹ ΒΔ Bekker.² τῷ ΑΒ, Bekker.³ φανερόν . . . ἔτυχεν secl. Ross.

^a Ross points out that this case (in which if the false premiss is corrected a valid though unscientific syllogism is obtained) does not belong under (iii) but is identical with that already mentioned under (ii).

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converted in quality, and the error is the same as before. But when (iii) the conclusion is not reached through the proper middle term, if D is subordinate to A, this premiss will be true, and the other false, since A may apply to two or more terms which are not subordinate to one another; but if D is not subordinate to A, clearly this premiss will always be false (since it is assumed as affirmative), whereas DB may be true ^a or false; for there is no reason why A should not apply to no D, and D to all B (as *e.g.*, "animal" applies to no "science," but "science" to all "music"), nor why A should not apply to no D and D to no B. [Thus it is evident that when the middle term is not subordinate to A not only both premisses but either indifferently may be false.] ^b

(iii) Inference by an improper middle.

Thus it is evident in how many ways and by what sort of premisses syllogistic error may occur both in immediate attribution and in demonstrative attribution.

XVIII. It is evident also that if any sense-faculty has been lost, some knowledge must be irrevocably lost with it; since we learn either by induction or by demonstration. Now demonstration proceeds from universals and induction from particulars; but it is impossible to gain a view of universals except through induction (since even what we call abstractions ^c can only be grasped by induction, because, although they cannot exist in separation, some of them inhere in each class of objects, in so far as each class has

Lack of a sense-faculty as a cause of ignorance.

^b This sentence is unlikely to be Aristotelian (since if D is not subordinate to A the major premiss must be false) and Philoponus ignores it. It is probably a rash observation by an early "editor."

^c τὰ ἐξ ἀφαιρέσεως generally means "mathematical abstractions," *e.g.*, continuity or dimension (*cf. Met.* 1061 a 28); possibly here the sense is wider.

81 b

5 χωριστά ἐστίν, ἥ τοιονδὶ ἕκαστον), ἐπαχθῆναι δὲ μὴ ἔχοντας αἰσθησιν ἀδύνατον. τῶν γὰρ καθ' ἕκαστον ἡ αἰσθησις· οὐ γὰρ ἐνδέχεται λαβεῖν αὐτῶν τὴν ἐπιστήμην· οὔτε γὰρ ἐκ τῶν καθόλου ἄνευ ἐπαγωγῆς, οὔτε δι' ἐπαγωγῆς ἄνευ τῆς αἰσθήσεως.

10 XIX. Ἔστι δὲ πᾶς συλλογισμὸς διὰ τριῶν ὄρων, καὶ ὁ μὲν δεικνύει δυνάμενος ὅτι ὑπάρχει τὸ Α τῷ Γ διὰ τὸ ὑπάρχειν τῷ Β καὶ τοῦτο τῷ Γ, ὁ δὲ στερητικός, τὴν μὲν ἐτέραν πρότασιν ἔχων ὅτι ὑπάρχει τι ἄλλο ἄλλῳ, τὴν δ' ἐτέραν ὅτι οὐχ ὑπάρχει. φανερόν
15 οὖν ὅτι αἱ μὲν ἀρχαὶ καὶ αἱ λεγόμεναι ὑποθέσεις αὐταὶ εἰσι· λαβόντα γὰρ ταῦτα οὕτως ἀνάγκη δεικνύναι, οἷον ὅτι τὸ Α τῷ Γ ὑπάρχει διὰ τοῦ Β, πάλιν δ' ὅτι τὸ Α τῷ Β δι' ἄλλου μέσου, καὶ ὅτι τὸ Β τῷ Γ ὡσαύτως. κατὰ μὲν οὖν δόξαν συλλογιζομένοις καὶ μόνον διαλεκτικῶς δῆλον ὅτι τοῦτο μόνον σκε-
20 πτέον, εἰ ἐξ ὧν ἐνδέχεται ἐνδοξοτάτων γίγνεται ὁ συλλογισμὸς, ὥστ' εἰ καὶ μὴ ἔστι τι τῇ ἀληθείᾳ τῶν ΑΒ μέσον, δοκεῖ δὲ εἶναι, ὁ διὰ τούτου συλλογιζόμενος συλλελόγισται διαλεκτικῶς· πρὸς δ' ἀλήθειαν ἐκ τῶν ὑπαρχόντων δεῖ σκοπεῖν. ἔχει δ' οὕτως· ἐπειδὴ ἔστιν ὃ αὐτὸ μὲν κατ' ἄλλου κατηγορεῖται
25 μὴ κατὰ συμβεβηκός—λέγω δὲ τὸ κατὰ συμβεβηκός οἷον τὸ λευκὸν ποτ' ἐκείνῳ φαμεν εἶναι ἄνθρωπον, οὐχ ὁμοίως λέγοντες καὶ τὸν ἄνθρωπον λευκόν· ὁ μὲν γὰρ οὐχ ἕτερόν τι ὧν λευκὸν ἐστίν, τὸ δὲ λευκὸν ὅτι συμβέβηκε τῷ ἀνθρώπῳ εἶναι λευκῷ—

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a determinate nature); and we cannot employ induction if we lack sense-perception, because it is sense-perception that apprehends particulars. It is impossible to gain scientific knowledge of them, since they can neither be apprehended from universals without induction, nor through induction apart from sense-perception.

XIX. Every syllogism is effected by means of three terms. One kind has the effect of proving that A applies to C because A applies to B and B to C; the other is negative, and has for one premiss the affirmative and for the other the negative attribution of one term to another. It is evident, then, that these are the starting-points and so-called hypotheses (of syllogism); for it is by assuming them in this way that one must effect one's proof, *e.g.*, that A applies by means of B to C, and again that A applies to B through some other term as middle, and similarly that B applies to C. Now if we are arguing with a view to plausibility, *i.e.*, only dialectically, clearly we need only consider whether the conclusion proceeds from premisses which are as widely as possible accepted; so that although a given term is not really the middle between A and B, provided that it is accepted as such, if we draw our inference through it the inference is dialectically sound. But if our object is truth, we must base our investigation on the actual facts. Now the position is this. There are terms which are predicable of something else not accidentally—by “accidentally” I mean as we sometimes say “that white (thing) is a man,” which is not the same as saying “the man is white,” since a man is not a white thing because he is something else, but the white (thing) is a man because it is an accident of the man to be

In demonstration the premisses express true relations.

Some terms are essentially subjects; others essentially attributes.

81 b

ἔστιν οὖν ἔνια τοιαῦτα ὥστε καθ' αὐτὰ κατηγορεῖ-
 30 σθαι. ἔστω δὴ τὸ Γ τοιοῦτον ὃ αὐτὸ μὲν μηκέτι
 ὑπάρχει ἄλλω, τούτῳ δὲ τὸ Β πρῶτῳ, καὶ οὐκ
 ἔστιν ἄλλο μεταξύ· καὶ πάλιν τὸ Ε τῷ Ζ ὡσαύτως,
 καὶ τοῦτο τῷ Β. ἄρ' οὖν τοῦτο ἀνάγκη στῆναι, ἢ
 ἐνδέχεται εἰς ἄπειρον ἰέναι; καὶ πάλιν εἰ τοῦ μὲν
 Α μηδὲν κατηγορεῖται καθ' αὐτὸ τὸ δὲ Α τῷ Θ
 35 ὑπάρχει πρῶτῳ, μεταξύ δε μηδενὶ προτέρῳ, καὶ τὸ
 Θ τῷ Η, καὶ τοῦτο τῷ Β, ἄρα καὶ τοῦτο ἵστασθαι
 ἀνάγκη, ἢ καὶ τοῦτ' ἐνδέξεται εἰς ἄπειρον ἰέναι;
 διαφέρει δὲ τοῦτο τοῦ πρότερον τοσοῦτον, ὅτι τὸ
 μὲν ἔστιν, ἄρα ἐνδέχεται ἀρξαμένῳ ἀπὸ τοιούτου ὃ
 40 μηδενὶ ὑπάρχει ἐτέρῳ ἄλλ' ἄλλο ἐκείνῳ, ἐπὶ τὸ
 ἄνω εἰς ἄπειρον ἰέναι, θάτερον δὲ ἀρξάμενον ἀπὸ
 82 a τοιούτου ὃ αὐτὸ μὲν ἄλλου ἐκείνου δὲ μηδὲν κατη-
 γορεῖται, ἐπὶ τὸ κάτω σκοπεῖν εἰ ἐνδέχεται εἰς
 ἄπειρον ἰέναι. ἔτι τὰ μεταξύ ἄρ' ἐνδέχεται ἄπειρα
 εἶναι ὠρισμένων τῶν ἄκρων; λέγω δ' οἷον εἰ τὸ Α
 5 τῷ Γ ὑπάρχει, μέσον δ' αὐτῶν τὸ Β, τοῦ δὲ Β καὶ
 τοῦ Α ἕτερα, τούτων δ' ἄλλα, ἄρα καὶ ταῦτα εἰς
 ἄπειρον ἐνδέχεται ἰέναι, ἢ ἀδύνατον; ἔστι δὲ τοῦτο
 σκοπεῖν ταῦτ' καὶ εἰ αἱ ἀποδείξεις εἰς ἄπειρον
 ἔρχονται, καὶ εἰ ἔστιν ἀπόδειξις ἅπαντος, ἢ πρὸς
 ἄλληλα περαίνεται. ὁμοίως δὲ λέγω καὶ ἐπὶ τῶν
 10 στερητικῶν συλλογισμῶν καὶ προτάσεων, οἷον εἰ τὸ
 Α μὴ ὑπάρχει τῷ Β μηδενί, ἤτοι πρῶτῳ, ἢ ἔσται
 τι μεταξύ ᾧ προτέρῳ οὐχ ὑπάρχει (οἷον εἰ τῷ¹ Η,

¹ τῷ Α²η: τὸ ΑΒδ.

^a The distinction which Aristotle is drawing between natural subjects and natural attributes is partly obscured in Greek by the substantival use of the neuter adjective. What he seems to mean here is that "white" is not really the sub-

white ^a—, some things, then, are such that they are of their own nature predicable. Let C be such that it does not further apply to any other term, but B applies directly to C, and there is no other term mediating between them. Again, let E apply in the same way to F, and F to B. Is there then any necessary limit to this series, or may it proceed to infinity? Again, if nothing is of itself predicable of A, but A applies directly to H and to no intermediate term first, and H applies to G and G to B, must this series too come to an end, or may it too proceed to infinity? The latter question differs from the former in that the first asks “Is it possible, if we start from a term such that it applies to nothing else, but something else applies to it, to proceed to infinity in the upward direction?” and the latter asks whether, if we start from a term such that it is itself predicable of something else, but nothing is predicable of it, we can proceed to infinity in the downward direction. Further, can the intermediate terms be infinite in number when the extremes are definite? I mean, *e.g.*, if A applies to C, and B is their middle term, and other terms are predicable of B and A, and again other terms are predicable of these, can these too proceed to infinity, or is this impossible? To inquire into this is the same as to inquire whether demonstrations form an infinite series, *i.e.*, whether there is a demonstration of everything, or the extremes are limited in relation one to the other. Similarly too in the case of negative syllogisms and premisses; *e.g.*, if A applies to no B, either it does so directly, or there will be some intermediate term, *e.g.*, G, to which it first does not apply,
 subject of which “man” is predicated, but an accidental attribute of that subject.

Can predication form an infinite chain (1) of attributes upwards from a fixed subject, (2) of subjects downwards from a fixed attribute,

(3) by interpolation between fixed extremes?

82 a

ὁ τῷ B ὑπάρχει παντί) καὶ πάλιν τούτου ἔτι ἄλλω προτέρῳ, οἷον εἰ τῷ¹ Θ, ὁ τῷ H παντὶ ὑπάρχει. καὶ γὰρ ἐπὶ τούτων ἢ ἄπειρα οἷς ὑπάρχει προτέροις ἢ ἴσονται.

- 15 Ἐπὶ δὲ τῶν ἀντιστρεφόντων οὐχ ὁμοίως ἔχει. οὐ γὰρ ἔστιν ἐν τοῖς ἀντικατηγορουμένοις² οὐδ' πρώτου κατηγορεῖται ἢ τελευταίου· πάντα γὰρ πρὸς πάντα ταύτῃ γε ὁμοίως ἔχει, εἴτ' ἔστιν ἄπειρα τὰ κατ' αὐτοῦ κατηγορούμενα εἴτ' ἀμφοτέρᾳ ἔστι τὰ ἀπορηθέντα ἄπειρα· πλὴν εἰ μὴ ὁμοίως ἐνδέχεται ἀντι-
20 στρέφειν, ἀλλὰ τὸ μὲν ὡς συμβεβηκὸς τὸ δ' ὡς κατηγορίαν.

XX. Ὅτι μὲν οὖν τὰ μεταξὺ οὐκ ἐνδέχεται ἄπειρα εἶναι, εἰ ἐπὶ τὸ κάτω καὶ τὸ ἄνω ἴστανται αἱ κατηγορίαι, δῆλον (λέγω δ' ἄνω μὲν τὴν ἐπὶ τὸ καθόλου μᾶλλον, κάτω δὲ τὴν ἐπὶ τὸ κατὰ μέρος).
25 εἰ γὰρ τοῦ A κατηγορουμένου κατὰ τοῦ Z ἄπειρα τὰ μεταξὺ, ἐφ' ὧν B, δῆλον ὅτι ἐνδέχουτ' ἂν ὥστε καὶ ἀπὸ τοῦ A ἐπὶ τὸ κάτω ἕτερον ἑτέρου κατηγορεῖσθαι εἰς ἄπειρον (πρὶν γὰρ ἐπὶ τὸ Z ἐλθεῖν ἄπειρα τὰ μεταξὺ) καὶ ἀπὸ τοῦ Z ἐπὶ τὸ ἄνω ἄπειρα πρὶν ἐπὶ τὸ A ἐλθεῖν· ὥστ' εἰ ταῦτα ἀδύνατα,
30 καὶ τοῦ A καὶ Z ἀδύνατον ἄπειρα εἶναι μεταξὺ.

¹ τῷ A²n : τὸ ABd.

² κατηγορουμένοις A¹Bd.

^a In the sense that predicate and subject are strictly interchangeable.

^b i.e., additional attributes or additional subjects. In this case, however, the distinction is meaningless, because (the

but which applies to all B ; and again some other term prior to G, *e.g.*, H, to which A does not apply, but which applies to all G. In this case too either the intermediate terms to which A is more directly related in attribution are infinite in number, or the series has a limit.

If the premisses are convertible,^a however, the conditions are not the same. Where the terms are reciprocally predicable there is none of which another is primarily or ultimately predicated, since in this respect all are similarly related, whether the terms predicated of the subject are infinite in number or both classes ^b about which we expressed uncertainty are infinite in number. The only exception is if the terms are not convertible in the same way, but one only accidentally and the other as a true predicate.^c

If subject and predicate are interchangeable there is no series.

XX. It is obvious that the intermediate terms cannot be infinite in number if there is an upward and a downward limit to predication (by "upward" I mean in the direction of the universal, and by "downward" in that of the particular). For if when A is predicated of F the intermediate terms—B—are infinite in number, clearly it would be possible both starting from A to predicate one term of another in the downward direction to infinity (since the intermediate terms before one reaches F are infinite in number), and starting from F to predicate to infinity in the upward direction before one reaches A. Thus if these results are impossible, it is also impossible that there should be infinitely many intermediate terms between A and terms being mutually predicable of one another) none is either subject or attribute more than another. Such terms (*e.g.*, properties of a species) form a circle, not a series, of predication.

Between fixed extremes there is no infinite chain in affirmative predication.

^a Cf. 81 b 25-29.

82 a

οὐδὲ γὰρ εἴ τις λέγοι ὅτι τὰ μὲν ἐστὶ τῶν ABZ¹
 ἐχόμενα ἀλλήλων ὥστε μὴ εἶναι μεταξύ, τὰ δ' οὐκ
 ἔστι λαβεῖν, οὐδὲν διαφέρει. ὁ γὰρ ἂν λάβω τῶν
 B, ἔσται πρὸς τὸ A ἢ πρὸς τὸ Z ἢ ἄπειρα τὰ
 μεταξύ ἢ οὐ. ἀφ' οὗ δὴ πρῶτον ἄπειρα, εἴτ' εὐθύς
 35 εἴτε μὴ εὐθύς, οὐδὲν διαφέρει· τὰ γὰρ μετὰ ταῦτα
 ἄπειρά ἐστιν.

XXI. Φανερόν δὲ καὶ ἐπὶ τῆς στερητικῆς ἀπο-
 δείξεως ὅτι στήσεται, εἴπερ ἐπὶ τῆς κατηγορικῆς
 ἴσταται ἐπ' ἀμφοτέρα. ἔστω γὰρ μὴ ἐνδεχόμενον
 μήτε ἐπὶ τὸ ἄνω ἀπὸ τοῦ ὑστάτου εἰς ἄπειρον ἵεναι
 82 b (λέγω δ' ὑστατον ὃ αὐτὸ μὲν ἄλλω μηδενὶ ὑπάρχει,
 ἐκείνῳ δὲ ἄλλο, οἷον τὸ Z) μήτε ἀπὸ τοῦ πρώτου
 ἐπὶ τὸ ὑστατον (λέγω δὲ πρῶτον ὃ αὐτὸ μὲν κατ'
 ἄλλου, κατ' ἐκείνου δὲ μηδὲν ἄλλο). εἰ δὴ ταῦτ'
 ἔστι, καὶ ἐπὶ τῆς ἀποφάσεως στήσεται. τριχῶς γὰρ
 5 δεικνυται μὴ ὑπάρχον. ἢ γὰρ ᾧ μὲν τὸ Γ, τὸ B
 ὑπάρχει παντί, ᾧ δὲ τὸ B, οὐδενὶ τὸ A. τοῦ μὲν
 τοίνυν BΓ, καὶ αἰεὶ τοῦ ἑτέρου διαστήματος, ἀνάγκη
 βαδίζειν εἰς ἄμεσα· κατηγορικὸν γὰρ τοῦτο τὸ
 διάστημα. τὸ δ' ἕτερον δῆλον ὅτι εἰ ἄλλω οὐχ
 ὑπάρχει προτέρῳ, οἷον τῷ Δ, τοῦτο δεήσει τῷ B
 10 παντὶ ὑπάρχειν· καὶ εἰ πάλιν ἄλλω τοῦ Δ προτέρῳ
 οὐχ ὑπάρχει, ἐκείνο δεήσει τῷ Δ παντὶ ὑπάρχειν·

¹ ABZ Waitz : ABΓ ABdn : AB M, Bekker.

^a Sc., from A or F.

^b The argument is : A negative conclusion can be proved in each of the three figures. In any example (Aristotle gives one in each figure, viz. Celarent, Camestres and Bocardo) (1) we cannot assume an infinitive number of middles between

F. Nor does it affect the case supposing that it be said that some of the terms in the series AB . . . F are contiguous, so that there can be no intermediates between them, and that others cannot be grasped at all ; for whatever B we take, the intermediates in the direction of either A or F will either be infinite in number or not. It makes no difference where the infinite series first starts, whether immediately ^a or not ; the rest of the terms are infinite in number.

XXI. If there is a limit to the series in both directions in affirmative demonstration, evidently there will be a limit in negative demonstrations also. Let it be impossible to continue to infinity either upwards from the last term (by "last term" I mean that which applies to no other term, whereas some other term, *e.g.*, F, applies to it) or from the first term towards the last (by "first term" I mean that which is predicable of another but has no other term predicated of it). If these conditions obtain, there will be a limit in negation too. There are three ways in which one term can be proved not to apply to another.^b (1) B applies to all that to which C applies, but A to none of that to which B applies. Now in the premiss BC, and generally in the minor premiss, we must reach immediate propositions, because this premiss is affirmative. As for the other term,^c clearly if it is inapplicable to another prior term, *e.g.*, D, this term will have to apply to all B. Again, if it is inapplicable to another term prior to D, that term will have to the terms of an affirmative premiss ; (2) mediation of a negative premiss always gives two new premisses, one affirmative and one negative ; since the former are limited in number, the latter must be too.

If affirmative predication must have limits, so must negative.

Proof in the first figure.

^c *Viz.* A. BeA is proved by DeA and BaD ; and similarly with DeA.

ὥστ' ἐπεὶ ἡ ἐπὶ τὸ ἄνω¹ ἴσταται ὁδός, καὶ ἡ ἐπὶ τὸ
A² στήσεται, καὶ ἔσται τι πρῶτον ᾧ οὐχ ὑπάρχει.

Πάλιν εἰ τὸ μὲν B παντὶ τῷ A τῷ δὲ Γ μηδενί,
τὸ A τῶν³ Γ οὐδενὶ ὑπάρχει. πάλιν τοῦτο εἰ δεῖ δεῖ-
15 ξαι, δῆλον ὅτι ἡ διὰ τοῦ ἄνω τρόπου δειχθήσεται
ἡ διὰ τούτου ἡ διὰ τοῦ τρίτου. ὁ μὲν οὖν πρῶτος
εἴρηται, ὁ δὲ δεύτερος δειχθήσεται. οὕτω δ' ἂν
δεικνύοι, οἷον ὅτι τὸ Δ τῷ μὲν B παντὶ ὑπάρχει τῷ
δὲ Γ οὐδενί, εἰ ἀνάγκη ὑπάρχειν τι τῷ B. καὶ
πάλιν εἰ τοῦτο τῷ Γ μὴ ὑπάρξει, ἄλλο τῷ Δ
20 ὑπάρχει, ὃ τῷ Γ οὐχ ὑπάρχει. οὐκοῦν ἐπεὶ τὸ
ὑπάρχειν αἰεὶ τῷ ἀνωτέρω ἴσταται, στήσεται καὶ τὸ
μὴ ὑπάρχειν.

Ὁ δὲ τρίτος τρόπος ἦν· εἰ τὸ μὲν A τῷ B παντὶ
ὑπάρχει, τὸ δὲ Γ μὴ ὑπάρχει, οὐ παντὶ ὑπάρχει τὸ
Γ ᾧ τὸ A. πάλιν δὲ τοῦτο ἡ διὰ τῶν ἄνω εἰ-
25 ρημένων ἡ ὁμοίως δειχθήσεται. ἐκείνως μὲν δὴ
ἴσταται· εἰ δ' οὕτω, πάλιν λήψεται τὸ B τῷ E
ὑπάρχειν, ᾧ τὸ Γ μὴ παντὶ ὑπάρχει. καὶ τοῦτο
πάλιν ὁμοίως. ἐπεὶ δ' ὑπόκειται ἵστασθαι καὶ ἐπὶ
τὸ κάτω, δῆλον ὅτι στήσεται καὶ τὸ Γ οὐχ ὑπάρχον.

Φανερόν δ' ὅτι καὶ ἐὰν μὴ μιᾷ ὁδῷ δεικνύηται
30 ἀλλὰ πάσαις, ὅτε μὲν ἐκ τοῦ πρώτου σχήματος ὅτε

¹ κάτω fecit n, Bekker.

² A n¹, Ross : Δ ABd : ἄνω n².

³ τῷ D.

^a The required sense is fairly clear, and Ross's readings, which I have adopted, are at least compatible with it; but the text is barely convincing.

^b Not the conclusion, but the negative premiss CeB.

^c i.e., by the first, second or third figure.

^d As before, not only a negative but an affirmative premiss

apply to all D. Thus since the upward (affirmative) process is limited, the (negative) process towards A will be limited too,^a and there will be some first term to which A does not apply.

(2) If B applies to all A but to no C, A applies to no C. If it is now required to prove this,^b clearly the proof will either be by the method described above, or by the present method, or by the third.^c The first has been stated already ; the second will be proved now. The proof will be as follows : D applies to all B, but to no C (since some predicate must apply to B).^d Again, since D is not to apply to C, some other term which does not apply to C applies to D. Thus since the affirmative series of attribution is limited in the upward direction, the negative series will also be limited.

Proof in the second figure.

(3) The third case is, as we have seen ^e ; if A applies and C does not apply to all B, C does not apply to all that to which A applies. This ^f again can be proved either by the foregoing methods or by a similar one. In the former case the series is clearly limited ; in the latter we shall assume this time that B applies to E, to not all of which C applies ; and this again will be proved similarly. Since we have assumed that there is a downward limit also,^g clearly there will be a limit to the non-attribution of C.

Proof in the third figure.

It is evident that even if the proof is not effected by one method but by all three—now by the first must be interpolated. Ross's interpretation " if in fact there is any particular term D that necessarily belongs to B " seems improbable.

If all three figures are used, the result is the same.

^e If this is the meaning here of the " philosophical imperfect," the reference is presumably to the discussion of the third figure in *An. Pr.* I. vi.

^f The negative premiss BoC.

^g 82 a 37.

82 b

δὲ ἐκ τοῦ δευτέρου ἢ τρίτου, ὅτι καὶ οὕτω στήσεται·
πεπερασμένα γάρ εἰσιν αἱ ὁδοί, τὰ δὲ πεπερασμένα
πεπερασμενάκις ἀνάγκη πεπεράνθαι πάντα.

Ὅτι μὲν οὖν ἐπὶ τῆς στερήσεως, εἶπερ καὶ ἐπὶ
35 τοῦ ὑπάρχειν, ἴσταται, δῆλον· ὅτι δ' ἐπ' ἐκείνων,
λογικῶς μὲν θεωροῦσιν ὧδε φανερόν.

XXII. Ἐπὶ μὲν οὖν τῶν ἐν τῷ τί ἐστι κατη-
γορουμένων δῆλον· εἰ γὰρ ἔστιν ὀρίσασθαι ἢ εἰ
γνωστόν τὸ τί ἦν εἶναι, τὰ δ' ἄπειρα μὴ ἔστι δι-
83 a ελθεῖν, ἀνάγκη πεπεράνθαι τὰ ἐν τῷ τί ἐστι κατ-
ηγορούμενα. καθόλου δὲ ὧδε λέγωμεν. ἔστι γὰρ
εἰπεῖν ἀληθῶς τὸ λευκὸν βαδίζειν καὶ τὸ μέγα
ἐκεῖνο ξύλον εἶναι, καὶ πάλιν τὸ ξύλον μέγα εἶναι
καὶ τὸν ἄνθρωπον βαδίζειν. ἕτερον δὲ ἔστι τὸ
5 οὕτως εἰπεῖν καὶ τὸ ἐκείνως. ὅταν μὲν γὰρ τὸ
λευκὸν εἶναι φῶ ξύλον, τότε λέγω ὅτι ᾧ συμβέβηκε
λευκῷ εἶναι ξύλον ἐστίν, ἀλλ' οὐχ ὥς τὸ ὑποκεί-
μενον τῷ ξύλῳ τὸ λευκὸν ἐστι· καὶ γὰρ οὔτε λευκὸν
ὄν οὔθ' ὅπερ λευκόν τι ἐγένετο ξύλον, ὥστ' οὐκ
ἔστιν ἀλλ' ἢ κατὰ συμβεβηκός. ὅταν δὲ τὸ ξύλον
10 λευκὸν εἶναι φῶ, οὐχ ὅτι ἕτερόν τί ἐστι λευκόν,
ἐκείνῳ δὲ συμβέβηκε ξύλῳ εἶναι, οἷον ὅταν τὸν
μουσικὸν λευκὸν εἶναι φῶ (τότε γὰρ ὅτι ὁ ἄνθρωπος
λευκός ἐστιν, ᾧ συμβέβηκεν εἶναι μουσικῷ, λέγω),
ἀλλὰ τὸ ξύλον ἐστὶ τὸ ὑποκείμενον, ὅπερ καὶ ἐγέν-
ετο, οὐχ ἕτερόν τι ὄν ἢ ὅπερ ξύλον ἢ ξύλον τί. εἰ

^a Cf. 81 b 25-29.

figure, now by the second or third—even so the series will be limited ; for the methods are finite in number, and the product of a finite number of things taken in a finite number of ways must always be finite.

Thus it is clear that there is a limit to the series of negative attribution, if there is a limit in affirmative attribution also. That there is one in the latter case will be apparent in the light of the following dialectical argument.

Now to prove that affirmative predication has a limit.

XXII. In the case of predicates which form part of the essence, it is obvious (that there is a limit) ; since if definition is possible, *i.e.*, if the essential nature is knowable, and things infinite in number cannot be exhausted, the predicates which form part of the essence must be limited in number. But we can treat the question generally as follows. It is possible to state truly “ the white (object) walks ” and “ that large thing is wood ” and again “ the (piece of) wood is large ” and “ the man walks.”^a The two latter statements are quite different from the two former. When I say “ the white thing is wood ” I mean that the subject of which whiteness is an accident is wood, not that whiteness is the substrate in which the wood inheres ; for it was not *qua* white or *qua* a particular kind of white that the white thing became wood, and so it is wood only accidentally. But when I say “ the wood is white,” I do not mean that something else is white, and that it is an accident of that something else to be wood, as when I say “ the cultured (person) is white ” ; for then I mean that the man, of whom it is an accident to be cultured, is white ; but the wood is the substrate, which actually became white, not *qua* anything else, but *qua* wood in general or a par-

Predication. Essential attributes must be limited.

Predication proper distinguished from accidental predication.

83 a

15 δὴ δεῖ νομοθετῆσαι, ἔστω τὸ οὕτω λέγειν κατηγορεῖν, τὸ δ' ἐκείνως ἥτοι μηδαμῶς κατηγορεῖν, ἢ κατηγορεῖν μὲν μὴ ἀπλῶς, κατὰ συμβεβηκὸς δὲ κατηγορεῖν. ἔστι δ' ὥς μὲν τὸ λευκὸν τὸ κατηγορούμενον, ὥς δὲ τὸ ξύλον τὸ οὐ κατηγορεῖται. ὑποκείσθω δὴ τὸ κατηγορούμενον κατηγορεῖσθαι
 20 αἰεί, οὐ κατηγορεῖται, ἀπλῶς, ἀλλὰ μὴ κατὰ συμβεβηκός· οὕτω γὰρ αἱ ἀποδείξεις ἀποδεικνύουσιν. ὥστε ἢ ἐν τῷ τί ἐστιν ἢ ὅτι ποιὸν ἢ ποσὸν ἢ πρὸς τι ἢ ποιοῦν ἢ πάσχον ἢ πού ἢ ποτέ, ὅταν ἐν καθ' ἐνὸς κατηγορηθῇ.

Ἔτι τὰ μὲν οὐσίαν σημαίνοντα ὅπερ ἐκείνο ἢ
 25 ὅπερ ἐκείνό τι σημαίνει καθ' οὗ κατηγορεῖται· ὅσα δὲ μὴ οὐσίαν σημαίνει, ἀλλὰ κατ' ἄλλου ὑποκειμένου λέγεται ὃ μὴ ἐστι μήτε ὅπερ ἐκείνο μήτε ὅπερ ἐκείνό τι, συμβεβηκότα, οἷον κατὰ τοῦ ἀνθρώπου τὸ λευκόν. οὐ γὰρ ἐστιν ὁ ἄνθρωπος οὔτε
 30 ὅπερ λευκὸν οὔτε ὅπερ λευκόν τι, ἀλλὰ ζῶον ἴσως· ὅπερ γὰρ ζῶόν ἐστιν ὁ ἄνθρωπος. ὅσα δὲ μὴ οὐσίαν σημαίνει, δεῖ κατὰ τινος ὑποκειμένου κατηγορεῖσθαι, καὶ μὴ εἶναί τι λευκὸν ὃ οὐχ ἕτερόν τι ὃν λευκὸν ἐστιν. τὰ γὰρ εἶδη χαιρέτω· τερετίσ-
 35 μάτα τε γὰρ ἐστι, καὶ εἰ ἔστιν, οὐδὲν πρὸς τὸν λόγον ἐστίν· αἱ γὰρ ἀποδείξεις περὶ τῶν τοιούτων εἰσὶν.

^a Here, as often, the categories of "position" and "state" are omitted (for the full list see *Cat.* 1 b 25). In any case completeness is unnecessary since the distinction is between essential and non-essential attributes.

^b In the sense of non-essential attributes.

ticular piece of wood. Thus if we are to lay down a general rule, let us call the latter kind of assertion predication, and the former kind either not predication at all, or predication not in an unqualified but in an accidental sense. The predicate corresponds to "white" in the example, and the subject to "wood." Let us assume, then, that the predicate is predicated of the subject, not accidentally but always without qualification, for that is how demonstrations conduct their proofs. Then, when one term is predicated of another, that which is stated is either part of the essence, or quality, quantity, relation, activity, passivity, place or time.^a

Further, predicates which denote essence indicate that the subject is identical with the predicate or with some part of the predicate ; but those which do not denote essence, but are stated of some other subject, which is identical neither with the predicate nor with some part of the predicate, indicate accidents,^b as *e.g.*, "white" is predicated of "man" ; man is identical neither with "white" nor with some particular form of "white" ; but he is presumably an animal ; for man is identical with a particular kind of animal. Predicates which do not denote essence must be predicated of some subject ; a thing cannot be white unless it is something else first. The Forms may be dismissed—they are mere prattle^c ; and even if they exist, they are irrelevant, because demonstrations are concerned only with such predicates as we have described.

Non-essential predicates require a subject of their own.

^c In view of Aristotle's debt to the Platonic Forms, it is ungenerous of him to describe the theory by a word which in Greek suggests the twittering of birds or a person's aimless humming. No doubt his indignation is roused by the thought of Forms as self-subsistent attributes.

83 a

"Ἐτι εἰ μὴ ἔστι τόδε τοῦδε¹ ποιότης κακείμενον
 τούτου, μηδὲ ποιότητος ποιότης, ἀδύνατον ἀντι-
 κατηγορεῖσθαι ἀλλήλων οὕτως, ἀλλ' ἀληθὲς μὲν
 ἐνδέχεται εἰπεῖν, ἀντικατηγορῆσαι δ' ἀληθῶς οὐκ

83 b

ἐνδέχεται. ἢ γάρ τοι ὥς οὐσία κατηγορηθήσεται,
 οἶον ἢ γένος ὃν ἢ διαφορὰ τοῦ κατηγορουμένου.
 ταῦτα δὲ δέδεικται ὅτι οὐκ ἔσται ἄπειρα, οὐτ' ἐπὶ
 τὸ κάτω οὐτ' ἐπὶ τὸ ἄνω (οἶον ἄνθρωπος δίπουν,
 τοῦτο ζῶον, τοῦτο δ' ἕτερον· οὐδὲ τὸ ζῶον κατ'
 5 ἀνθρώπου, τοῦτο δὲ κατὰ Καλλίου, τοῦτο δὲ κατ'
 ἄλλου ἐν τῷ τί ἐστιν), τὴν μὲν γὰρ οὐσίαν ἅπασαν
 ἔστιν ὀρίσασθαι τὴν τοιαύτην, τὰ δ' ἄπειρα οὐκ
 ἔστι διεξελεῖν νοοῦντα. ὥστ' οὐτ' ἐπὶ τὸ ἄνω οὐτ'
 ἐπὶ τὸ κάτω ἄπειρα· ἐκείνην γὰρ οὐκ ἔστιν ὀρίσα-
 σθαι, ἥς τὰ ἄπειρα κατηγορεῖται. ὥς μὲν δὴ γένη
 10 ἀλλήλων οὐκ ἀντικατηγορηθήσεται· ἔσται γὰρ αὐτὸ
 ὅπερ αὐτό τι. οὐδὲ μὴν τοῦ ποιοῦ ἢ τῶν ἄλλων
 οὐδέν, ἂν μὴ κατὰ συμβεβηκὸς κατηγορηθῇ· πάντα
 γὰρ ταῦτα συμβέβηκε καὶ κατὰ τῶν οὐσιῶν κατ-
 ηγορεῖται. ἀλλὰ δὴ ὅτι οὐδ' εἰς τὸ ἄνω ἄπειρα
 ἔσται· ἐκάστου γὰρ κατηγορεῖται ὃ ἂν σημαίνει ἢ
 15 ποῖόν τι ἢ ποσόν τι ἢ τι τῶν τοιούτων ἢ τὰ ἐν τῇ
 οὐσίᾳ· ταῦτα δὲ πεπέρανται, καὶ τὰ γένη τῶν κατη-
 γοριῶν πεπέρανται· ἢ γὰρ ποῖόν ἢ ποσόν ἢ πρὸς τι
 ἢ ποιοῦν ἢ πάσχον ἢ πού ἢ ποτέ.

¹ τόδε τοῦδε n, Philoponus: τοῦτο τουδὲ ABd.

^a Sc., "and the downward limit is the individual."

^b If X = part of Y, and Y = part of X, each will be identical with part of (part of) itself.

^c 82 b 37.

Further, if it is not possible both for X to be a quality of Y and *vice versa*, i.e., if there cannot be a quality of a quality, X and Y cannot be predicated reciprocally in the way in which we have laid down. It may be true to state one of the other, but the reciprocating statement cannot be true. For (1) the predicate may be stated as substance, i.e., the genus or differentia of the subject. (It has been shown that predication of this kind cannot proceed to infinity either upwards or downwards—e.g., man is biped, biped is animal, animal is something else ; or animal is predicated of man, man of Callias, and Callias of something else which is part of the essence—for every substance of this sort can be defined, but it is impossible to exhaust in thought an infinite series. Hence the series cannot be infinite either upwards or downwards, for we cannot define a substance of which an infinite number of terms is predicated.^a) Then they cannot be predicated as genera of each other, for then a thing will be identical with a particular part of itself.^b (2) Nor can anything be predicated reciprocally of quality or any of the other categories, except accidentally ; for all these are attributes and are predicable only of substances. As for the proof that the series will not be infinite in the upper direction, at every step the predicate denotes either quality or quantity or one of the other categories, or else the elements in the essence. But the latter are limited in number,^c and so are the kinds of categories, viz., quality, quantity, relation, activity, passivity, place and time.^d

^a Cf. 83 a 21. That even the full list of ten categories is exhaustive is nowhere proved, nor indeed is it capable of proof.

Ἵπόκειται δὲ ἐν καθ' ἐνὸς κατηγορεῖσθαι, αὐτὰ
 δὲ αὐτῶν, ὅσα μὴ τί ἐστι, μὴ κατηγορεῖσθαι. συμ-
 20 βεβηκότα γάρ ἐστι πάντα, ἀλλὰ τὰ μὲν καθ' αὐτά,
 τὰ δὲ καθ' ἕτερον τρόπον· ταῦτα δὲ πάντα καθ'
 ὑποκειμένου τινὸς κατηγορεῖσθαι φάμεν, τὸ δὲ συμ-
 βεβηκὸς οὐκ εἶναι ὑποκείμενόν τι· οὐδὲν γὰρ τῶν
 τοιούτων τίθεμεν εἶναι ὃ οὐχ ἕτερόν τι ὃν λέγεται
 ὃ λέγεται, ἀλλ' αὐτὸ ἄλλου καὶ ἄλλ' ἅττα καθ'
 25 ἐτέρου. οὗτ' εἰς τὸ ἄνω ἄρα ἐν καθ' ἐνὸς οὗτ' εἰς
 τὸ κάτω ὑπάρχειν λεχθήσεται. καθ' ὧν μὲν γὰρ
 λέγεται τὰ συμβεβηκότα, ὅσα ἐν τῇ οὐσίᾳ ἐκάστου·
 ταῦτα δὲ οὐκ ἄπειρα· ἄνω δὲ ταυτά τε καὶ τὰ συμ-
 βεβηκότα, ἀμφοτέρω οὐκ ἄπειρα. ἀνάγκη ἄρα
 εἶναί τι οὗ πρῶτόν τι κατηγορεῖται καὶ τούτου
 30 ἄλλο, καὶ τοῦτο ἴστασθαι καὶ εἶναί τι ὃ οὐκέτι οὔτε
 κατ' ἄλλου προτέρου οὔτε κατ' ἐκείνου ἄλλο πρό-
 τερον κατηγορεῖται.

Εἰς μὲν οὖν τρόπος λέγεται ἀποδείξεως οὗτος,
 ἔτι δ' ἄλλος, εἰ ὧν πρότερα ἅττα κατηγορεῖται,
 ἔστι τούτων ἀπόδειξις, ὧν δ' ἔστιν ἀπόδειξις, οὔτε
 35 βέλτιον ἔχειν ἐγχωρεῖ πρὸς αὐτὰ τοῦ εἰδέναι, οὗτ'
 εἰδέναι ἄνευ ἀποδείξεως, εἰ δὲ τόδε διὰ τῶνδε γνώ-

^a Definitory predicates are (in a sense at least) convertible with their subjects.

^b *i.e.*, as a subject. Mure and Ross seem to be mistaken in taking τοιούτων as referring to συμβεβηκότα.

^c Cf. 82 b 37, 83 b 15.

^d Cf. 83 b 13.

^e Predication is limited at one end by the individual substance, at the other by the highest genus or category.

^f *i.e.*, premisses which depend upon other premisses.

POSTERIOR ANALYTICS, I. XXII

We have now established that in predication one predicate is asserted of one subject, and that predicates (except those which denote essence ^a) are not predicated of one another. They are all attributes, some *per se* and others in a different sense ; but we hold that they are all predicated of some subject, whereas an attribute is not a kind of subject ; because we do not regard as such ^b anything which is not something else distinct from the statement which is made about it, but is merely stated of some other term, while other attributes are predicated of a different subject. It follows that the assertion of a single predicate of a single subject cannot form an infinite series either upwards or downwards ; for the subjects of which the attributes are stated are no more than those which are implied in the essence of the individual, and these are not infinite in number ^c ; while in the upward direction we have these subjects and their attributes, both of which are limited in number.^d Hence there must be some subject of which something is first predicated, and something else must be predicated of this, and the series must be finite ; *i.e.*, there must be a term which is not predicated of any other term prior to it, and of which no other prior term is predicated.^e

Recapitulation, leading to

first dialectical proof.

This is a statement of one manner of proof, but there is another also ; predicates of whose subjects other prior predicates can be predicated ^f are demonstrable ; and it is not possible to stand in a better relation ^g than that of knowledge to anything which is demonstrable, nor to know it apart from demonstration. Moreover, if one thing is knowable through

Second dialectical proof.

^a Aristotle refers to intuition, by which we apprehend the indemonstrable ; *cf.* Book II, ch. xix.

83 b

ριμον, τάδε δὲ μὴ ἴσμεν μηδὲ βέλτιον ἔχομεν πρὸς αὐτὰ τοῦ εἰδέναι, οὐδὲ τὸ διὰ τούτων γνῶριμον ἐπιστησόμεθα. εἰ οὖν ἔστι τι εἰδέναι δι' ἀποδείξεως ἀπλῶς καὶ μὴ ἐκ τινῶν μηδ' ἐξ ὑποθέσεως, ἀνάγκη
 84 a ἴστασθαι τὰς κατηγορίας τὰς μεταξύ. εἰ γὰρ μὴ ἴστανται, ἀλλ' ἔστιν αἰεὶ τοῦ ληφθέντος ἐπάνω, ἀπάντων ἔσται ἀπόδειξις· ὥστ' εἰ τὰ ἄπειρα μὴ ἐγχωρεῖ διελθεῖν, ὧν ἔστιν ἀπόδειξις, ταῦτ' οὐκ εἰσόμεθα δι' ἀποδείξεως. εἰ οὖν μηδὲ βέλτιον ἔχομεν
 5 πρὸς αὐτὰ τοῦ εἰδέναι, οὐκ ἔσται οὐδὲν ἐπίστασθαι δι' ἀποδείξεως ἀπλῶς, ἀλλ' ἐξ ὑποθέσεως.

Λογικῶς μὲν οὖν ἐκ τούτων ἂν τις πιστεύσειε περὶ τοῦ λεχθέντος, ἀναλυτικῶς δὲ διὰ τῶνδε φανερόν συντομώτερον, ὅτι οὐτ' ἐπὶ τὸ ἄνω οὐτ' ἐπὶ τὸ
 10 κάτω ἄπειρα τὰ κατηγορούμενα ἐνδέχεται εἶναι ἐν ταῖς ἀποδεικτικαῖς ἐπιστήμαις, περὶ ὧν ἡ σκέψις ἐστίν.

Ἡ μὲν γὰρ ἀπόδειξις ἐστὶ τῶν ὅσα ὑπάρχει καθ' αὐτὰ τοῖς πράγμασιν. καθ' αὐτὰ δὲ διττῶς· ὅσα τε γὰρ ἐν¹ ἐκείνοις ἐνυπάρχει ἐν τῷ τί ἐστὶ, καὶ οἷς αὐτὰ ἐν τῷ τί ἐστὶν ὑπάρχουσιν αὐτοῖς· οἷον τῷ
 15 ἀριθμῷ τὸ περιττόν, ὃ ὑπάρχει μὲν ἀριθμῷ, ἐνυπάρχει δ' αὐτὸς ὁ ἀριθμὸς ἐν τῷ λόγῳ αὐτοῦ, καὶ πάλιν πλῆθος ἢ τὸ διαιρετόν ἐν τῷ λόγῳ τοῦ ἀριθμοῦ ἐνυπάρχει. τούτων δ' οὐδέτερα ἐνδέχεται

¹ ἐν secl. Jaeger.

^a The proof is called analytical because it is based upon a principle of the relevant science, viz., demonstration.

^b See a 18 *infra*.

certain others, and we do not know the latter or stand in a better relation to them than that of knowledge, we shall have no scientific knowledge of that which is knowable through them. If, then, it is possible to know a thing absolutely through demonstration, and not as a qualified or hypothetical consequence, the series of intermediate predications must have a limit. If there is no limit, and there is always something higher than the term last taken, everything will be demonstrable. Therefore, since it is impossible to traverse the numerically infinite, we shall not know by means of demonstration those predicates which are demonstrable. Hence if at the same time we do not stand in a better relation to them than that of knowledge, it will not be possible to have scientific knowledge of anything absolutely through demonstration, but only hypothetically.

One might be convinced dialectically of the truth of our contention from the foregoing discussion ; but by analytical^a method it can be apprehended more readily from the following arguments that there cannot be either in the upward or in the downward direction an infinite series of predicates in the demonstrative sciences, which are the subject of our investigation.

Demonstration is concerned with the essential attributes of things. There are two senses in which attributes may be essential ; (a) because they inhere in the essence of their subjects, or (b) because their subjects inhere in their essence. An example of (b) is the relation of " odd " ^b to number ; " odd " is an attribute of number, and number itself is inherent in the definition of " odd." On the other hand, (a) plurality or divisibility is inherent in the definition of number. Neither of these processes of attribution

Analytical
proof.

ἄπειρα εἶναι, οὐθ' ὥς τὸ περιττὸν τοῦ ἀριθμοῦ
 (πάλιν γὰρ ἂν ἐν τῷ περιττῷ ἄλλο εἴη ᾧ ἐνυπῆρχεν
 20 ὑπάρχοντι· τοῦτο δ' εἰ ἔστι, πρῶτον ὁ ἀριθμὸς
 ἐνυπάρξει ὑπάρχουσιν αὐτῷ· εἰ οὖν μὴ ἐνδέχεται
 ἄπειρα τοιαῦτα ὑπάρχειν ἐν τῷ ἐνί, οὐδ' ἐπὶ τὸ
 ἄνω ἔσται ἄπειρα· ἀλλὰ μὴν ἀνάγκη γε πάντα
 ὑπάρχειν τῷ πρώτῳ, οἷον τῷ ἀριθμῷ, κακείνοις
 τὸν ἀριθμόν, ὥστ' ἀντιστρέφοντα ἔσται, ἀλλ' οὐχ
 25 ὑπερτείνοντα)· οὐδὲ μὴν ὅσα ἐν τῷ τί ἐστὶν ἐν-
 υπάρχει, οὐδὲ ταῦτα ἄπειρα· οὐδὲ γὰρ ἂν εἴη ὀρίσα-
 σθαι. ὥστ' εἰ τὰ μὲν κατηγορούμενα καθ' αὐτὰ
 πάντα λέγεται, ταῦτα δὲ μὴ ἄπειρα, ἴσταιτο ἂν τὰ
 ἐπὶ τὸ ἄνω, ὥστε καὶ ἐπὶ τὸ κάτω.

Εἰ δ' οὕτω, καὶ τὰ ἐν τῷ μεταξύ δύο ὄρων αἰεὶ
 30 πεπερασμένα. εἰ δὲ τοῦτο, δῆλον ἤδη καὶ τῶν
 ἀποδείξεων ὅτι ἀνάγκη ἀρχάς τε εἶναι, καὶ μὴ πάν-
 των εἶναι ἀπόδειξιν, ὅπερ ἔφαμέν τινας λέγειν κατ'
 ἀρχάς. εἰ γὰρ εἰσὶν ἀρχαί, οὕτε πάντ' ἀποδεικτὰ
 οὐτ' εἰς ἄπειρον οἷόν τε βαδίζειν· τὸ γὰρ εἶναι
 τούτων ὅποτερονοῦν οὐδὲν ἄλλο ἐστὶν ἢ τὸ εἶναι
 35 μηδὲν διάστημα ἄμεσον καὶ ἀδιαίρετον, ἀλλὰ πάντα
 διαιρετά. τῷ γὰρ ἐντὸς ἐμβάλλεσθαι ὄρον, ἀλλ'
 οὐ τῷ προσλαμβάνεσθαι, ἀποδείκνυται τὸ ἀποδεικ-
 νύμενον, ὥστ' εἰ τοῦτ' εἰς ἄπειρον ἐνδέχεται ἵέναι,
 ἐνδέχοιτ' ἂν δύο ὄρων ἄπειρα μεταξύ εἶναι μέσα.

^a Number is assumed to be the downward limit ; if there is no upward limit there will be terms with infinitely many elements in their essence.

^b Thus they form not a vertical series but a kind of circle. Since they are convertible, "odd" must stand for "odd or even."

^c Cf. 82 b 38.

^d Proved in ch. xx.

^e 72 b 6.

can proceed to infinity. (b) The series cannot be infinite when the relation is that of "odd" to number; for then in its turn "odd" would have another attribute in which "odd" was inherent; and if so, number must be ultimately inherent in the several "odds" which are its attributes. Thus since an infinite number of such attributes cannot apply to a single subject, the series will not be infinite in the upward direction either.^a Actually all such attributes must so inhere in the ultimate subject—the attributes of number in number and number in them—that they will be commensurate with it and not extend beyond it.^b Nor again are the attributes which inhere in the essence of their subject infinite in number; if they were, definition would be impossible.^c Thus if all the attributes are predicated as essential, and as such cannot be infinite in number, the upward series must have a limit, and therefore so must the downward.

If this is so, the intermediates between any two terms must always be finite in number^d; and if this is so, it is obvious at once that there must be first principles of demonstration, and that the view that everything is demonstrable (which we mentioned at the beginning^e as held by some) is false. For if there are first principles, (1) not everything is demonstrable, and (2) demonstration cannot form an infinite series; because the rejection of either consequence immediately implies that no premiss is immediate and indivisible, but all are divisible. For it is by adding a term internally, and not externally, that a proposition is demonstrated. Thus if the process of demonstration can continue to infinity, it would be possible for there to be an infinite number of middles

84 b ἀλλὰ τοῦτ' ἀδύνατον, εἰ ἴστανται αἱ κατηγορίαι ἐπὶ τὸ ἄνω καὶ τὸ κάτω. ὅτι δὲ ἴστανται, δέδεικται λογικῶς μὲν πρότερον, ἀναλυτικῶς δὲ νῦν.

XXIII. Δεδειγμένων δὲ τούτων φανερόν ὅτι, εἰάν τι τὸ αὐτὸ δυσὶν ὑπάρχει, οἷον τὸ Α τῷ τε Γ καὶ
 5 τῷ Δ, μὴ κατηγορουμένου θατέρου κατὰ θατέρου, ἢ μηδαμῶς ἢ μὴ κατὰ παντός, ὅτι οὐκ αἰεὶ κατὰ κοινόν τι ὑπάρξει. οἷον τῷ ἰσοσκελεῖ καὶ τῷ σκαληνῷ τὸ δυσὶν ὀρθαῖς ἴσας ἔχειν κατὰ κοινόν τι ὑπάρχει (ἢ γὰρ σχῆμά τι ὑπάρχει, καὶ οὐχ ἢ ἕτερον), τοῦτο δ' οὐκ αἰεὶ οὕτως ἔχει. ἔστω γὰρ τὸ
 10 Β καθ' ὃ τὸ Α τῷ ΓΔ ὑπάρχει. δῆλον τοίνυν ὅτι καὶ τὸ Β τῷ Γ καὶ¹ Δ κατ' ἄλλο κοινόν, κἀκείνο καθ' ἕτερον, ὥστε δύο ὄρων μεταξὺ ἄπειροι ἂν ἐμπίπτοιεν ὅροι. ἀλλ' ἀδύνατον. κατὰ μὲν τοίνυν κοινόν τι ὑπάρχειν οὐκ ἀνάγκη αἰεὶ τὸ αὐτὸ πλείοσιν,
 15 εἴπερ² ἔσται ἅμεσα διαστήματα. ἐν μέντοι τῷ αὐτῷ γένει καὶ ἐκ τῶν αὐτῶν ἀτόμων ἀνάγκη τοὺς ὅρους εἶναι, εἴπερ τῶν καθ' αὐτὰ ὑπαρχόντων ἔσται τὸ κοινόν· οὐ γὰρ ἦν ἐξ ἄλλου γένους εἰς ἄλλο διαβῆναι τὰ δεικνύμενα.

Φανερόν δὲ καὶ ὅτι, ὅταν τὸ Α τῷ Β ὑπάρχει, εἰ
 20 μὲν ἔστι τι μέσον, ἔστι δείξαι ὅτι τὸ Α τῷ Β ὑπάρχει· καὶ στοιχεῖα τούτου ἐστὶ ταῦτα³ καὶ το-

¹ καὶ] καὶ τῷ D.

² εἴπερ ci. Jaeger: ἐπέειπερ.

³ ταῦτα Ross: ταῦτα.

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between two terms. This, however, is impossible, if the series of predications has an upward and a downward limit. That it has these limits was proved above by dialectical, and has now been proved by analytical method.

XXIII. Now that this fact has been established, it is evident that if the same attribute applies to two subjects, *e.g.*, if A applies both to C and to D, which are not reciprocally predicable of each other, at least not universally, the predicate will not always apply in virtue of a common characteristic. *E.g.*, "having the sum of its angles equal to two right angles" applies in virtue of a common characteristic to the isosceles and to the scalene triangle: it belongs to each of them *qua* a particular kind of figure, and not *qua* different. But this is not always so. Let B stand for the characteristic in virtue of which A applies to C and D. Then clearly B also applies to C and D in virtue of some other characteristic, and this in virtue of another; so that an infinite number of terms will be interpolated between the original two. But this is impossible.^a Thus if there are to be immediate premisses it will not necessarily be in virtue of some common characteristic that the same predicate applies to more than one subject. If, however, it is an essential attribute that is to be proved common, the <middle> terms must belong to the same genus and <the premisses> be derived from the same immediate premisses; for we saw ^b that in proving propositions we cannot pass from one genus to another.

It is evident also that when A applies to B, if there is a middle term, it is possible to prove that A applies to B; and the elements of this proof are identical with the middle terms, or rather the same in number;

Corollaries :
(1) Common attributes need not be identically mediated.

(2) Connections are provable by middle terms.

84 b

σαῦθ' ὅσα μέσα ἐστίν· αἱ γὰρ ἄμεσοι προτάσεις
στοιχεῖα, ἢ πᾶσαι ἢ αἱ καθόλου. εἰ δὲ μὴ ἔστιν,
οὐκέτι ἔστιν ἀπόδειξις, ἀλλ' ἢ ἐπὶ τὰς ἀρχὰς ὁδὸς
αὕτη ἐστίν. ὁμοίως δὲ καὶ εἰ τὸ Α τῷ Β μὴ ὑπάρ-
25 χει, εἰ μὲν ἔστιν ἢ μέσον ἢ πρότερον ᾧ οὐχ ὑπάρχει,
ἔστιν ἀπόδειξις, εἰ δὲ μή, οὐκ ἔστιν, ἀλλ' ἀρχή· καὶ
στοιχεῖα τοσαῦτ' ἐστὶν ὅσοι ὅροι· αἱ γὰρ τούτων
προτάσεις ἀρχαὶ τῆς ἀποδείξεώς εἰσιν, καὶ ὥσπερ
ἐναι ἀρχαὶ εἰσιν ἀναπόδεικτοι, ὅτι ἔστι τόδε τοδὶ
30 καὶ ὑπάρχει τόδε τῷ δὶ, οὕτω καὶ ὅτι οὐκ ἔστι τόδε
τοδὶ οὐδ' ὑπάρχει τόδε τῷ δὶ ὥσθ' αἱ μὲν εἶναι τι,
αἱ δὲ μὴ εἶναι τι ἔσσονται ἀρχαί.

Ὅταν δὲ δέη δεῖξαι, ληπτέον ὁ τοῦ Β πρῶτον
κατηγορεῖται. ἔστω τὸ Γ, καὶ τούτου ὁμοίως τὸ
Δ.¹ καὶ οὕτως αἰεὶ βαδίζοντι οὐδέποτε ἔξωτέρω
πρότασις οὐδ' ὑπάρχον λαμβάνεται τοῦ Α ἐν τῷ
35 δεικνύναι, ἀλλ' αἰεὶ τὸ μέσον πυκνοῦται ἕως ἀδιαί-
ρετα γένηται καὶ ἐν. ἔστι δ' ἐν ὅταν ἄμεσον γένη-
ται, καὶ μία πρότασις ἀπλῶς ἢ ἄμεσος. καὶ ὥσπερ
ἐν τοῖς ἄλλοις ἢ ἀρχὴ ἀπλοῦν, τοῦτο δ' οὐ ταὐτὸ
πανταχοῦ, ἀλλ' ἐν βάρει μὲν μνᾶ, ἐν δὲ μέλει δίεςις,
85 a ἄλλο δ' ἐν ἄλλῳ, οὕτως ἐν συλλογισμῷ τὸ ἐν πρό-
τασις ἄμεσος, ἐν δ' ἀποδείξει καὶ ἐπιστήμῃ ὁ νοῦς.

Ἐν μὲν οὖν τοῖς δεικτικοῖς συλλογισμοῖς τοῦ

¹ Δ n, Ross : A.

^a Assuming that there are several middles, forming with A and B a chain of immediate premisses, all of which, except the last, are "universal," i.e. majors.

for it is the immediate premisses—either all or those which are universal—that are elements.^a If there is no middle term, demonstration is impossible; we are approaching first principles. Similarly too if A does not apply to B, if there is either a middle or a prior term to which A does not apply, demonstration is possible (otherwise it is not possible; we are dealing with a first principle); and there will be as many elements as there are <middle> terms; for it is the premisses containing these that are the principles of the demonstration. Just as there are some indemonstrable premisses to the effect that X is Y or X applies to Y, so there are others to the effect that X is not Y or does not apply to Y; so that some will be principles making an affirmative and others making a negative statement.

When, however, proof is required, we must assume <as middle> the immediate predicate of B. Let this be C, and let D similarly be predicated of C. If we continue this process we never assume in our proof a premiss or an attribute which falls outside A, but we go on packing the space between until the intervals are indivisible or unitary: and we have one unit when the premiss is immediate. It is only the immediate premiss that is *one* in the unqualified sense. Just as in all other genera the basic measure is something simple, and this is not the same in all cases, but in weight is the mina,^b in music the quarter-tone, and so on in each genus, so in syllogism the unit is the immediate premiss, while in demonstration and understanding the unit is an act of intuition.^c

In affirmative syllogisms, then, nothing falls outside

How to select these in (a) affirmative proof,

(b) negative proof.

^b About 1 lb. avoirdupois.

^c Which cognizes the immediate premiss.

85 a

ὑπάρχοντος οὐδὲν ἔξω πίπτει, ἐν δὲ τοῖς στερη-
 τικοῖς, ἔνθα μὲν ὁ δεῖ ὑπάρχειν, οὐδὲν τούτου ἔξω
 5 πίπτει, οἷον εἰ τὸ Α τῷ Β διὰ τοῦ Γ μὴ (εἰ γὰρ τῷ
 μὲν Β παντὶ τὸ Γ, τῷ δὲ Γ μηδενὶ τὸ Α). πάλιν ἂν
 δέη ὅτι τῷ Γ τὸ Α οὐδενὶ ὑπάρχει, μέσον ληπτέον
 τοῦ Α καὶ Γ, καὶ οὕτως αἰ πορεύσεται. εἰ δὲ
 δέη δεῖξαι ὅτι τὸ Δ τῷ Ε οὐχ ὑπάρχει τῷ τὸ Γ τῷ
 μὲν Δ παντὶ ὑπάρχειν τῷ δὲ Ε μηδενὶ [ἢ μὴ παντί],¹
 10 τοῦ Ε οὐδέποτ' ἔξω πεσεῖται· τοῦτο δ' ἐστὶν ὧ [οὐ]²
 δεῖ ὑπάρχειν. ἐπὶ δὲ τοῦ τρίτου τρόπου οὔτε ἀφ'
 οὐ δεῖ οὔτε ὁ δεῖ στερῆσαι οὐδέποτ' ἔξω βαδιεῖται.

XXIV. Οὕσης δ' ἀποδείξεως τῆς μὲν καθόλου
 τῆς δὲ κατὰ μέρος, καὶ τῆς μὲν κατηγορικῆς τῆς
 15 δὲ στερητικῆς, ἀμφισβητεῖται ποτέρα βελτίων· ὥς
 δ' αὐτως καὶ περὶ τῆς ἀποδεικνύναι λεγομένης καὶ
 τῆς εἰς τὸ ἀδύνατον ἀγούσης ἀποδείξεως. πρῶτον
 μὲν οὖν ἐπισκεψώμεθα περὶ τῆς καθόλου καὶ τῆς
 κατὰ μέρος· δηλώσαντες δὲ τοῦτο, καὶ περὶ τῆς
 δεικνύναι λεγομένης καὶ τῆς εἰς τὸ ἀδύνατον
 εἰπωμεν.

¹ ἢ μὴ παντί secl. Ross.² οὐ om. Dn¹, Ross.^a i.e., no middle term is assumed that is wider than the predicate.^b Celarent in the first figure.^c Strictly non-attribution; Aristotle again means the predicate or major term.^d Ross is doubtless right in bracketing ἢ μὴ παντί and so confining the reference to Camestres, because Aristotle seems to have only universal conclusions in view.^e Since the major and minor terms are regarded as extremes, "outside" here means "below"; no middle will be narrower than the subject. It may, however (though Aristotle does not actually say so), be wider than the predicate.

the attribute.^a In negative syllogisms (1) in one mood ^b nothing falls outside the term whose attribution ^c is required to be proved; e.g., supposing that it is required to be proved by means of C that A does not apply to B (the premisses being C applies to all B, and A to no C); if in turn it is required to prove that A applies to no C, a middle term must be assumed between A and C, and the process will continue in this way. (2) If, however, it is required to prove that D does not apply to E because C applies to all D but to none [or not to all] ^d of E, the additional terms will never fall outside ^e E, i.e., the subject to which the predicate is required (not)^f to apply. (3) In the third mood ^g the additional terms will never proceed beyond the subject or the predicate of the required negative conclusion.

XXIV. Since demonstration may be either universal or particular,^h and either affirmative or negative, it may be debated which is the better. So too with regard to so-called ostensive proof and *reductio ad impossibile*. First, then, let us consider universal and particular demonstration. When we have cleared up this question let us discuss direct proof and *reductio ad impossibile*.ⁱ

Is universal superior to particular demonstration?

^a The negative, required in English, is dispensable in Aristotle's formula (cf. $\delta \delta \epsilon \iota \upsilon \pi \acute{\alpha} \rho \chi \epsilon \iota \nu$ in a 3 above). It was probably inserted in the text by a zealous corrector.

^g Clearly not the third figure (which, as Ross points out, does not satisfy the conditions) but Cesare in the second—the only other mood which gives a universal negative conclusion.

^h Not in the ordinary sense of the terms, because demonstration proper is not concerned with particular or singular propositions (the argument adduced and rejected below is unscientific); the distinction is between degrees of universality.

ⁱ See ch. xxvi.

85 a

- 20 Δόξειε μὲν οὖν τάχ' ἄν τιςιν ὥδὶ σκοποῦσιν ἡ
κατὰ μέρος εἶναι βελτίων. εἰ γὰρ καθ' ἣν μᾶλλον
ἐπιστάμεθα ἀπόδειξιν βελτίων ἀπόδειξις (αὕτη γὰρ
ἀρετὴ ἀποδείξεως), μᾶλλον δ' ἐπιστάμεθα ἕκαστον
ὅταν αὐτὸ εἰδῶμεν καθ' αὐτὸ ἢ ὅταν κατ' ἄλλο (οἶον
25 τὸν μουσικὸν Κορίσκον ὅταν ὅτι ὁ Κορίσκος μου-
σικὸς ἢ ὅταν ὅτι ἄνθρωπος¹ μουσικός· ὁμοίως δὲ
καὶ ἐπὶ τῶν ἄλλων), ἡ δὲ καθόλου ὅτι ἄλλο, οὐχ
ὅτι αὐτὸ τετύχηκεν ἐπιδείκνυσιν (οἶον ὅτι τὸ ἰσο-
σκελὲς οὐχ ὅτι ἰσοσκελὲς ἀλλ' ὅτι τρίγωνον), ἡ δὲ
κατὰ μέρος ὅτι αὐτό· εἰ δὴ βελτίων μὲν ἢ καθ' αὐτό,
30 τοιαύτη δ' ἢ κατὰ μέρος τῆς καθόλου μᾶλλον, καὶ
βελτίων ἄν ἢ κατὰ μέρος ἀπόδειξις εἴη. ἔτι εἰ τὸ
μὲν καθόλου μὴ ἐστί τι παρὰ τὰ καθ' ἕκαστα, ἡ δ'
ἀπόδειξις δόξαν ἐμποιεῖ εἶναί τι τοῦτο καθ' ὃ ἀπο-
δείκνυσιν, καὶ τινα φύσιν ὑπάρχειν ἐν τοῖς οὖσι ταύ-
την, οἶον τριγώνου παρὰ τὰ τινὰ καὶ σχήματος παρὰ
35 τὰ τινὰ καὶ ἀριθμοῦ παρὰ τοὺς τινὰς ἀριθμούς,
βελτίων δ' ἢ περὶ ὄντος ἢ μὴ ὄντος καὶ δι' ἣν μὴ
ἀπατηθήσεται ἢ δι' ἣν, ἔστι δ' ἢ μὲν καθόλου τοι-
αύτη (προϊόντες γὰρ δεικνύουσιν, ὥσπερ περὶ τοῦ ἀνά

¹ ἄνθρωπος Ross.

^a Of Scepsis in Mysia; a friend whose name Aristotle often uses in illustrative examples. The epithet *μουσικός* is probably used with its wider meaning.

^b Probably either Academic mathematicians or actual disciples of Eudoxus, who discovered the general theory of proportion.

Some people, looking at the question in the following way, might suppose that particular demonstration is superior. (1) If the superior method of demonstration is that by which we gain more knowledge (since this is the distinctive merit of demonstration), and we have more knowledge of an individual thing when we recognize it in virtue of itself than when we do so in virtue of something else (as, *e.g.*, we have more knowledge of "cultured Coriscus" ^a when we know that Coriscus is cultured than when we only know that man is cultured; and similarly in all other cases); and whereas universal demonstration informs us that something else, not that the particular thing, has a given attribute—*e.g.*, does not tell us that an isosceles triangle has a given attribute because it is isosceles but because it is a triangle—, particular demonstration informs us that the particular thing has it;—if, then, the better demonstration is that which informs us of something in virtue of itself, and particular is more of this nature than universal demonstration, then particular will also be superior to universal demonstration. (2) Further, if the universal does not exist apart from particulars, and demonstration produces in us a belief that there is something of this nature in virtue of which the demonstration proceeds, and that this inheres as a definite characteristic in things (*e.g.*, the characteristics triangle, figure and number apart from particular triangles, figures and numbers); and if the demonstration which treats of the existent and is infallible is superior to that which treats of the non-existent and is fallible; and if universal demonstration is of the latter kind (since it is by proceeding in this way that they ^b attempt proofs like that which

Arguments
against uni-
versal de-
monstra-
tion.

85 a

λόγον, οἷον ὅτι ὁ ἂν ἢ τι τοιοῦτον ἔσται ἀνὰ λόγον,
ὁ οὔτε γραμμὴ οὔτ' ἀριθμὸς οὔτε στερεὸν οὔτ' ἐπί-

85 b

πεδον, ἀλλὰ παρὰ ταῦτά τι).—εἰ οὖν καθόλου μὲν
μᾶλλον αὕτη, περὶ ὄντος δ' ἦττον τῆς κατὰ μέρος
καὶ ἐμποιεῖ δόξαν ψευδῇ, χείρων ἂν εἴη ἢ καθόλου
τῆς κατὰ μέρος.

Ἡ πρῶτον μὲν οὐδὲν μᾶλλον ἐπὶ τοῦ καθόλου ἢ
5 τοῦ κατὰ μέρος ἄτερος λόγος ἐστίν; εἰ γὰρ τὸ δυσὶν
ὀρθαῖς ὑπάρχει μὴ ἢ ἰσοσκελὲς ἀλλ' ἢ τρίγωνον, ὁ
εἰδὼς ὅτι ἰσοσκελὲς ἦττον οἶδεν ἢ αὐτὸ ἢ ὁ εἰδὼς
ὅτι τρίγωνον. ὅλως τε, εἰ μὲν μὴ ὄντος ἢ τρίγωνον
εἶτα δείκνυσιν, οὐκ ἂν εἴη ἀπόδειξις, εἰ δὲ ὄντος, ὁ
εἰδὼς ἕκαστον ἢ ἕκαστον ὑπάρχει μᾶλλον οἶδεν. εἰ
10 δὴ τὸ τρίγωνον ἐπὶ πλεόν ἐστί, καὶ ὁ αὐτὸς λόγος,
καὶ μὴ καθ' ὁμωνυμίαν τὸ τρίγωνον, καὶ ὑπάρχει
παντὶ τριγώνῳ τὸ δύο, οὐκ ἂν τὸ τρίγωνον ἢ ἰσο-
σκελὲς, ἀλλὰ τὸ ἰσοσκελὲς ἢ τρίγωνον, ἔχει τοιαύτας
τὰς γωνίας. ὥστε ὁ καθόλου εἰδὼς μᾶλλον οἶδεν ἢ
15 ὑπάρχει ἢ ὁ κατὰ μέρος. βελτίων ἄρα ἢ καθόλου
τῆς κατὰ μέρος. ἔτι εἰ μὲν εἴη τις λόγος εἰς καὶ μὴ
ὁμωνυμία τὸ καθόλου, εἴη τ'¹ ἂν οὐδὲν ἦττον ἐνίων

¹ τ' om. n.

asserts that a proportional is anything which has a certain definite characteristic, and that it is neither a line nor a number nor a solid nor a plane, but something distinct from these)—, if, then, this kind of proof is closer to universal demonstration, and treats less of the existent than particular demonstration, and produces a false opinion, universal will be inferior to particular demonstration.

In point of fact, however, (1) the first argument applies no more to universal than to particular demonstration. If the attribute of having the sum of its interior angles equal to two right angles belongs to a figure not *qua* isosceles but *qua* triangle, the man who knows that the figure possesses this attribute because it is isosceles knows less of the essential reason for the fact than he who knows that it is so because the figure is a triangle. And in general if, when an attribute does not belong to a given subject *qua* triangle, the attribute is proved of that subject, the proof cannot amount to demonstration; but if it does apply to the subject (*qua* triangle), then he has the greater knowledge who knows that a given attribute belongs to a given subject as such. Thus if "triangle" is the wider term, and has an invariable meaning, the term "triangle" not being equivocal; and if the attribute of having the sum of its interior angles equal to two right angles applies to every triangle, then it is the isosceles *qua* triangle, and not the triangle *qua* isosceles, that will possess such angles. Thus the man who knows the universal has more knowledge than he who knows the particular. Therefore universal is superior to particular demonstration. (2) If the meaning is invariable and the universal term is not merely equivocal, it will be not

Refutation
of the
above.

85 b

τῶν κατὰ μέρος, ἀλλὰ καὶ μᾶλλον, ὅσω τὰ ἄφθαρτα
 ἐν ἐκείνοις ἐστί, τὰ δὲ κατὰ μέρος φθαρτὰ μᾶλλον,
 ἔτι τε οὐδεμία ἀνάγκη ὑπολαμβάνειν τι εἶναι τοῦτο
 20 παρὰ ταῦτα ὅτι ἐν δηλοῖ, οὐδὲν μᾶλλον ἢ ἐπὶ τῶν
 ἄλλων ὅσα μὴ τὶ σημαίνει ἀλλ' ἢ ποιὸν ἢ πρὸς τι
 ἢ ποιεῖν. εἰ δὲ ἄρα, οὐχ ἢ ἀπόδειξις αἰτία ἀλλ' ὁ
 ἀκούων.

Ἔτι εἰ ἢ ἀπόδειξις μὲν ἐστὶ συλλογισμὸς δεικτι-
 κὸς αἰτίας καὶ τοῦ διὰ τί, τὸ καθόλου δ' αἰτιώτερον
 25 (ὥ γὰρ καθ' αὐτὸ ὑπάρχει τι, τοῦτο αὐτὸ αὐτῷ
 αἴτιον· τὸ δὲ καθόλου πρῶτον· αἴτιον ἄρα τὸ καθό-
 λου)· ὥστε καὶ ἢ ἀπόδειξις βελτίων· μᾶλλον γὰρ τοῦ
 αἰτίου καὶ τοῦ διὰ τί ἐστίν.

Ἔτι μέχρι τούτου ζητοῦμεν τὸ διὰ τί, καὶ τότε
 οἰόμεθα εἰδέναι ὅταν μὴ ἢ ὅτι τι ἄλλο τοῦτο ἢ
 30 γιγνόμενον ἢ ὄν· τέλος γὰρ καὶ πέρας τὸ ἔσχατον
 ἦδη οὕτως ἐστίν. οἶον τίνος ἕνεκα ἦλθεν; ὅπως
 λάβῃ τὰργύριον, τοῦτο δ' ὅπως ἀποδῶ ὃ ὠφείλε,
 τοῦτο δ' ὅπως μὴ ἀδικήσῃ· καὶ οὕτως ἰόντες, ὅταν
 μηκέτι δι' ἄλλο μὴδ' ἄλλου ἕνεκα, διὰ τοῦτο ὡς τέ-
 λος φαμὲν ἐλθεῖν καὶ εἶναι καὶ γίνεσθαι, καὶ τότε
 35 εἰδέναι μάλιστα διὰ τί ἦλθεν. εἰ δὲ ὁμοίως ἔχει ἐπὶ
 πασῶν τῶν αἰτιῶν καὶ τῶν διὰ τί, ἐπὶ δὲ τῶν ὅσα

^a Genera and species being (for Aristotle at least) permanent types.

^b In the sense that the subject of a (commensurately) universal attribute is the first subject to which it can be shown to apply: 73 b 32.

less but more really existent than some of the particulars, inasmuch as universals include imperishable things,^a whereas particulars tend rather to be perishable. Further, there is no need to assume that the universal is some one entity apart from the particulars simply because it has a single denotation ; no more than in the case of the other categories which denote not substance but quality or relation or activity. If this assumption is made, the fault lies not in the demonstration but in the hearer.

(3) There is also the argument that demonstration is a syllogism proving the cause or reasoned fact, and the universal is more of the nature of a cause (for a subject which possesses an attribute *per se* is itself the cause of its own possession of that attribute ; and the universal is primary^b ; therefore the universal is the cause). Therefore universal demonstration is superior, because it more properly proves the cause or reasoned fact. Further positive arguments.

(4) Again, we cease our inquiry for the reason and assume that we know it when we reach a fact whose existence or coming into existence does not depend upon any other fact ; for the last stage of an inquiry by this method is *ipso facto* the end and limit. *E.g.*, why did X come ? To get the money ; and this was in order to repay what he owed, and this again in order not to do wrong. When, as we proceed in this way, we reach a cause which neither depends upon anything else nor has anything else as its object, we say that this is the end for which the man came, or exists, or comes into being ; it is then that we say that we understand most completely *why* the man came. If, then, the same principle applies to all causes and reasoned facts, and if our knowledge of

85 b

αἷτια οὕτως ὥς οὐ ἔνεκα οὕτως ἴσμεν μάλιστα, καὶ ἐπὶ τῶν ἄλλων ἄρα τότε μάλιστα ἴσμεν ὅταν μηκέτι ὑπάρχη τοῦτο ὅτι ἄλλο. ὅταν μὲν οὖν γινώσκωμεν ὅτι τέτταρσιν αἱ ἕξω ἴσαι, ὅτι ἰσοσκελές, ἔτι

86 a λείπεται διὰ τί τὸ ἰσοσκελές, ὅτι τρίγωνον, καὶ τοῦτο, ὅτι σχῆμα εὐθύγραμμον. εἰ δὲ τοῦτο μηκέτι διότι ἄλλο, τότε μάλιστα ἴσμεν. καὶ καθόλου δὲ τότε· ἢ καθόλου ἄρα βελτίων.

Ἔτι ὅσω ἂν μᾶλλον κατὰ μέρος ἦ, εἰς τὰ ἄπειρα
5 ἐμπίπτει, ἢ δὲ καθόλου εἰς τὸ ἀπλοῦν καὶ τὸ πέρασ.
ἔστι δ', ἢ μὲν ἄπειρά, οὐκ ἐπιστητά, ἢ δὲ πε-
πέρανται, ἐπιστητά. ἢ ἄρα καθόλου, μᾶλλον ἐπι-
στητὰ ἢ κατὰ μέρος. ἀποδεικτὰ ἄρα μᾶλλον τὰ
καθόλου. τῶν δὲ ἀποδεικτῶν μᾶλλον μᾶλλον ἀπό-
δειξις· ἅμα γὰρ μᾶλλον τὰ πρὸς τι. βελτίων ἄρα ἢ
10 καθόλου, ἐπείπερ καὶ μᾶλλον ἀπόδειξις.

Ἔτι εἰ¹ αἰρετωτέρα καθ' ἣν τοῦτο καὶ ἄλλο ἢ καθ'
ἣν τοῦτο μόνον οἶδεν· ὁ δὲ τὴν καθόλου ἔχων οἶδε
καὶ τὸ κατὰ μέρος, οὗτος δὲ τὸ καθόλου οὐκ οἶδεν·
ὥστε καὶ οὕτως αἰρετωτέρα εἶη.

Ἔτι δὲ ᾧδε. τὸ γὰρ καθόλου μᾶλλον δεικνύναι

¹ εἰ om. DM.

all final causes is most complete under the conditions which we have just described, then in all other cases too our knowledge is most complete when we reach a fact which does not depend further upon any other fact. So when we recognize that the sum of the exterior angles of a figure is equal to four right angles, because the figure is isosceles, there still remains the reason why the figure is isosceles, *viz.*, that it is a triangle, and this because it is a right-lined figure. If this reason depends upon nothing else, our knowledge is now complete. Moreover our knowledge is now universal ; and therefore universal knowledge is superior.

(5) Again, the more particular causes are, the more they tend to form an infinite regress, whereas universal demonstration tends towards the simple and finite ; and causes *qua* infinite are not knowable, whereas *qua* finite they are knowable. Hence causes are more knowable *qua* universal than *qua* particular ; and therefore universal causes are more demonstrable. But the demonstration of things which are more demonstrable is more truly demonstration ; for correlatives vary simultaneously in degree. Hence universal demonstration is superior, inasmuch as it is more truly demonstration.

(6) Again, that kind of demonstration by which one knows a given fact *and* another fact as well is preferable to that by which one knows only the given fact. But he who has universal knowledge knows the particular cause as well, whereas the man who has only particular knowledge does not know the universal cause. Hence on this ground also universal demonstration will be preferable.

(7) Again, there is the following argument. Proof

15 ἐστὶ τὸ διὰ μέσου δεικνύναι ἐγγυτέρω ὄντος τῆς ἀρχῆς. ἐγγυτάτῳ δὲ τὸ ἄμεσον· τοῦτο δ' ἀρχή. εἰ οὖν ἡ ἐξ ἀρχῆς τῆς μὴ ἐξ ἀρχῆς, ἡ μᾶλλον ἐξ ἀρχῆς τῆς ἡττον ἀκριβεστέρα ἀποδείξις. ἔστι δὲ τοιαύτη ἡ καθόλου μᾶλλον· κρείττων ἄρ' ἂν εἴη ἡ καθόλου. οἷον εἰ ἔδει ἀποδείξαι τὸ Α κατὰ τοῦ Δ·
20 μέσα τὰ ἐφ' ὧν ΒΓ· ἀνωτέρω δὴ τὸ Β, ὥστε ἡ διὰ τούτου καθόλου μᾶλλον.

Ἄλλὰ τῶν μὲν εἰρημένων ἓνια λογικά ἐστι· μάλιστα δὲ δῆλον ὅτι ἡ καθόλου κυριωτέρα ὅτι τῶν προτάσεων τὴν μὲν προτέραν ἔχοντες ἴσμεν πως
25 καὶ τὴν ὑστέραν καὶ ἔχομεν δυνάμει, οἷον εἴ τις οἶδεν ὅτι πᾶν τρίγωνον δυσὶν ὀρθαῖς, οἶδέ πως καὶ τὸ ἰσοσκελὲς ὅτι δύο ὀρθαῖς, δυνάμει, καὶ εἰ μὴ οἶδε τὸ ἰσοσκελὲς ὅτι τρίγωνον· ὁ δὲ ταύτην ἔχων τὴν πρότασιν τὸ καθόλου οὐδαμῶς οἶδεν, οὔτε δυνάμει οὔτ' ἐνεργείᾳ. καὶ ἡ μὲν καθόλου νοητή, ἡ δὲ
30 κατὰ μέρος εἰς αἴσθησιν τελευτᾷ.

XXV. Ὅτι μὲν οὖν ἡ καθόλου βελτίων τῆς κατὰ μέρος, τοσαῦθ' ἡμῖν εἰρήσθω· ὅτι δ' ἡ δεικτική τῆς

^a The implication is that (6), which Aristotle now proceeds to expand, is (or can be made) truly scientific.

^b Not a major and a minor, but the two premisses mentioned in the following lines.

^c When it reaches individuals, which are perceptible rather than intelligible.

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of the more universal fact consists in proving by a middle which is nearer to the first principle. Now that which is nearest to the first principle is the immediate premiss, *i.e.*, the first principle itself. If, then, demonstration from the first principle is more accurate than demonstration which is not from the first principle, that demonstration which is more nearly from the first principle is more accurate than that which is less nearly from it. Now it is universal demonstration which is more truly of this nature; and therefore universal demonstration is superior. *E.g.*, suppose that it is required to demonstrate A of D, the middle terms being B and C. B is the *higher* term, and so the demonstration by means of B is the more universal.

Some of the foregoing arguments, however, are merely dialectical.^a The clearest indication that universal demonstration is more authoritative is that when we comprehend the former of the two premisses ^b we have knowledge in a sense of the latter as well, and comprehend it potentially. *E.g.*, if anyone knows that every triangle has the sum of its interior angles equal to two right angles, he knows in a sense also (*viz.*, potentially) that the sum of the interior angles of an isosceles triangle is equal to two right angles, even if he does not know that the isosceles is a triangle. But the man who comprehends the latter premiss does not in any sense know the universal fact, neither potentially nor actually. Moreover universal demonstration is intelligible, whereas particular demonstration terminates in sense perception.^c

Final proofs that universal demonstration is superior.

XXV. The foregoing account may suffice to show that universal is superior to particular demonstration.

Affirmative is superior to negative

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στερητικῆς, ἐντεῦθεν δῆλον. ἔστω γὰρ αὕτη ἡ ἀπόδειξις βελτίων τῶν ἄλλων τῶν αὐτῶν ὑπαρχόντων, ἡ ἐξ ἐλαττόνων αἰτημάτων ἢ ὑποθέσεων ἢ προτάσεων. εἰ γὰρ γνώριμοι ὁμοίως, τὸ θάπτον γνῶναι διὰ τούτων ὑπάρξει· τοῦτο δ' αἰρετώτερον. λόγος δὲ τῆς προτάσεως, ὅτι βελτίων ἡ ἐξ ἐλαττόνων, καθόλου ὁδε¹. εἰ γὰρ ὁμοίως εἴη τὸ γνώριμα εἶναι τὰ μέσα, τὰ δὲ πρότερα γνωριμώτερα, ἔστω

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ἡ μὲν διὰ μέσων ἀπόδειξις τῶν ΒΓΔ ὅτι τὸ Α τῷ Ε ὑπάρχει, ἡ δὲ διὰ τῶν ΖΗ ὅτι τὸ Α τῷ Ε. ὁμοίως δὴ² ἔχει τὸ ὅτι τὸ Α τῷ Δ ὑπάρχει καὶ τὸ Α τῷ Ε. τὸ δ' ὅτι τὸ Α τῷ Δ πρότερον καὶ γνωριμώτερον ἢ ὅτι τὸ Α τῷ Ε· διὰ γὰρ τούτου ἐκείνο ἀποδείκνυται, πιστότερον δὲ τὸ δι' οὗ. καὶ ἡ διὰ τῶν ἐλαττόνων ἄρα ἀπόδειξις βελτίων τῶν ἄλλων τῶν αὐτῶν ὑπαρχόντων. ἀμφοτέραι μὲν οὖν διὰ τε ὄρων τριῶν καὶ προτάσεων δύο δείκνυνται, ἀλλ' ἡ μὲν εἶναί τι λαμβάνει, ἡ δὲ καὶ εἶναι καὶ μὴ εἶναι τι· διὰ πλειόνων ἄρα, ὥστε χείρων.

10 Ἔτι ἐπειδὴ δέδεικται ὅτι ἀδύνατον ἀμφοτέρων οὐσῶν στερητικῶν τῶν προτάσεων γενέσθαι συλλογισμόν, ἀλλὰ τὴν μὲν δεῖ τοιαύτην εἶναι, τὴν δ'

¹ ὁδε Dnp : ὡδε Waitz : δέ codd. plerique.

² δὴ np : δέ.

^a i.e., more universal.

^b Presumably because it is proved by the same number of middle terms.

^c The argument is blatantly dialectical, since it turns upon an equivocation. The premisses of a negative syllogism are the same in *number* as those of an affirmative one; they are "more" only in *kind*.

^d *An. Pr.* I. vii.

That affirmative is superior to negative demonstration will be clear from the following argument. (1) It may be assumed that, given the same conditions, that form of demonstration is superior to the rest which depends upon fewer postulates or hypotheses or premisses ; for supposing that they are equally well known, when there are fewer of them knowledge will be more quickly attained, and this result is to be preferred. The argument that demonstration from fewer premisses is superior may be stated universally as follows. Supposing that in both cases alike the middle terms are known, and that middle terms are better known in proportion as they are prior,^a let us assume demonstration that A applies to E in one case by means of the middle terms B, C and D, and in another by means of F and G. Then the proposition that A applies to D is equally evident ^b with the proposition (in the second case) that A applies to E. But the proposition that A applies to D is prior and more knowable than the proposition (in the first case) that A applies to E ; for the latter is proved by the former, and the means of proof is more certain than the thing proved. Therefore the demonstration which proceeds from fewer premisses is superior to any other conducted under the same conditions. Now both affirmative and negative demonstration are proved by three terms and two premisses, but whereas the former assumes that something is so, the latter assumes both that something is and that something is not so. Hence it proceeds from more ^c premisses, and is therefore inferior.

(2) It has already been proved ^d that there can be no syllogism when both premisses are negative ; if one is of this kind, the other must make an affirmative

demonstration.
First argument.

Second argument.

ὅτι ὑπάρχει, ἔτι πρὸς τούτῳ δεῖ τόδε λαβεῖν. τὰς
 μὲν γὰρ κατηγορικὰς αὐξανομένης τῆς ἀποδείξεως
 ἀναγκαῖον γίνεσθαι πλείους, τὰς δὲ στερητικὰς
 15 ἀδύνατον πλείους εἶναι μιᾶς ἐν ἅπαντι συλλογισμῷ.
 ἔστω γὰρ μηδενὶ ὑπάρχον τὸ Α ἐφ' ὅσων τὸ Β,
 τῷ δὲ Γ ὑπάρχον παντὶ τὸ Β. ἂν δὴ δέη πάλιν
 αὔξειν ἀμφοτέρας τὰς προτάσεις, μέσον ἐμβλητέον.
 τοῦ μὲν ΑΒ ἔστω τὸ Δ, τοῦ δὲ ΒΓ τὸ Ε. τὸ μὲν
 20 δὴ Ε φανερόν ὅτι κατηγορικόν, τὸ δὲ Δ τοῦ μὲν
 Β κατηγορικόν, πρὸς δὲ τὸ Α ὡς στερητικὸν κείμεναι.
 τὸ μὲν γὰρ Δ παντὸς τοῦ Β, τὸ δὲ Α οὐδενὶ δεῖ τῶν
 Δ ὑπάρχειν. γίνεται οὖν μία στερητικὴ πρότασις
 ἢ τὸ ΑΔ. ὁ δ' αὐτὸς τρόπος καὶ ἐπὶ τῶν ἐτέρων
 συλλογισμῶν. αἰ γὰρ τὸ μέσον τῶν κατηγορικῶν
 25 ὄρων κατηγορικὸν ἐπ' ἀμφοτέρα· τοῦ δὲ στερητικοῦ
 ἐπὶ θάτερα στερητικὸν ἀναγκαῖον εἶναι, ὥστε αὕτη
 μία τοιαύτη γίνεται πρότασις, αἱ δ' ἄλλαι κατη-
 γορικάι. εἰ δὴ γνωριμώτερον δι' οὗ δείκνυται καὶ
 πιστότερον, δείκνυται δ' ἢ μὲν στερητικὴ διὰ τῆς
 κατηγορικῆς, αὕτη δὲ δι' ἐκείνης οὐ δείκνυται,
 30 προτέρα καὶ γνωριμωτέρα οὖσα καὶ πιστοτέρα βελ-
 τίων ἂν εἴη.

Ἔτι εἰ ἀρχὴ συλλογισμοῦ ἢ καθόλου πρότασις
 ἄμεσος, ἔστι δ' ἐν μὲν τῇ δεικτικῇ καταφατικῇ ἐν
 δὲ τῇ στερητικῇ ἀποφατικῇ ἢ καθόλου πρότασις, ἢ
 δὲ καταφατικῇ τῆς ἀποφατικῆς προτέρα καὶ γνω-
 ριμωτέρα (διὰ γὰρ τὴν κατάφασιν ἢ ἀπόφασιν
 35 γνώριμος, καὶ προτέρα ἢ κατάφασιν, ὥσπερ καὶ τὸ
 εἶναι τοῦ μὴ εἶναι)· ὥστε βελτίων ἢ ἀρχὴ τῆς

statement. Now in addition to this we must grasp the following fact. As the demonstration is expanded,^a the affirmative premisses must increase in number, but there cannot be more than one negative premiss in any syllogism. Let us suppose that A applies to no instances of B, and that B applies to all C. Then if it is further required to expand both these premisses, a middle term must be interpolated in them. Let D be the middle of AB, and E of BC. Then obviously E is affirmative, but D, though related affirmatively to B, is related negatively to A; for D must be predicated of all B, but A must apply to no D. Thus we get one negative premiss, *viz.*, AD. The same holds good of all other syllogisms. Where the terms are affirmative, the middle is always related affirmatively to both the others; but in a negative syllogism the middle term must be related negatively to one of the others, and therefore this is the only premiss of this kind that we obtain; the rest are affirmative. Now if the means of proof is more knowable and more certain than the thing proved, and negative is proved by affirmative demonstration, but not affirmative by negative, the affirmative, being prior and more knowable and more certain, must be superior.

(3) Again, if the starting-point of a syllogism is the universal immediate premiss and if in affirmative proof the universal premiss is affirmative and in negative proof negative, and if the affirmative is prior to and more knowable than the negative premiss (for it is through the affirmation that the negation becomes known, and the affirmation is prior to the negation, just as being is prior to not-being),—then the starting-point of the affirmative is superior to that of

Third argument.

^a By the interpolation of middle terms.

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δεικτικῆς ἢ τῆς στερητικῆς· ἡ δὲ βελτίοσιν ἀρχαῖς
 χρωμένῃ βελτίων.

Ἔτι ἀρχοειδεστέρα· ἄνευ γὰρ τῆς δεικνουσύνης
 οὐκ ἔστιν ἡ στερητική.

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XXVI. Ἐπεὶ δ' ἡ κατηγορικὴ τῆς στερητικῆς
 βελτίων, δῆλον ὅτι καὶ τῆς εἰς τὸ ἀδύνατον ἀγούσης.
 δεῖ δ' εἰδέναι τίς ἡ διαφορὰ αὐτῶν. ἔστω δὴ τὸ Α
 μηδενὶ ὑπάρχον τῷ Β, τῷ δὲ Γ τὸ Β παντί· ἀνάγκη
 5 δὴ τῷ Γ μηδενὶ ὑπάρχειν τὸ Α. οὕτω μὲν οὖν
 ληφθέντων δεικτικὴ ἡ στερητικὴ ἂν εἴη ἀπόδειξις
 ὅτι τὸ Α τῷ Γ οὐχ ὑπάρχει. ἡ δ' εἰς τὸ ἀδύνατον
 ὧδ' ἔχει. εἰ δέοι δεῖξαι ὅτι τὸ Α τῷ Β οὐχ ὑπάρχει,
 ληπτέον ὑπάρχειν, καὶ τὸ Β τῷ Γ, ὥστε συμβαίνει
 τὸ Α τῷ Γ ὑπάρχειν. τοῦτο δ' ἔστω γνώριμον καὶ
 10 ὁμολογούμενον ὅτι ἀδύνατον. οὐκ ἄρα οἷόν τε τὸ
 Α τῷ Β ὑπάρχειν. εἰ οὖν τὸ Β τῷ Γ ὁμολογεῖται
 ὑπάρχειν, τὸ Α τῷ Β ἀδύνατον ὑπάρχειν. οἱ μὲν
 οὖν ὅροι ὁμοίως τάττονται, διαφέρει δὲ τὸ ὅπο-
 τέρα ἂν ᾗ γνωριμωτέρα ἡ πρότασις ἡ στερητικὴ,
 πότερον ὅτι τὸ Α τῷ Β οὐχ ὑπάρχει ἢ ὅτι τὸ Α τῷ
 15 Γ. ὅταν μὲν οὖν ᾗ τὸ συμπέρασμα γνωριμώτερον
 ὅτι οὐκ ἔστιν, ἡ εἰς τὸ ἀδύνατον γίγνεται ἀπόδειξις,
 ὅταν δ' ἡ ἐν τῷ συλλογισμῷ, ἡ ἀποδεικτική. φύσει

^a Here again there seems to be an equivocation, though Aristotle may not have been conscious of it. In the previous sentence *ἀρχή* has been translated "starting-point" because that is all that it seems to be intended to mean; but here it seems rather to mean "logical principle." The argument which follows tends to confirm this view.

^b *i.e.*, an affirmative premiss.

the negative demonstration. But the demonstration which uses superior first principles ^a is itself superior.

(4) Again, affirmative demonstration is more of the nature of a first principle ; for negative demonstration is impossible without another <affirmative> demonstration ^b to prove it. Fourth argument.

XXVI. Since affirmative demonstration is superior to negative, clearly it is also superior to *reductio ad impossibile*. We must, however, understand what is the difference between them.^c Let us suppose that A applies to no B, but that B applies to all C ; then A must apply to no C. When the terms are taken in this way the negative demonstration that A does not apply to C will be ostensive. But *reductio ad impossibile* takes the following form. Supposing that it is required to prove that A does not apply ^d to B, we must assume that it does apply, and that B applies to C, so that it follows that A applies to C. Let it be known and admitted that this is impossible. Then A cannot apply to B. Thus if B is admitted to apply to C, A cannot apply to B.^e The terms, then, are arranged in the same way ; the difference depends upon this : in which form the negative premiss is better known, whether as the statement " A does not apply to B " or " A does not apply to C." Thus when it is the negative statement in the conclusion that is better known, we get demonstration by *reductio ad impossibile* ; when it is one of the premisses of the syllogism, we get ostensive demonstration. Ostensive demonstration is superior to *reductio ad impossibile*.

^c Sc., negative ostensive proof and *reductio ad impossibile*.

^d In this example Aristotle ignores quantity as being complicative and unnecessary for his argument.

^e Because the conjunction of two true premisses cannot give a false conclusion : *An. Pr.* II. 53 b 12-25.

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δὲ προτέρα ἢ ὅτι τὸ Α τῷ Β ἢ ὅτι τὸ Α τῷ Γ.
 πρότερα γάρ ἐστι τοῦ συμπεράσματος ἐξ ὧν τὸ
 συμπέρασμα· ἐστι δὲ τὸ μὲν Α τῷ Γ μὴ ὑπάρχειν
 20 συμπέρασμα, τὸ δὲ Α τῷ Β ἐξ οὗ τὸ συμπέρασμα.
 οὐ γὰρ εἰ συμβαίνει ἀναιρεῖσθαι τι, τοῦτο συμπέ-
 ρασμά ἐστιν, ἐκεῖνα δὲ ἐξ ὧν, ἀλλὰ τὸ μὲν ἐξ οὗ
 συλλογισμός ἐστιν ὃ ἂν οὕτως ἔχη ὥστε ἢ ὅλον
 πρὸς μέρος ἢ μέρος πρὸς ὅλον ἔχειν, αἱ δὲ τὸ ΑΓ
 25 καὶ ΒΓ¹ προτάσεις οὐκ ἔχουσιν οὕτω πρὸς ἀλλήλας.
 εἰ οὖν ἢ ἐκ γνωριμωτέρων καὶ προτέρων κρείττων,
 εἰσὶ δ' ἀμφοτέραι ἐκ τοῦ μὴ εἶναι τι πισταί, ἀλλ' ἢ
 μὲν ἐκ προτέρου ἢ δ' ἐξ ὑστέρου, βελτίων ἀπλῶς
 ἂν εἴη τῆς εἰς τὸ ἀδύνατον ἢ στερητικῇ ἀπόδειξις,
 ὥστε καὶ ἢ ταύτης βελτίων ἢ κατηγορικῇ δῆλον
 30 ὅτι καὶ τῆς εἰς τὸ ἀδύνατόν ἐστι βελτίων.

XXVII. Ἀκριβεστέρα δ' ἐπιστήμη ἐπιστήμης καὶ
 προτέρα ἢ τε τοῦ ὅτι καὶ διότι ἢ αὐτή, ἀλλὰ μὴ
 χωρὶς τοῦ ὅτι τῆς τοῦ διότι, καὶ ἢ μὴ καθ' ὑποκει-
 μένου τῆς καθ' ὑποκειμένου, οἷον ἀριθμητικῇ ἀρ-
 35 μονικῇ, καὶ ἢ ἐξ ἐλαττόνων τῆς ἐκ προσθέσεως,
 οἷον γεωμετρίας ἀριθμητικῇ. λέγω δ' ἐκ προσθέ-
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But the statement "A does not apply to B" is prior in nature to "A does not apply to C"; for the premisses from which the conclusion is drawn are prior to the conclusion, and the statement "A does not apply to C" is the conclusion, while "A does not apply to B" is one of the premisses from which the conclusion is drawn. For if we obtain a destructive result,^a this result is not a conclusion, nor are the statements from which it is drawn premisses, in the strict sense. The statements from which a syllogism follows are premisses related to one another as whole to part or part to whole; and the premisses AC and BC are not so related to one another. Therefore if that demonstration is superior which proceeds from better known and prior premisses, and both these kinds of demonstration depend upon negative statements, of which one is prior and the other posterior, then negative demonstration will be absolutely superior to *reductio ad impossibile*; and therefore affirmative demonstration, being superior to negative, will *a fortiori* also be superior to demonstration by *reductio ad impossibile*.

XXVII. Knowledge at the same time of the fact and of the reasoned fact, as contrasted with knowledge of the former without the latter, is more accurate and prior. So again is knowledge of objects which do not inhere in a substrate as contrasted with that of objects which do so inhere (*e.g.*, arithmetic and harmonics) and that which depends upon fewer factors as contrasted with that which uses additional factors (*e.g.*, arithmetic and geometry). What I mean by

Ranking of sciences according to their aims and subject-matter.

^a Involving the disproof of a hypothesis.

¹ BF C², Ross : AB.

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σεως οἶον μονὰς οὐσία ἄθετος, στιγμή δὲ οὐσία θετός· ταύτην ἐκ προσθέσεως.

XXVIII. Μία δ' ἐπιστήμη ἐστὶν ἡ ἐνὸς γένους, ὅσα ἐκ τῶν πρώτων σύγκειται καὶ μέρη ἐστὶν ἡ
 40 πάθη τούτων καθ' αὐτά. ἑτέρα δ' ἐπιστήμη ἐστὶν
 87 b ἑτέρας, ὅσων αἱ ἀρχαὶ μήτ' ἐκ τῶν αὐτῶν μήθ' ἄτεραι¹ ἐκ τῶν ἐτέρων. τούτου δὲ σημεῖον ὅταν εἰς τὰ ἀναπόδεικτα ἔλθῃ· δεῖ γὰρ αὐτὰ ἐν τῷ αὐτῷ γένει εἶναι τοῖς ἀποδεδειγμένοις. σημεῖον δὲ καὶ τούτου ὅταν τὰ δεικνύμενα δι' αὐτῶν ἐν τῷ αὐτῷ γένει ὥσι καὶ συγγενῇ.

5 XXIX. Πλείους δ' ἀποδείξεις εἶναι τοῦ αὐτοῦ ἐγχωρεῖ οὐ μόνον ἐκ τῆς αὐτῆς συστοιχίας λαμβάνοντι μὴ τὸ συνεχὲς μέσον, οἶον τῶν AB τὸ Γ καὶ Δ καὶ Z, ἀλλὰ καὶ ἐξ ἑτέρας. οἶον ἔστω τὸ A μεταβάλλειν, τὸ δ' ἐφ' ᾧ Δ κινεῖσθαι, τὸ δὲ B ἡδεσθαι, καὶ πάλιν τὸ H ἡρεμίζεσθαι. ἀληθὲς οὖν
 10 καὶ τὸ Δ τοῦ B καὶ τὸ A τοῦ Δ κατηγορεῖν· ὁ γὰρ ἡδόμενος κινεῖται καὶ τὸ κινούμενον μεταβάλλει. πάλιν τὸ A τοῦ H καὶ τὸ H τοῦ B ἀληθὲς κατηγορεῖν· πᾶς γὰρ ὁ ἡδόμενος ἡρεμίζεται καὶ ὁ ἡρεμιζόμενος μεταβάλλει. ὥστε δι' ἐτέρων μέσων καὶ οὐκ ἐκ τῆς αὐτῆς συστοιχίας ὁ συλλογισμός. οὐ μὴν
 15 ὥστε μηδέτερον κατὰ μηδετέρου λέγεσθαι τῶν μέσων· ἀνάγκη γὰρ τῷ αὐτῷ τινι ἄμφω ὑπάρχειν.

¹ ἄτεραι Philoponus (?), ci. Mure : ἑτεραι Bn : ἑτερα Ad.

^a Not in the strict sense : cf. *Met.* XIII (M) ii.

^b The species and their essential attributes.

^c If one set of principles is derived from the other, they belong respectively to a lower and a higher branch of the same science.

^a The ultimate truths or postulates.

^e *Sc.*, with either or both of the extreme terms.

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additional factors is this: a unit is a substance ^a without position, but a point is a substance with position: I regard the latter as containing an additional factor.

XXVIII. A science is one if it is concerned with a single genus or class of objects which are composed of the primary elements of that genus and are parts of it or essential modifications of those parts.^b One science is different from another if their principles do not belong to the same genus, or if the principles of the one are not derived from the principles of the other.^c This is verified when one reaches the indemonstrables,^d because these must be in the same genus as the things demonstrated. This again is verified when the conclusions proved by their means are in the same genus and cognate.

XXIX. It is possible to have more than one demonstration of the same conclusion, not only by selecting a middle term, not directly connected,^e from the same series, *e.g.*, by choosing C or D or F as the middle term for AB, but also by choosing one from another series.^f For example, A is change, D being moved, B pleasure and G relaxation. Then it is true both to predicate D of B and A of D; because if a man is pleased he is moved, and that which is moved changes. Again it is true to predicate A of G and G of B; because everyone who is pleased relaxes, and one who relaxes changes. Thus the conclusion can be drawn by means of different middle terms which do not belong to the same series. Of course the two middles must not exclude one another; both must apply to some of the same subject. We must

What makes a science one.

There may be more than one proof of the same conclusion.

^f *i.e.*, another chain of reasoning. There can, however, be only one *scientific* demonstration of any given fact.

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ἐπισκέψασθαι δὲ καὶ διὰ τῶν ἄλλων σχημάτων
ὁσαχῶς ἐνδέχεται τοῦ αὐτοῦ γενέσθαι συλλογισμόν.

XXX. Τοῦ δ' ἀπὸ τύχης οὐκ ἔστιν ἐπιστήμη δι'
20 ἀποδείξεως. οὔτε γὰρ ὡς ἀναγκαῖον οὔθ' ὡς ἐπὶ
τὸ πολὺ τὸ ἀπὸ τύχης ἐστίν, ἀλλὰ τὸ παρὰ ταῦτα
γιγνόμενον· ἢ δ' ἀπόδειξις θατέρου τούτων. πᾶς
γὰρ συλλογισμὸς ἢ δι' ἀναγκαίων ἢ διὰ τῶν ὡς ἐπὶ
τὸ πολὺ προτάσεων· καὶ εἰ μὲν αἱ προτάσεις ἀναγ-
25 καῖαι, καὶ τὸ συμπέρασμα ἀναγκαῖον, εἰ δ' ὡς ἐπὶ
τὸ πολὺ, καὶ τὸ συμπέρασμα τοιοῦτον. ὥστ' εἰ τὸ
ἀπὸ τύχης μήτ' ὡς ἐπὶ τὸ πολὺ μήτ' ἀναγκαῖον,
οὐκ ἂν εἴη αὐτοῦ ἀπόδειξις.

XXXI. Οὐδὲ δι' αἰσθήσεως ἔστιν ἐπίστασθαι. εἰ
γὰρ καὶ ἔστιν ἡ αἴσθησις τοῦ τοιοῦδε καὶ μὴ τοῦδέ
30 τινος, ἀλλ' αἰσθάνεσθαι γε ἀναγκαῖον τόδε τι καὶ
πὺν καὶ νῦν. τὸ δὲ καθόλου καὶ ἐπὶ πᾶσιν ἀδύνατον
αἰσθάνεσθαι· οὐ γὰρ τόδε οὐδὲ νῦν· οὐ γὰρ ἂν ἦν
καθόλου· τὸ γὰρ αἰεὶ καὶ πανταχοῦ καθόλου φαμέν
εἶναι. ἐπεὶ οὖν αἱ μὲν ἀποδείξεις καθόλου, ταῦτα
δ' οὐκ ἔστιν αἰσθάνεσθαι, φανερόν ὅτι οὐδ' ἐπίστα-
35 σθαι δι' αἰσθήσεως ἔστιν, ἀλλὰ δῆλον ὅτι καὶ εἰ
ἦν αἰσθάνεσθαι τὸ τρίγωνον ὅτι δυσὶν ὀρθαῖς ἴσας
ἔχει τὰς γωνίας, ἐζητοῦμεν ἂν ἀπόδειξιν καὶ οὐχ

^a It is tempting to regard this observation as a sort of "marginal jotting" in Aristotle's lecture notes. The project is not carried out.

^b For chance see *Physics* II. iv-vi, and cf. *Met.* 1064 b 32 ff.

^c When we perceive a sensible object, what we perceive is, in one sense, a complex of sensible qualities (colour, shape, size, etc.) which constitute a recognizable type. But the

examine this point in the other figures to see in how many ways it is possible to draw the same inference.^a

XXX. There can be no demonstrative knowledge of the fortuitous.^b What happens by chance is neither a necessary nor a usual event, but something which happens in a different way from either; whereas demonstration is concerned with one or the other of them. Every syllogism proceeds through premisses which are either necessary or usual; if the premisses are necessary, the conclusion is necessary too; and if the premisses are usual, so is the conclusion. Hence if the fortuitous is neither usual nor necessary, there can be no demonstration of it.

There is no science of the fortuitous.

✓ XXXI. Scientific knowledge cannot be acquired by sense-perception. Even granting that perception is of the object as qualified, and not of a mere particular,^c still what we perceive must be a particular thing at a particular place and time. On the other hand a universal term of general application cannot be perceived by the senses, because it is not a particular thing or at a given time; if it were, it would not be universal; for we describe as universal only that which obtains always and everywhere. Therefore since demonstrations are universal, and universals cannot be perceived by the senses, obviously knowledge cannot be acquired by sense-perception. Again it is obvious that even if it were possible to perceive by the senses that the sum of the angles of a triangle is equal to two right angles, we should still require a proof of this; we should not (as some^d fact remains that the object perceived is only one particular instance of the type.

Sense-perception cannot give scientific knowledge,

^a e.g., Protagoras—if Plato represents his meaning fairly (which is questionable) in *Theaetetus* 151 E. Cf. Diogenes Laertius ix. 51.

87 b

ὥσπερ φασί τινες ἡπιστάμεθα· αἰσθάνεσθαι μὲν γὰρ
 ἀνάγκη καθ' ἕκαστον, ἢ δ' ἐπιστήμη τῷ¹ τὸ καθόλου
 γνωρίζειν ἐστίν. διὸ καὶ εἰ ἐπὶ τῆς σελήνης ὄντες
 40 ἐωρῶμεν ἀντιφράττουσαν τὴν γῆν, οὐκ ἂν ᾔδειμεν
 88 a τὴν αἰτίαν τῆς ἐκλείψεως. ᾔσθανόμεθα γὰρ ἂν ὅτι
 νῦν ἐκλείπει, καὶ οὐ διότι ὅλως· οὐ γὰρ ἦν τοῦ
 καθόλου αἴσθησις. οὐ μὴν ἀλλ' ἐκ τοῦ θεωρεῖν
 τοῦτο πολλάκις συμβαῖνον τὸ καθόλου ἂν θηρεύ-
 σαντες ἀπόδειξιν εἴχομεν· ἐκ γὰρ τῶν καθ' ἕκαστα
 5 πλειόνων τὸ καθόλου δῆλον. τὸ δὲ καθόλου τίμιον,
 ὅτι δηλοῖ τὸ αἴτιον· ὥστε περὶ τῶν τοιούτων ἡ
 καθόλου τιμιωτέρα τῶν αἰσθήσεων καὶ τῆς νοή-
 σεως, ὅσων ἕτερον τὸ αἴτιον· περὶ δὲ τῶν πρώτων
 ἄλλος λόγος.

Φανερόν οὖν ὅτι ἀδύνατον τῷ αἰσθάνεσθαι ἐπί-
 10 στασθαί τι τῶν ἀποδεικτῶν,² εἰ μὴ τις τὸ αἰσθά-
 νεσθαι τοῦτο λέγει, τὸ ἐπιστήμην ἔχειν δι' ἀπο-
 δείξεως. ἔστι μέντοι ἔνια ἀναγόμενα εἰς αἰσθήσεως
 ἐκλείψιν ἐν τοῖς προβλήμασιν. ἔνια γὰρ εἰ ἐωρῶμεν
 οὐκ ἂν ἐζητούμεν, οὐχ ὥς εἰδότες τῷ ὁρᾶν, ἀλλ'
 ὥς ἔχοντες τὸ καθόλου ἐκ τοῦ ὁρᾶν. οἷον εἰ τὴν
 15 ὕαλον τετρυπημένην ἐωρῶμεν καὶ τὸ φῶς διόν,

¹ τῷ] τὸ B, Philoponus (?), Ross.

² ἀποδεικτικῶν ABd.

^a Particular facts (given by sense-perception) have their causes in ultimate laws or truths (apprehended by intuition).

maintain) *know* that it is so. Sense-perception must be concerned with particulars, whereas knowledge depends upon recognition of the universal. Hence if we were on the moon and saw the earth intercepting the light of the sun, we should not know the cause of the eclipse. We should only perceive that an eclipse was taking place at that moment; we should have no perception at all of the reason for it, because (as we have seen) sense-perception does not tell us anything about universals. If, however, by observing repeated instances we had succeeded in grasping the universal, we should have our proof; because it is from the repetition of particular experiences that we obtain our view of the universal. The value of the universal is that it exhibits the cause. Thus in considering facts of this kind which have a cause other than themselves, knowledge of the universal is more valuable than perception by the senses or intuition.^a Primary truths call for separate consideration.^b

Clearly then it is impossible to acquire knowledge of any demonstrable fact by sense-perception, unless by sense-perception one means the acquisition of knowledge by demonstration. There are some problems, however, which are referable to a failure of sense-perception; *e.g.*, there are phenomena whose explanation would cause no difficulty if we could see what happens; not because we know a thing by seeing it, but because seeing it enables us to grasp the universal. For example, if we could see the channels in the burning-glass and the light passing

although its limitations may impede our comprehension.

Logic shows their connexion by proving the specific truth which covers all relevant particulars.

^b Cf. 100 b 12.

88 a

δηλον ἂν ἦν καὶ διὰ τί καίει, τῷ ὁρᾶν μὲν χωρὶς ἐφ' ἐκάστης, νοῆσαι δ' ἅμα ὅτι ἐπὶ πασῶν οὕτως.

XXXII. Τὰς δ' αὐτὰς ἀρχὰς ἀπάντων εἶναι τῶν συλλογισμῶν ἀδύνατον, πρῶτον μὲν λογικῶς θεω-
 20 ροῦσιν. οἱ μὲν γὰρ ἀληθεῖς εἰσι τῶν συλλογισ-
 μῶν, οἱ δὲ ψευδεῖς. καὶ γὰρ εἰ¹ ἔστιν ἀληθὲς ἐκ
 ψευδῶν συλλογίσασθαι, ἀλλ' ἅπαξ τοῦτο γίγνεται,
 οἷον εἰ τὸ Α κατὰ τοῦ Γ ἀληθές, τὸ δὲ μέσον τὸ Β
 ψεῦδος· οὔτε γὰρ τὸ Α τῷ Β ὑπάρχει οὔτε τὸ Β
 25 τῷ Γ. ἀλλ' ἐὰν τούτων μέσα λαμβάνηται τῶν
 προτάσεων, ψευδεῖς ἔσονται διὰ τὸ πᾶν συμπε-
 ρασμα ψεῦδος ἐκ ψευδῶν εἶναι, τὰ δ' ἀληθῆ ἐξ
 ἀληθῶν, ἕτερα δὲ τὰ ψευδῆ καὶ τὰ ληθῆ. εἴτα οὐδὲ
 τὰ ψευδῆ ἐκ τῶν αὐτῶν ἑαυτοῖς· ἔστι γὰρ ψευδῆ
 ἀλλήλοις καὶ ἐναντία καὶ ἀδύνατα ἅμα εἶναι, οἷον
 τὸ τὴν δικαιοσύνην εἶναι ἀδικίαν ἢ δειλίαν, καὶ τὸν
 30 ἄνθρωπον ἵππον ἢ βοῦν, ἢ τὸ ἴσον μείζον ἢ ἔλαττον.
 Ἐκ δὲ τῶν κειμένων ὧδε· οὐδὲ γὰρ τῶν ἀληθῶν
 αἱ αὐταὶ ἀρχαὶ πάντων. ἕτεραι γὰρ πολλῶν τῷ
 γένει αἱ ἀρχαί, καὶ οὐδ' ἐφαρμόττουσαι, οἷον αἱ
 μονάδες ταῖς στιγμαῖς οὐκ ἐφαρμόττουσιν· αἱ μὲν
 γὰρ οὐκ ἔχουσι θέσιν, αἱ δὲ ἔχουσιν. ἀνάγκη δέ
 35 γε ἢ εἰς μέσα ἀρμόττειν ἢ ἄνωθεν ἢ κάτωθεν, ἢ

¹ εἰ om. ABd.

^a According to Gorgias, fr. 5 (Diels) = Theophrastus, *de Igne* 73.

^b Cf. *An. Pr.* II. ii-iv.

^c This is inaccurate. A false conclusion can have one true premiss, and a true conclusion can have one or both premisses false. Thus there is no guarantee that the irregularity "only happens once." However, the general distinction between true and false syllogisms is fair enough.

^d As being peculiar to different sciences.

through,^a it would also be obvious why it burns ; because we should see the effect severally in each particular instance, and appreciate at the same time that this is what happens in every case.

XXXII. Syllogisms cannot all have the same first principles. (1) This can be shown, in the first place, by dialectical arguments. (a) Some syllogisms are true, others are false. It is, of course, possible to draw a true conclusion from false premisses,^b but this only happens once (in a chain of inference) ; e.g., if it is true to assert A of C, but false to assert the middle term B, because A does not apply to B nor B to C ; now if we take middle terms in these premisses, the (new) premisses will be false, because every false conclusion is based upon false premisses, whereas true conclusions are drawn from true premisses,^c and what is false is different from what is true. (b) Even false conclusions do not always have identical first principles ; because a false judgement may either involve a contradiction, e.g., that justice is injustice or that the equal is greater or smaller ; or incompatibility, e.g., that justice is cowardice, or that a man is a horse or an ox.

(2) The impossibility can be shown from what we have established already, as follows. (a) Not even all true syllogisms have the same principles. Many have first principles which are generically different,^d and cannot be interchanged ; as for example units cannot be interchanged with points, since the latter have position and the former have not. In any case the terms^e must be introduced either as middles, or as majors or minors, to the original terms ; or partly as

^e *Sc.*, belonging to the principle of the second science, by which it is hoped to prove the facts of the first.

88 a

τοὺς μὲν εἴσω ἔχειν τοὺς δ' ἔξω τῶν ὅρων. ἀλλ' οὐδὲ τῶν κοινῶν ἀρχῶν οἷόν τ' εἶναι τινὰς ἐξ ὧν

88 b ἅπαντα δειχθήσεται (λέγω δὲ κοινὰς οἷον τὸ πᾶν φάναι ἢ ἀποφάναι). τὰ γὰρ γένη τῶν ὄντων ἕτερα, καὶ τὰ μὲν τοῖς ποσοῖς τὰ δὲ τοῖς ποιοῖς ὑπάρχει μόνοις, μεθ' ὧν δείκνυται διὰ τῶν κοινῶν. ἔτι αἱ ἀρχαὶ οὐ πολλῶ ἐλάττους τῶν συμπερασμάτων.
5 ἀρχαὶ μὲν γὰρ αἱ προτάσεις, αἱ δὲ προτάσεις ἢ προσλαμβανομένου ὅρου ἢ ἐμβαλλομένου εἰσίν. ἔτι τὰ συμπεράσματα ἄπειρα, οἱ δ' ὅροι πεπερασμένοι. ἔτι αἱ ἀρχαὶ αἱ μὲν ἐξ ἀνάγκης, αἱ δ' ἐνδεχόμεναι.

Οὕτω μὲν οὖν σκοπούμενοις ἀδύνατον τὰς αὐτὰς
10 εἶναι πεπερασμένας, ἀπείρων ὄντων τῶν συμπερασμάτων. εἰ δ' ἄλλως πως λέγοι τις, οἷον ὅτι αἰδὶ

^a Sc., so that terms from different genera will be predicated of one another ; which is impossible (75 b 10).

^b It would be truer to say that the common principles provide the general conditions of the proof which is drawn from the special principles.

^c This argument smacks of equivocation. In the hypothesis that all syllogisms have the same ἀρχαί the word ἀρχαί seems to bear the sense of "ultimate principles," which might well be expected to be few in comparison with the many conclusions drawn from them. On the other hand premisses are surely ἀρχαί only as "starting-points" relatively to the conclusion. If there is no equivocation, the hypothesis is equivalent to "All syllogisms have the same premisses," which scarcely needs refutation.

The effects of adding terms to a syllogism have been considered in *An. Pr.* 42 b 16 ff., where Aristotle decides that "there will be many more conclusions than either terms or premisses." Noting the inconsistency, Ross suspects that the present passage expresses an earlier and superficial view. But the rule stated in the other passage (quoted by Ross in

the former and partly as the latter.^a (b) It is impossible that any of the common principles (*e.g.*, the law of the excluded middle) should serve as premisses for all proofs ; because subjects belong to different genera, some of which are predicated only of quantities and others only of qualities. It is with the help of these that proofs are effected by means of the common first principles.^b (c) The principles are not much fewer in number than the conclusions ; because the premisses are principles, and premisses are formed by adding another term either externally or internally.^c (d) The conclusions are infinite in number whereas the terms are finite.^d (e) Some principles are apodeictic, others problematic.^e

If we regard the question in this way the principles cannot be the same for all or finite in number when the conclusions are infinite. (3) Supposing that " the Answers to
the form " n premisses give $\frac{n(n-1)}{2}$ conclusions ") is valid

only if we deny the name " premiss " to those conclusions from which as premisses the remaining conclusions are proved. *E.g.*, to take one of Ross's examples : " from four premisses 'A is B,' ' B is C,' ' C is D,' ' D is E ' we get six conclusions ' A is C,' ' A is D,' ' A is E,' ' B is D,' ' B is E,' ' C is E ' " ; here only the first, fourth and sixth are proved directly from the original four premisses ; the remainder are proved by the help of three further premisses supplied from the conclusions. By this more accurate reckoning the premisses will always be one more than the conclusions, so Aristotle's statement in the present passage (if treated as a *meiosis*) is not far from the truth.

^a The conclusions are infinitely many because we know of no limit that can be set to them ; but the principles, if " the same for all," must be limited, and so must the premisses and terms, if the premisses are principles. Yet we have just seen that the principles are " not much fewer " than the conclusions.

^e And the conclusions drawn from them differ accordingly.

μὲν γεωμετρίας αἰδὶ δὲ λογισμῶν αἰδὶ δὲ ἰατρικῆς,
 τί ἂν εἴη τὸ λεγόμενον ἄλλο πλὴν ὅτι εἰσὶν ἀρχαὶ
 τῶν ἐπιστημῶν; τὸ δὲ τὰς αὐτὰς φάναι γελοῖον,
 15 ὅτι αὐταὶ αὐταῖς αἰ αὐταί· πάντα γὰρ οὕτω γίνονται
 ταῦτά. ἀλλὰ μὴν οὐδὲ τὸ ἐξ ἀπάντων δείκνυσθαι
 ὅτιοῦν, τοῦτ' ἐστὶ τὸ ζητεῖν ἀπάντων εἶναι τὰς
 αὐτὰς ἀρχάς· λίαν γὰρ εὐηθες. οὔτε γὰρ ἐν τοῖς
 φανεροῖς μαθήμασι τοῦτο γίνονται, οὔτ' ἐν τῇ
 ἀναλύσει δυνατόν· αἱ γὰρ ἄμεσοι προτάσεις ἀρχαί,
 20 ἕτερον δὲ συμπέρασμα προσληφθείσης γίνονται προ-
 τάσεως ἀμέσου. εἰ δὲ λέγοι τις τὰς πρώτας ἀμέ-
 σους προτάσεις ταύτας εἶναι ἀρχάς, μία ἐν ἐκάστῳ
 γένει ἐστίν. εἰ δὲ μήτ' ἐξ ἀπασῶν ὥς δέον δείκ-
 νυσθαι ὅτιοῦν μήτ' οὕτως ἐτέρας ὥσθ' ἐκάστης
 ἐπιστήμης εἶναι ἐτέρας, λείπεται εἰ συγγενεῖς αἱ
 25 ἀρχαὶ πάντων, ἀλλ' ἐκ τωνδὶ μὲν ταδί, ἐκ δὲ τωνδὶ
 ταδί. φανερόν δὲ καὶ τοῦθ' ὅτι οὐκ ἐνδέχεται·
 δέδεικται γὰρ ὅτι ἄλλαι ἀρχαὶ τῷ γένει εἰσὶν αἱ
 τῶν διαφόρων τῷ γένει. αἱ γὰρ ἀρχαὶ διτταί, ἐξ
 ὧν τε καὶ περὶ ὅ· αἱ μὲν οὖν ἐξ ὧν κοιναί, αἱ δὲ
 περὶ ὃ ἴδιαι, οἷον ἀριθμός, μέγεθος.

^a Viz., the definition of the subject-matter.

^b In ch. vii.

^c Cf. 75 b 2.

same " is used with another meaning, as if one should say " these are the very principles of geometry and these of arithmetic and these of medicine," this would simply mean no more than that there are principles of the sciences. It is absurd to say that they are the same *as themselves* ; because on this basis anything can be called the same. (4) Nor again does the attempt to maintain that all syllogisms have the same principles mean that any given proposition can be proved from the totality of first principles. This would be too absurd. It is not the case in the mathematical sciences whose methods are obvious ; and it is not possible in analysis, because here it is the immediate premisses that are the first principles, and each new conclusion is formed by the addition of a new immediate premiss. (5) If it be suggested that it is the primary immediate premisses that are the first principles, there is one ^a in each genus. (6) If, however, while it is not claimed that any conclusion must be provable from the totality of the first principles, it is still denied that the latter differ to the extent of being generically different for each science, it remains to consider whether the first principles of all propositions are cognate, but some are proper to the proofs of one and some to those of another particular science. It is obvious however that even this is impossible, because we have shown ^b that the first principles of things which differ in genus are themselves generically different. The fact is that first principles are of two kinds : the premisses from which demonstration proceeds, and the genus with which the demonstration is concerned.^c The former are common, while the latter (*e.g.*, number and magnitude) are peculiar.

possible objections or evasions.

88 b

30 XXXIII. Τὸ δ' ἐπιστητὸν καὶ ἐπιστήμη διαφέρει
 τοῦ δοξαστοῦ καὶ δόξης, ὅτι ἡ μὲν ἐπιστήμη καθό-
 λου καὶ δι' ἀναγκαίων, τὸ δ' ἀναγκαῖον οὐκ ἐνδέ-
 χεται ἄλλως ἔχειν. ἔστι δέ τινα ἀληθῆ μὲν καὶ
 ὄντα, ἐνδεχόμενα δὲ καὶ ἄλλως ἔχειν. δῆλον οὖν
 ὅτι περὶ μὲν ταῦτα ἐπιστήμη οὐκ ἔστιν· εἷη γὰρ
 35 ἂν ἀδύνατα ἄλλως ἔχειν τὰ δυνατὰ ἄλλως ἔχειν.
 ἀλλὰ μὴν οὐδὲ νοῦς (λέγω γὰρ νοῦν ἀρχὴν ἐπιστή-
 μης) οὐδ' ἐπιστήμη ἀναπόδεικτος (τοῦτο δ' ἐστὶν
 89 a ὑπόληψις τῆς ἀμέσου προτάσεως). ἀληθὲς δ' ἐστὶ
 νοῦς καὶ ἐπιστήμη καὶ δόξα καὶ τὸ διὰ τούτων
 λεγόμενον· ὥστε λείπεται δόξαν εἶναι περὶ τὸ ἀλη-
 θές μὲν ἢ ψεῦδος, ἐνδεχόμενον δὲ καὶ ἄλλως ἔχειν.
 τοῦτο δ' ἐστὶν ὑπόληψις τῆς ἀμέσου προτάσεως
 5 καὶ μὴ ἀναγκαίας. καὶ ὁμολογούμενον δ' οὕτω
 τοῖς φαινομένοις· ἡ τε γὰρ δόξα ἀβέβαιον, καὶ ἡ
 φύσις ἡ τοιαύτη. πρὸς δὲ τούτοις οὐδεὶς οἶεται
 δοξάζειν ὅταν οἴηται ἀδύνατον ἄλλως ἔχειν, ἀλλ'
 ἐπίστασθαι· ἀλλ' ὅταν εἶναι μὲν οὕτως, οὐ μὴν
 ἀλλὰ καὶ ἄλλως οὐδὲν κωλύειν, τότε δοξάζειν, ὡς
 10 τοῦ μὲν τοιούτου δόξαν οὔσαν, τοῦ δ' ἀναγκαίου
 ἐπιστήμην.

Πῶς οὖν ἔστι τὸ αὐτὸ δοξάσαι καὶ ἐπίστασθαι,
 καὶ διὰ τί οὐκ ἔσται¹ ἡ δόξα ἐπιστήμη, εἴ τις θήσῃ
 ἅπαν ὃ οἶδεν ἐνδέχεσθαι δοξάζειν; ἀκολουθήσει

¹ ἔστιν Dc.

^a It does not seem that Aristotle intends any distinction between intuition and indemonstrable knowledge.

^b i.e., mental states or activities.

XXXIII. Knowledge and its object differ from opinion and its object in that knowledge is of the universal and proceeds by necessary propositions ; and that which is necessary cannot be otherwise ; but there are some propositions which, though true and real, are also capable of being otherwise. Obviously it is not knowledge that is concerned with these ; if it were, that which is capable of being otherwise would be incapable of being otherwise. Nor is it intuition—by which I mean the starting-point of knowledge—or indemonstrable knowledge,^a which is the apprehension of an immediate premiss. But the only things^b that are true are intuition, knowledge and opinion, and the discourse resulting from these. Therefore we are left with the conclusion that it is opinion that is concerned with that which is true or false and which may be otherwise. In other words opinion is the assumption of a premiss which is neither mediated nor necessary. This description agrees with observed usage ; for opinion, like events of the character which we have just described, is uncertain. Besides, no one thinks that he is “ opining ” when he thinks that a thing cannot be otherwise ; he thinks that he has knowledge. It is when he thinks that a thing is so, but nevertheless there is no reason why it should not be otherwise, that he thinks that he is opining ; which implies that opinion is concerned with this sort of proposition, while knowledge is concerned with that which must be so.

Knowledge contrasted with opinion.

Opinion is of the contingent.

How, then, is it possible for the same thing to be an object of both opinion and knowledge ? and if someone maintains that he can opine everything that he knows, what reason can we give to show why opinion is not knowledge ? Both the man who knows

How can knowledge and opinion have the same object ?

- γὰρ ὁ μὲν εἰδὼς ὁ δὲ δοξάζων διὰ τῶν μέσων ἕως
 15 εἰς τὰ ἄμεσα ἔλθῃ, ὥστ' εἴπερ ἐκείνος οἶδε, καὶ ὁ
 δοξάζων οἶδεν. ὥσπερ γὰρ καὶ τὸ ὅτι δοξάζειν
 ἔστι, καὶ τὸ διότι· τοῦτο δὲ τὸ μέσον. ἢ εἰ μὲν
 οὕτως ὑπολήφεται τὰ μὴ ἐνδεχόμενα ἄλλως ἔχειν
 ὥσπερ [ἔχει]¹ τοὺς ὁρισμοὺς δι' ὧν αἱ ἀποδείξεις,
 οὐ δοξάσει ἀλλ' ἐπιστήσεται· εἰ δ' ἀληθῆ μὲν εἶναι,
 20 οὐ μέντοι ταυτά γε αὐτοῖς ὑπάρχειν κατ' οὐσίαν
 καὶ κατὰ τὸ εἶδος, δοξάσει καὶ οὐκ ἐπιστήσεται
 ἀληθῶς, καὶ τὸ ὅτι καὶ τὸ διότι, ἐὰν μὲν διὰ τῶν
 ἀμέσων δοξάσῃ· ἐὰν δὲ μὴ διὰ τῶν ἀμέσων, τὸ ὅτι
 μόνον δοξάσει; τοῦ δ' αὐτοῦ δόξα καὶ ἐπιστήμη
 οὐ πάντως ἐστίν, ἀλλ' ὥσπερ καὶ ψευδῆς καὶ ἀλη-
 25 θῆς τοῦ αὐτοῦ τρόπον τινά, οὕτω καὶ ἐπιστήμη καὶ
 δόξα τοῦ αὐτοῦ. καὶ γὰρ δόξαν ἀληθῆ καὶ ψευδῆ
 ὥς μὲν τινες λέγουσι τοῦ αὐτοῦ εἶναι, ἄτοπα συμ-
 βαίνειν αἰρεῖσθαι ἄλλα τε καὶ μὴ δοξάζειν ὁ δοξάζει
 ψευδῶς· ἐπεὶ δὲ τὸ αὐτὸ πλεοναχῶς λέγεται, ἔστι
 30 μὲν ὥς ἐνδέχεται, ἔστι δ' ὥς οὐ. τὸ μὲν γὰρ σύμ-
 μετρον εἶναι τὴν διάμετρον ἀληθῶς δοξάζειν ἄτοπον·
 ἀλλ' ὅτι ἢ διάμετρος, περὶ ἣν αἱ δόξαι, τὸ αὐτό,
 οὕτω τοῦ αὐτοῦ, τὸ δὲ τί ἦν εἶναι ἐκατέρῳ κατὰ
 τὸν λόγον οὐ τὸ αὐτό. ὁμοίως δὲ καὶ ἐπιστήμη καὶ
 δόξα τοῦ αὐτοῦ. ἢ μὲν γὰρ οὕτως τοῦ ζώου ὥστε
 35 μὴ ἐνδέχεσθαι μὴ εἶναι ζῶον, ἢ δ' ὥστ' ἐνδέχεσθαι,

¹ secl. Ross : ἔχειν M, Bekker, Waitz.

^a Cf. the discussion of the Law of Contradiction in *Met.* IV (I) iv-viii.

^b The true opinion—that the diagonal is incommensurable—recognizes a property of the diagonal which follows from its essence as expressed in definition; the contrary false opinion does not.

and the man who opines will proceed by means of the middle terms until they reach the immediate premisses ; so that if the former knows, so does the latter ; because it is equally possible to opine the fact and the reason for it ; *i.e.*, the middle term. The solution is probably this. If you apprehend propositions which cannot be otherwise in the same way as you apprehend the definitions through which demonstrations are effected, you will have not opinion but knowledge ; but if you only apprehend that the attributes are true and not that they apply in virtue of the essence and specific nature of their subject, you will have not true knowledge but an opinion, of both the fact and the reason for it,—that is, if you have reached your opinion through the immediate premisses ; otherwise you will have an opinion only of the fact. It is not in every sense that opinion and knowledge have the same object, but only in the sense that true and false opinion have, in a manner, the same object. (The sense in which some authorities ^a hold true and false opinion to apply to the same object involves, amongst other absurdities, the view that false opinion is not opinion at all.) Since “ the same ” is an equivocal expression, there is a sense in which this is possible, and another in which it is not. It would be absurd to have a true opinion that the diagonal of a square is commensurable with the sides ; but since the diagonal, with which the opinions are concerned, is the same, in this sense the true and the false opinion have the same object ; but the essence (in accordance with the definition) of the two objects is not the same.^b It is in this sense that knowledge and opinion can have the same object. Knowledge apprehends the term “ animal ” as a necessary,

Because they regard it differently,

just as true and false opinion do,

knowledge seeing an essential

89 a

οἶον εἰ ἡ μὲν ὅπερ ἀνθρώπου ἐστίν, ἡ δ' ἀνθρώπου
μὲν, μὴ ὅπερ δ' ἀνθρώπου. τὸ αὐτὸ γὰρ ὅτι ἀν-
θρωπος, τὸ δ' ὡς οὐ τὸ αὐτό.

Φανερόν δ' ἐκ τούτων ὅτι οὐδὲ δοξάζειν ἅμα τὸ
αὐτὸ καὶ ἐπίστασθαι ἐνδέχεται. ἅμα γὰρ ἂν ἔχοι
89 b ὑπόληψιν τοῦ ἄλλως ἔχειν καὶ μὴ ἄλλως τὸ αὐτό.
ὅπερ οὐκ ἐνδέχεται. ἐν ἄλλῳ μὲν γὰρ ἐκάτερον
εἶναι ἐνδέχεται τοῦ αὐτοῦ ὡς εἴρηται, ἐν δὲ τῷ
αὐτῷ οὐδ' οὕτως οἶόν τε· ἔξει γὰρ ὑπόληψιν ἅμα,
οἶον ὅτι ὁ ἄνθρωπος ὅπερ ζῶν (τοῦτο γὰρ ἦν τὸ
5 μὴ ἐνδέχεσθαι εἶναι μὴ ζῶν) καὶ μὴ ὅπερ ζῶν.
τοῦτο γὰρ ἔστω¹ τὸ ἐνδέχεσθαι.

Τὰ δὲ λοιπὰ πῶς δεῖ διανεῖμαι ἐπὶ τε διανοίας
καὶ νοῦ καὶ ἐπιστήμης καὶ τέχνης καὶ φρονήσεως
καὶ σοφίας, τὰ μὲν φυσικῆς τὰ δὲ ἠθικῆς θεωρίας
μᾶλλον ἐστίν.

10 XXXIV. 'Η δ' ἀγχίνουα ἐστίν εὐστοχία τις ἐν
ἀσκέπτῳ χρόνῳ τοῦ μέσου, οἶον εἴ τις ἰδὼν ὅτι ἡ
σελήνη τὸ λαμπρὸν αἰεὶ ἔχει πρὸς τὸν ἥλιον, ταχὺ
ἐνενόησε διὰ τί τοῦτο, ὅτι διὰ τὸ λάμπειν ἀπὸ τοῦ
ἡλίου· ἢ διαλεγόμενον πλουσίῳ ἔγνω διότι δανεί-
15 ζεται· ἢ διότι φίλοι, ὅτι ἐχθροὶ τοῦ αὐτοῦ. πάντα
γὰρ τὰ αἷτια τὰ μέσα [ό]² ἰδὼν τὰ ἄκρα ἐγνώρισεν.

¹ ἔσται A².

² secl. Ross : om. Philoponus (?).

^a Cf. 73 b 16 ff.

^b Exact equivalents are hard to find in English. *διάνοια* is a comprehensive term for coherent thinking ; *νοῦς* is direct apprehension of the indemonstrable (cf. *De Anima* III. iv-vii) ; *ἐπιστήμη* is the logical exploration of scientific facts ; *τέχνη* the application of thought to production ; *φρόνησις* the appreciation of moral values ; *σοφία* the study of reality at the highest level. The last five are discussed in *Eth. Nic.* VI. iii-vii.

opinion as a contingent attribute ; *e.g.*, knowledge apprehends it as essentially predicable of " man " ; opinion as predicable of " man " but not essentially. The subject " man " is the same in both cases, but the mode of predication is not the same.

connexion where opinion does not.

These considerations make it clear that it is impossible to have opinion and knowledge at the same time about the same object ; otherwise one would apprehend that the same thing both could and could not be otherwise, which is impossible. Knowledge and opinion of the same object may exist separately in different minds in the sense which we have explained ; but they cannot so exist in the same mind. This would imply the apprehension at one and the same time (*e.g.*) that man is essentially an animal (we have seen ^a that this is what it means to say that it is impossible for man not to be an animal) and is not essentially an animal (which we may take to be the meaning of the contrary assertion).

Hence one cannot have both at once about the same object.

How the other modes of thought should be distributed between cogitation, intuition, science, art, practical intelligence and wisdom will be better considered partly by natural science and partly by ethics.^b

Other modes of thought to be discussed elsewhere.

XXXIV. Quickness of wit is a sort of flair for hitting upon the middle term without a moment's hesitation. A man sees that the moon always has its bright side facing the sun, and immediately realizes the reason : that it is because the moon derives its brightness from the sun ; or he sees someone talking to a rich man, and decides that it is because he is trying to borrow money ; or he understands why people are friends, because they have a common enemy. In all these cases, perception of the extreme terms enables him to recognize the cause or middle term.

Quickness of wit.

89 b

τὸ λαμπρὸν εἶναι τὸ πρὸς τὸν ἥλιον ἐφ' οὗ A, τὸ
 λάμπειν ἀπὸ τοῦ ἡλίου B, σελήνη τὸ Γ. ὑπάρχει
 δὴ τῇ μὲν σελήνῃ τῷ Γ τὸ B, τὸ λάμπειν ἀπὸ τοῦ
 ἡλίου· τῷ δὲ B τὸ A, τὸ πρὸς τοῦτ' εἶναι τὸ
 20 λαμπρὸν ἀφ' οὗ λάμπει· ὥστε καὶ τῷ Γ τὸ A διὰ
 τοῦ B.

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A stands for "bright side facing the sun," B for "deriving brightness from the sun," and C for "moon." Then B, "deriving brightness from the sun," applies to C, "moon," and A, "having its bright side facing the source of its brightness," applies to B. Thus A applies to C through B.

B

89 b 23 I. Τὰ ζητούμενά ἐστιν ἴσα τὸν ἀριθμὸν ὅσαπερ ἐπιστάμεθα. ζητοῦμεν δὲ τέτταρα, τὸ ὅτι, τὸ
 25 διότι, εἰ ἔστι, τί ἐστιν. ὅταν μὲν γὰρ πότερον τόδε ἢ τόδε ζητῶμεν, εἰς ἀριθμὸν θέντες, οἷον πότερον ἐκλείπει ὁ ἥλιος ἢ οὐ, τὸ ὅτι ζητοῦμεν. σημεῖον δὲ τούτου· εὐρόντες γὰρ ὅτι ἐκλείπει πεπαύμεθα· καὶ ἔαν ἐξ ἀρχῆς εἰδῶμεν ὅτι ἐκλείπει, οὐ ζητοῦμεν πότερον. ὅταν δὲ εἰδῶμεν τὸ ὅτι, τὸ διότι ζητοῦ-
 30 μεν, οἷον εἰδότες ὅτι ἐκλείπει καὶ ὅτι κινεῖται ἢ γῆ, τὸ διότι ἐκλείπει ἢ διότι κινεῖται ζητοῦμεν. ταῦτα μὲν οὖν οὕτως, ἓν δ' ἄλλον τρόπον ζητοῦμεν, οἷον εἰ ἔστιν ἢ μὴ ἔστι κένταυρος ἢ θεός (τὸ δ' εἰ ἔστιν ἢ μὴ ἀπλῶς λέγω, ἀλλ' οὐκ εἰ λευκὸς ἢ μὴ)· γνόντες δὲ ὅτι ἔστι, τί ἐστι ζητοῦμεν, οἷον τί οὖν ἐστι θεός,
 35 ἢ τί ἐστιν ἄνθρωπος;

II. "Α μὲν οὖν ζητοῦμεν καὶ ἃ εὐρόντες ἴσμεν, ταῦτα καὶ τοσαῦτά ἐστιν. ζητοῦμεν δέ, ὅταν μὲν ζητῶμεν τὸ ὅτι ἢ τὸ εἰ ἔστιν ἀπλῶς, ἄρ' ἔστι μέσον

^a i.e., a predicate as well as a subject.

^b The four questions intended seem clearly to be (1) Is S P? (2) Why is S P? (3) Does S exist? (4) What is (the

BOOK II

I. THERE are four kinds of question that we ask, and they correspond to the kinds of things that we know. They are : the question of fact, the question of reason or cause, the question of existence, and the question of essence. (1) When we ask whether this or that is so, introducing a plurality of terms ^a (*e.g.*, whether the sun suffers eclipse or not), we are asking the question of fact. The proof is that when we have discovered that it does suffer eclipse our inquiry is finished ; and if we know at the outset that it does so, we do not ask whether it does. It is when we know the fact that we ask (2) the reason ; *e.g.*, if we know that the sun suffers eclipse and that the earth moves, we ask the reasons for these facts. That is how we ask these questions ; but there are others which take a different form : *e.g.* (3) whether a centaur or a god exists. The question of existence refers to simple existence, and not to whether the subject is (say) white or not. When we know that the subject exists, we ask (4) what it is ; *e.g.*, “ what, then, is a god ? ” or “ a man ? ” ^b

BOOK II.
DEMON-
STRATION
AND DEFINITION.
The four
kinds of
question
and their
objects.

II. These are the four kinds of question which we ask and the four kinds of knowledge which we have when we have discovered the answers. When we ask the question of fact or of simple existence, we

Each kind
of question
relates to a
middle-
term,

definition of) S ?—*i.e.*, it is implied that each is asked about a subject term or substance. But *cf.* Introd. p. 12.

89 b

αὐτοῦ ἢ οὐκ ἔστιν· ὅταν δὲ γνόντες ἢ τὸ ὅτι ἢ εἰ
 90 a ἔστιν, ἢ τὸ ἐπὶ μέρους ἢ τὸ ἀπλῶς, πάλιν τὸ διὰ τί
 ζητῶμεν ἢ τὸ τί ἐστι, τότε ζητοῦμεν τί τὸ μέσον.
 λέγω δὲ τὸ ὅτι ἢ εἰ ἔστιν ἐπὶ μέρους καὶ ἀπλῶς,
 ἐπὶ μέρους μὲν, ἄρ' ἐκλείπει ἢ σελήνη ἢ αὔξεται;
 εἰ γάρ ἐστι τί ἢ μή ἐστι τί ἐν τοῖς τοιούτοις ζητοῦ-
 5 μεν· ἀπλῶς δ', εἰ ἔστιν ἢ μή σελήνη ἢ νύξ.

Συμβαίνει ἄρα ἐν ἀπάσαις ταῖς ζητήσεσι ζητεῖν
 ἢ εἰ ἔστι μέσον ἢ τί ἐστι τὸ μέσον. τὸ μὲν γὰρ
 αἷτιον τὸ μέσον, ἐν ἅπασιν δὲ τοῦτο ζητεῖται. ἄρ'
 ἐκλείπει; ἄρ' ἔστι τι αἷτιον ἢ οὐ; μετὰ ταῦτα
 γνόντες ὅτι ἔστι τι, τί οὖν τοῦτ' ἔστι ζητοῦμεν. τὸ
 10 γὰρ αἷτιον τοῦ εἶναι μὴ τοδὶ ἢ τοδὶ ἀλλ' ἀπλῶς τὴν
 οὐσίαν, ἢ τοῦτ' μὴ ἀπλῶς ἀλλὰ τι τῶν καθ' αὐτὸ ἢ
 κατὰ συμβεβηκός, τὸ μέσον ἐστίν. λέγω δὲ τὸ μὲν
 ἀπλῶς τὸ ὑποκείμενον, οἶον σελήνην ἢ γῆν ἢ ἥλιον ἢ
 τρίγωνον, τὸ δὲ τί ἐκλειψιν ἰσότητα ἀνισότητα, εἰ

¹ τοῦ Bonitz : τὸ codd.

^a The " thing " for which the middle term is sought must properly be an attribute or a connexion. It is only in so far as middle term = cause that the formula can be applied to substance. In a strictly teleological system to ask whether a substance exists is to ask whether it has a cause, and to ask what a substance is amounts to demanding a causal definition. (Ross well compares *Met.* 1041 a 26, b 4, 1043 a 14-21, remarking truly that Aristotle seldom observes this principle of definition.) But, as the examples show, Aristotle is already thinking less of substances than of phenomena and attributes. His analysis is indeed over-simplified.

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are asking whether the thing ^a has a middle term or not ; but when, after ascertaining that the proposition is a fact or that the subject exists (in other words, that the subject *is* in a particular sense, or simply *is*), we then proceed to ask the reason for the fact, or what the subject is, we are asking what the middle term is. In describing the "fact" and "existence" as particular and simple modes of being I mean this : an example of particular being is "Does the moon suffer eclipse ?" or "Does the moon wax ?" because in such questions we are asking whether an attribute is predicable of the subject ; an example of simple being is "Does the moon exist ?" or "Does night ^b exist ?"

It follows, then, that in all these questions we are asking either "Is there a middle term ?" or "What is the middle term ?" because the middle term is the cause, and that is what we are trying to find out in every case. "Does it suffer eclipse ?" means "Is there or is there not a cause (for its being eclipsed) ?"; and then, when we have ascertained that there is a cause, we ask "then what is the cause ?" The cause for a substance's being—not being this or that, but simply existing—and the cause, not for its simply existing, but for its being coupled with some essential or accidental ^c attribute—is in both cases the middle term. By that which simply exists I mean the subject—moon, earth, sun or triangle—; by that which the subject is in a particular sense I mean the predicate : being eclipsed, equality, inequality, inter-

because we
are always
seeking a
cause.

^b Night is not a substance, like the moon, but either an event or a privative attribute. If Aristotle intends to vary his choice of subject, he should do so explicitly.

^c Or rather "non-essential." A purely accidental attribute would be outside the scope of science.

90 a

ἐν μέσῳ ἢ μή. ἐν ᾗ πασι γὰρ τούτοις φανερόν ἐστιν
 15 ὅτι τὸ αὐτὸ ἐστὶ τὸ τί ἐστὶ καὶ διὰ τί ἐστὶν. τί
 ἐστὶν ἔκλειψις; στέρησις φωτὸς ἀπὸ σελήνης ὑπὸ
 γῆς ἀντιφράξεως. διὰ τί ἐστὶν ἔκλειψις, ἢ διὰ τί
 ἐκλείπει ἡ σελήνη; διὰ τὸ ἀπολείπειν τὸ φῶς ἀντι-
 φραττούσης τῆς γῆς. τί ἐστὶ συμφωνία; λόγος
 20 ἀριθμῶν ἐν ὁξεί καὶ¹ βαρεῖ. διὰ τί συμφωνεῖ τὸ
 ὁξὺ τῷ βαρεῖ; διὰ τὸ λόγον ἔχειν ἀριθμῶν τὸ ὁξὺ
 καὶ τὸ βαρὺ. ἄρ' ἐστὶ συμφωνεῖν τὸ ὁξὺ καὶ τὸ
 βαρὺ; ἄρ' ἐστὶν ἐν ἀριθμοῖς ὁ λόγος αὐτῶν;
 λαβόντες δ' ὅτι ἐστὶ, τίς οὖν ἐστὶν ὁ λόγος;

"Ὅτι δ' ἐστὶ τοῦ μέσου ἡ ζήτησις, δηλοῖ ὅσων τὸ
 25 μέσον αἰσθητόν. ζητοῦμεν γὰρ μὴ ἡσθημένοι, οἷον
 τῆς ἐκλείψεως, εἰ ἐστὶν ἢ μή. εἰ δ' ἦμεν ἐπὶ τῆς
 σελήνης, οὐκ ἂν ἐζητοῦμεν οὗτ' εἰ γίγνεται οὔτε διὰ
 τί, ἀλλ' ἅμα δῆλον ἂν ἦν. ἐκ γὰρ τοῦ αἰσθεσθαι
 καὶ τὸ καθόλου ἐγένετο ἂν ἡμῖν εἰδέναι. ἡ μὲν γὰρ
 30 αἰσθησις ὅτι νῦν ἀντιφράττει (καὶ γὰρ δῆλον ὅτι
 νῦν ἐκλείπει). ἐκ δὲ τούτου τὸ καθόλου ἂν ἐγένετο.

"Ὡσπερ οὖν λέγομεν, τὸ τί ἐστὶν εἰδέναι ταῦτό
 ἐστὶ καὶ διὰ τί ἐστὶν· τοῦτο δ' ἢ ἀπλῶς καὶ μὴ τῶν

¹ καὶ n, Philoponus : ἦ.

^a Of the earth, in an eclipse of the moon. That this is the sense of ἐν μέσῳ here seems clear from 95 a 14, 15, 98 b 18; I do not see why Ross takes it to mean "centrality in the universe."

^b Viz., 1 : 2 (octave), 2 : 3 (fifth), 3 : 4 (fourth); their discovery is attributed to Pythagoras.

POSTERIOR ANALYTICS, II. 11

position or non-interposition.^a In all these cases it is obvious that the question of essence and the question of cause are identical. Q. "What is an eclipse?" A. "The moon's deprivation of light through obstruction by the earth," is the same as Q. "What is the cause of an eclipse?" or "Why does the moon suffer eclipse?" A. "Because the (sun's) light fails owing to the obstruction of the earth." Again, Q. "What is a concord?" A. "A numerical ratio^b of high and low pitch," is the same as Q. "Why is the high note concordant with the low one?" A. "Because they exhibit a numerical ratio"; and Q. "Are the high and low notes concordant?" is the same as Q. "Is their ratio *numerical*?" And when we have grasped that it is, the question follows "Then what is their ratio?"

That the object of our inquiry is the middle term can be clearly seen in cases where the middle term is perceptible by the senses. We ask our question when we have not yet perceived whether there is a middle term or not; *e.g.*, in the case of an eclipse. If we were on the moon, we should ask neither whether nor why it was taking place; the answers to both questions would be simultaneously obvious, because from the act of perception we should be able to apprehend the universal.^c The fact that the eclipse was now taking place would be obvious, and since sense-perception would tell us that the earth was now obstructing the light, from this the universal would follow.

As we said, then, to know the essence of a thing is the same as to know the cause of it. This is so whether the subject simply *is*, apart from *being* any of its

This is obvious when the middle term is perceptible to sense.

To know the essence is to know the cause.

^a Cf. 88 a 12.

90 a

ὑπαρχόντων τι, ἢ τῶν ὑπαρχόντων οἷον ὅτι δύο ὀρθαί, ἢ ὅτι μείζον ἢ ἔλαττον.

III. Ὅτι μὲν οὖν πάντα τὰ ζητούμενα μέσου
 35 ζήτησίς ἐστι, δῆλον· πῶς δὲ τὸ τί ἐστι δείκνυται,
 καὶ τίς ὁ τρόπος τῆς ἀναγωγῆς, καὶ τί ἐστὶν ὀρι-
 σμὸς καὶ τίνων, εἵπωμεν, διαπορήσαντες πρῶτον
 90 b περὶ αὐτῶν. ἀρχὴ δ' ἔστω τῶν μελλόντων ἥπερ
 ἐστὶν οἰκειοτάτη τῶν ἐχομένων λόγων.

Ἀπορήσειε γὰρ ἂν τις, ἄρ' ἔστι τὸ αὐτὸ καὶ κατὰ
 τὸ αὐτὸ ὀρισμῶ εἰδέναι καὶ ἀποδείξει, ἢ ἀδύνατον;
 ὁ μὲν γὰρ ὀρισμὸς τοῦ τί ἐστὶν εἶναι δοκεῖ, τὸ δὲ
 5 τί ἐστὶν ἅπαν καθόλου καὶ κατηγορικόν· συλλογι-
 σμοὶ δ' εἰσὶν οἱ μὲν στερητικοί, οἱ δ' οὐ καθόλου,
 οἷον οἱ μὲν ἐν τῷ δευτέρῳ σχήματι στερητικοὶ
 πάντες, οἱ δ' ἐν τῷ τρίτῳ οὐ καθόλου. εἴτα οὐδὲ
 τῶν ἐν τῷ πρώτῳ σχήματι κατηγορικῶν ἀπάντων
 ἐστὶν ὀρισμός, οἷον ὅτι πᾶν τρίγωνον δυσὶν ὀρθαῖς
 10 ἴσας ἔχει. τούτου δὲ λόγος ὅτι τὸ ἐπίστασθαί ἐστιν
 τὸ ἀποδεικτὸν¹ τὸ ἀπόδειξιν ἔχειν, ὥστ' εἰ ἐπὶ τῶν
 τοιούτων ἀπόδειξις ἐστὶ, δῆλον ὅτι οὐκ ἂν εἴη
 αὐτῶν καὶ ὀρισμός. ἐπίσταιτο γὰρ ἂν τις καὶ
 κατὰ τὸν ὀρισμόν, οὐκ ἔχων τὴν ἀπόδειξιν· οὐδὲν
 γὰρ κωλύει μὴ ἅμα ἔχειν. ἱκανὴ δὲ πίστις καὶ ἐκ
 15 τῆς ἐπαγωγῆς· οὐδὲν γὰρ πώποτε ὀρισάμενοι ἔγνω-

¹ ἀποδεικτὸν^{c2}, Philoponus: ἀποδεικτικόν Ad: ἀποδεικτικῶς BDMnu.

^a As usual, Aristotle prepares for his own positive teaching

attributes ; or whether it *is* one of its attributes, *e.g.*, having the sum of its angles equal to two right angles, or greater or smaller.

III. It is clear, then, that in all our inquiries we are trying to find a middle term. We must now explain how the essence is brought to light, and in what way it is referable to demonstration, and what definition is, and what things are definable ; first examining the difficulties involved in these questions.^a Let us begin this next section with a discussion which is most pertinent to the ensuing inquiry.

Programme of the inquiry.

First we must discuss some difficulties.

It might be asked whether it is possible to know the same thing in the same respect both by definition and by demonstration. (1) Definition is generally held to be of the essence, and essence is always universal and affirmative, but some conclusions are negative and some are not universal. *E.g.*, all those in the second figure are negative, and those in the third are not universal. (2) Again, even the affirmative conclusions in the first figure are not all appropriate to definition (*e.g.*, "every triangle has the sum of its angles equal to two right angles"). The reason for this is that to have scientific knowledge of what is demonstrable is the same as to have a demonstration of it, and so if demonstration is possible in the case of the aforesaid conclusions, clearly they cannot be definable as well ; otherwise one could know the conclusion in virtue of the definition without possessing the demonstration, since there is no reason why he should not have one without the other. (3) Induction too affords sufficient grounds for holding that definition and demonstration are not the same, be-

Can we gain the same knowledge by demonstration and definition ? Not everything demonstrable is definable.

(beginning in ch. viii) by an aporematic survey (chs. iii-vii) of possible theories and arguments.

μεν, οὔτε τῶν καθ' αὐτὸ ὑπαρχόντων οὔτε τῶν συμβεβηκότων. ἔτι εἰ ὁ ὀρισμὸς οὐσίας τινὸς γνωρισμός, τά γε τοιαῦτα φανερόν ὅτι οὐκ οὐσίαι.

Ὅτι μὲν οὖν οὐκ ἔστιν ὀρισμὸς ἅπαντος οὐπερ καὶ ἀπόδειξις, δῆλον. τί δαί;¹ οὐ ὀρισμός, ἄρα
 20 παντὸς ἀπόδειξις ἔστιν ἢ οὐ; εἰς μὲν δὴ λόγος καὶ περὶ τούτου ὁ αὐτός. τοῦ γὰρ ἐνός, ἥ ἔν, μία ἐπιστήμη. ὥστ' εἶπερ τὸ ἐπίστασθαι τὸ ἀποδεικτόν ἐστι τὸ τὴν ἀπόδειξιν ἔχειν, συμβήσεται τι ἀδύνατον· ὁ γὰρ τὸν ὀρισμὸν ἔχων ἄνευ τῆς ἀποδείξεως ἐπιστήσεται. ἔτι αἱ ἀρχαὶ τῶν ἀποδείξεων
 25 ὀρισμοί, ὧν ὅτι οὐκ ἔσονται ἀποδείξεις δέδεικται πρότερον· ἢ ἔσονται αἱ ἀρχαὶ ἀποδεικταὶ καὶ τῶν ἀρχῶν ἀρχαί, καὶ τοῦτ' εἰς ἄπειρον βαδιεῖται, ἢ τὰ πρῶτα ὀρισμοὶ ἔσονται ἀναπόδεικτοι.

Ἄλλ' ἄρα, εἰ μὴ παντὸς τοῦ αὐτοῦ, ἀλλὰ τινὸς τοῦ αὐτοῦ ἔστιν ὀρισμὸς καὶ ἀπόδειξις; ἢ ἀδύνα-
 30 τον; οὐ γὰρ ἔστιν ἀπόδειξις οὐ ὀρισμός. ὀρισμὸς μὲν γὰρ τοῦ τί ἐστι καὶ οὐσίας· αἱ δ' ἀποδείξεις φαίνονται πᾶσαι ὑποτιθέμεναι καὶ λαμβάνουσαι τὸ τί ἐστιν, οἷον αἱ μαθηματικαὶ τί μονὰς καὶ τί τὸ περιπτόν, καὶ αἱ ἄλλαι ὁμοίως. ἔτι πᾶσα ἀπόδειξις τι κατὰ τινὸς δείκνυσιν, οἷον ὅτι ἔστιν ἢ οὐκ ἔστιν·
 35 ἐν δὲ τῷ ὀρισμῷ οὐδὲν ἕτερον ἑτέρου κατηγορεῖται, οἷον οὔτε τὸ ζῶον κατὰ τοῦ δίποδος οὔτε τοῦτο κατὰ τοῦ ζώου, οὐδὲ δὴ κατὰ τοῦ ἐπιπέδου τὸ

¹ δαί B : δ'.

cause we never get to know any attribute, whether essential or accidental,^a by defining it. Also, (4) if definition is the method of getting to know the essence, obviously such attributes are not essences.

Clearly then not everything that is demonstrable is also definable. Very well; is everything that is definable demonstrable, or not? (1) One of the arguments given above also applies here. Of one fact, *qua* one, there is only one knowledge; therefore if to know the demonstrable is to possess the demonstration, an impossible result will follow: the possessor of the definition will have knowledge without possessing the demonstration. (2) The starting-points of demonstrations are definitions, and it has been shown above^b that of these there can be no demonstration: either the starting-points will be demonstrable, and will have starting-points that are demonstrable, and there will be an infinite regress; or the primary truths will be indemonstrable definitions.

nor is everything definable demonstrable;

But perhaps some things, if not all, are both definable and demonstrable. Surely this is impossible; because (1) there is no demonstration of the definable. Definition is of the essence or essential nature, and it is obvious that all demonstrations assume the essence as a received fact; *e.g.*, mathematics assumes the nature of unity and oddness, and similarly in the other sciences. (2) Every demonstration proves some predicate of some subject, either affirmatively or negatively; but in a definition nothing is predicated of anything else; "animal" is not predicated of "two-footed" nor *vice versa*, nor is "figure" pre-

in fact, nothing is both demonstrable and definable.

^a Cf. 90 a 11.

^b 72 b 18-25, 84 a 29-b 2.

90 b

σχῆμα· οὐ γάρ ἐστι τὸ ἐπίπεδον σχῆμα, οὐδὲ τὸ
 σχῆμα ἐπίπεδον. ἔτι ἕτερον τὸ τί ἐστι καὶ ὅτι ἐστι
 91 a δειξάι. ὁ μὲν οὖν ὀρισμός τί ἐστι δηλοῖ, ἡ δὲ ἀπό-
 δειξις ὅτι¹ ἐστὶ τόδε κατὰ τοῦδε ἢ οὐκ ἔστιν.
 ἑτέρου δὲ ἑτέρα ἀπόδειξις, ἐὰν μὴ ὡς μέρος ἢ τι τῆς
 ὅλης. τοῦτο δὲ λέγω, ὅτι δέδεικται τὸ ἰσοσκελές
 5 δύο ὀρθαῖς, εἰ πᾶν τρίγωνον δέδεικται· μέρος γάρ,
 τὸ δ' ὅλον. ταῦτα δὲ πρὸς ἀλλήλα οὐκ ἔχει οὕτως,
 τὸ ὅτι ἐστι καὶ τί ἐστίν· οὐ γάρ ἐστι θατέρου
 θάτερον μέρος.

Φανερόν ἄρα ὅτι οὔτε οὗ ὀρισμός, τούτου παντὸς
 ἀπόδειξις, οὔτε οὗ ἀπόδειξις, τούτου παντὸς ὀρισ-
 μός, οὔτε² ὅλως τοῦ αὐτοῦ οὐδενὸς ἐνδέχεται ἄμφω
 10 ἔχειν· ὥστε δηλὸν ὡς οὐδὲ ὀρισμός καὶ ἀπόδειξις
 οὔτε τὸ αὐτὸ ἂν εἴη οὔτε θάτερον ἐν θατέρῳ· καὶ
 γὰρ ἂν τὰ ὑποκείμενα ὁμοίως εἶχεν.

IV. Ταῦτα μὲν οὖν μέχρι τούτου διηπορήσθω.
 τοῦ δὲ τί ἐστι πότερον ἔστι συλλογισμὸς καὶ ἀπό-
 δειξις ἢ οὐκ ἔστι, καθάπερ νῦν ὁ λόγος ὑπέθετο·
 15 ὁ μὲν γὰρ συλλογισμὸς τί κατὰ τινὸς δείκνυσι διὰ
 τοῦ μέσου· τὸ δὲ τί ἐστίν ἴδιόν τε καὶ ἐν τῷ τί ἐστι
 κατηγορεῖται. ταῦτα δ' ἀνάγκη ἀντιστρέφειν. εἰ
 γὰρ τὸ Α τοῦ Γ ἴδιον, δηλὸν ὅτι καὶ τοῦ Β καὶ
 τοῦτο τοῦ Γ, ὥστε πάντα ἀλλήλων. ἀλλὰ μὴν

¹ ὅτι ἢ n.² Pacius: ὥστε.

^a By "definition" Aristotle means the complex of genus and differentia (e.g. "two-footed animal" or "plane figure bounded by three straight lines") which is itself predicated of the definiendum.

^b Aristotle is tiresomely vague in his use of the phrase τί ἐστι, which approximates sometimes to τί ἦν εἶναι, sometimes to ὀρισμός. Here it seems to mean first one and then the other.

^c Cf. note on 73 a 7.

icated of "plane"; a plane is not a figure, nor a figure a plane.^a (3) To reveal the essence of a thing is not the same as to prove a proposition about it; now definition exhibits the essence, but demonstration proves that an attribute is, or is not, predicated of a subject. Also different things have different demonstrations, unless they are related as part to whole (by this qualification I mean, *e.g.*, that if it is proved that every triangle has the sum of its angles equal to two right angles, this is also proved of the isosceles triangle, "isosceles" being the part and "triangle" the whole). But the proposition and the essence are not so related, because one is not a part of the other.

It is evident, then, that not everything that is definable is demonstrable, and not everything that is demonstrable is definable; and that in no case is it possible to have both definition and demonstration of the same thing. Thus it is clear also that definition and demonstration cannot be the same, and that neither can be included in the other; otherwise their objects would be similarly related.

It follows that demonstration and definition are quite distinct.

IV. The foregoing difficulties may now be regarded as sufficiently stated. But is syllogism or demonstration of the essence possible, or is it impossible, as our discussion assumed just now? Syllogism proves an attribute of a subject through the middle term; but the definition^b is both (1) peculiar^c to its subject and (2) predicated as belonging to its essence. Now (1) terms so related must be convertible; for if A is peculiar to C, clearly it is also peculiar to B, and B to C, so that all are peculiar to one another.^d Further,

Can a definition be proved syllogistically?

^a Since A and C are co-extensive, B, the middle term, must be co-extensive with them both.

91 a

- καὶ εἰ τὸ Α ἐν τῷ τί ἐστὶν ὑπάρχει παντὶ τῷ Β,
 20 καὶ καθόλου τὸ Β παντὸς τοῦ Γ ἐν τῷ τί ἐστὶ λέγε-
 ται, ἀνάγκη καὶ τὸ Α ἐν τῷ τί ἐστὶ τοῦ Γ λέγεσθαι.
 εἰ δὲ μὴ οὕτω τις λήψεται διπλώσας, οὐκ ἀνάγκη
 ἔσται τὸ Α τοῦ Γ κατηγορεῖσθαι ἐν τῷ τί ἐστὶν, εἰ
 τὸ μὲν Α τοῦ Β ἐν τῷ τί ἐστὶ, μὴ καθ' ὅσων δὲ τὸ
 Β ἐν τῷ τί ἐστὶν. τὸ δὴ τί ἐστὶν ἄμφω ταῦτα ἔξει·
 25 ἔσται ἄρα καὶ τὸ Β κατὰ τοῦ Γ τὸ τί ἐστὶν. εἰ δὴ
 τὸ τί ἐστὶ καὶ τὸ τί ἦν εἶναι ἄμφω ἔχει, ἐπὶ τοῦ
 μέσου ἔσται πρότερον τὸ τί ἦν εἶναι. ὅλως τε, εἰ
 ἔστι δεῖξαι τί ἐστὶν ἄνθρωπος, ἔστω τὸ Γ ἄνθρω-
 πος, τὸ δὲ Α τὸ τί ἐστὶν, εἴτε ζῶον δίπουν εἴτ'
 ἄλλο τι. εἰ τοίνυν συλλογιεῖται, ἀνάγκη κατὰ τοῦ
 30 Γ¹ τὸ Α παντὸς κατηγορεῖσθαι. τούτου² δ' ἔσται
 ἄλλος λόγος μέσος, ὥστε καὶ τοῦτο ἔσται τί ἐστὶν
 ἄνθρωπος. λαμβάνει οὖν ὁ δεῖ δεῖξαι· καὶ γὰρ τὸ
 Β ἔσται³ τί ἐστὶν ἄνθρωπος. δεῖ δ' ἐν ταῖς δυσὶ
 προτάσεσι καὶ τοῖς πρώτοις καὶ ἀμέσοις σκοπεῖν·
 35 μάλιστα γὰρ φανερόν τὸ λεγόμενον γίγνεται. οἱ
 μὲν οὖν διὰ τοῦ ἀντιστρέφειν δεικνύντες τί ἐστὶ
 ψυχὴ, ἢ τί ἐστὶν ἄνθρωπος ἢ ἄλλο ὅτιοῦν τῶν
 ὄντων, τὸ ἐξ ἀρχῆς αἰτοῦνται, οἷον εἴ τις ἀξιώσκει
 ψυχὴν εἶναι τὸ αὐτὸ αὐτῷ αἴτιον τοῦ ζῆν, τοῦτο δ'
 ἀριθμὸν αὐτὸν αὐτὸν κινουῦντα· ἀνάγκη γὰρ αἰτῆσαι

¹ Γ scripsi : B.² τούτου] τοῦτο ci. Bonitz, prob. Ross.³ ἔσται ci. Bonitz : ἐστὶ codd.

^a Presumably Aristotle means that the minor premiss (in which B is predicate) will supply the definition, so that we are assuming what we are trying to prove.

^b It is hard to get a satisfactory sense from the vulgate,

(2) if A is an essential attribute of all B, and B is asserted universally and essentially of all C, A must be asserted essentially of C; but without this double assumption it will not necessarily follow that A is predicated essentially of C—I mean, if A is essentially predicated of B, but B is not essentially true of everything of which it is predicated. So both premisses must state the essence; therefore B too will be predicated as essence of C. Then since both premisses state the essence or essential nature, the essence will appear in the case of the middle term before it appears in the conclusion.^a In general, if it is required to prove the essence of “man,” let C be “man” and A the essence—“two-footed animal,” or whatever else it may be. Then if we are to have a syllogism, A must be predicated of all C.^b But this premiss will be mediated by another definition, so that this too will be the essence of “man.” Thus we are assuming what we are required to prove, since B will also be the essence of “man.” We should consider the case, however, in relation to the two premisses and to primary and immediate connexions; because this throws most light upon the point that we are discussing. Those who try to prove the essence of “soul” or “man” or anything else by conversion are guilty of *petitio principii*. E.g., suppose that somebody asserts that soul is that which is the cause of its own life, and that this is a self-moving number^c; he is necessarily postulating that soul is and Bonitz’ τοῦτο, which Ross adopts, seems barely convincing. I have therefore ventured to write Γ for B, which I suppose to be a “correction” made by an editor or copyist who was puzzled by finding B first at I. 31.

^a Cf. *De Anima* 404 b 29, 408 b 32. The view is ascribed to Xenocrates by Plutarch, *Moralia* 1012 D.

Only by a
petitio prin-
cipii.

91 b τὴν ψυχὴν ὅπερ ἀριθμὸν εἶναι αὐτὸν αὐτὸν κινουῦντα, οὕτως ὡς τὸ αὐτὸ ὄν. οὐ γὰρ εἰ ἀκολουθεῖ τὸ Α τῷ Β καὶ τοῦτο τῷ Γ, ἔσται τῷ Γ τὸ Α τὸ τί ἦν εἶναι, ἀλλ' ἀληθὲς¹ εἰπεῖν ἔσται μόνον· οὐδ' εἰ ἔστι τὸ Α ὅπερ τι καὶ κατὰ τοῦ Β κατηγορεῖται παντός.
 5 καὶ γὰρ τὸ ζῶν εἶναι κατηγορεῖται κατὰ τοῦ ἀνθρώπου εἶναι· ἀληθὲς γὰρ πᾶν τὸ ἀνθρώπου εἶναι ζῶν εἶναι, ὥσπερ καὶ πάντα ἀνθρωπον ζῶον, ἀλλ' οὐχ οὕτως ὥστε ἓν εἶναι. ἐὰν μὲν οὖν μὴ οὕτω λάβῃ, οὐ συλλογιεῖται ὅτι τὸ Α ἐστὶ τῷ Γ τὸ τί ἦν εἶναι καὶ ἡ οὐσία· ἐὰν δὲ οὕτω λάβῃ, πρότερον
 10 ἔσται εἰληφὼς τῷ Γ τί ἐστὶ τὸ τί ἦν εἶναι [τὸ Β].² ὥστ' οὐκ ἀποδέδεικται· τὸ γὰρ ἐν ἀρχῇ εἴληφεν.

V. Ἀλλὰ μὴν οὐδ' ἡ διὰ τῶν διαιρέσεων ὁδὸς συλλογίζεται, καθάπερ ἐν τῇ ἀναλύσει τῇ περὶ τὰ σχήματα εἴρηται. οὐδαμοῦ γὰρ ἀνάγκη γίνεται
 15 τὸ πρᾶγμα ἐκεῖνο εἶναι τῶνδὶ ὄντων, ἀλλ' ὥσπερ οὐδ' ὁ ἐπάγων ἀποδείκνυσιν. οὐ γὰρ δεῖ τὸ συμπέρασμα ἐρωτᾶν, οὐδὲ τῷ δοῦναι εἶναι, ἀλλ' ἀνάγκη εἶναι ἐκείνων ὄντων, καὶ μὴ φῆ ὁ ἀποκρινόμενος. ἂρ' ὁ ἀνθρωπος ζῶον ἢ ἄψυχον; εἴτ' ἔλαβε ζῶον, οὐ συλλελόγισται. πάλιν ἅπαν ζῶον
 20 ἢ πεζὸν ἢ ἐνυδρον· ἔλαβε πεζόν. καὶ τὸ εἶναι τὸν ἀνθρωπον τὸ ὅλον, ζῶον πεζόν, οὐκ ἀνάγκη ἐκ τῶν εἰρημένων, ἀλλὰ λαμβάνει καὶ τοῦτο. διαφέρει δ'

¹ ἀληθὲς n, Eustratius (?): ἀληθὲς ἦν.

² secl. Ross.

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essentially a self-moving number in the sense of being identical with it. For if A is a consequent of B, and B of C, A will not be the essence of C—it will only be true to predicate it of C ; nor (will A be the essence of C) if A is predicated of all B as genus of species. Animality is predicated of all humanity, because it is true that all humanity is a species of animality, just as it is true that every man is an animal ; but not in the sense that they are identical. Thus unless the premisses are taken in the way that we have described, it cannot be inferred that A is the essence or real nature of C ; and if they are so taken, it will have been already assumed what the essence of C is. Therefore the conclusion is not proved, because there has been *petitio principii*.

V. Nor again does the method of division lead to a conclusion, as has been explained in my logical analysis of the figures.^a At no stage do we find the logical necessity that, given certain conditions, the object must have the required definition ; the process is just as inconclusive as induction. The conclusion must not be a question, nor stand by concession only ; it must follow necessarily from the premisses, even if the respondent rejects it. (The exponent of division asks) “ Is ‘ man ’ animate or inanimate ? ” and then assumes “ animate ” ; it is not the result of inference. Next “ every animal is either terrestrial or aquatic,” and he assumes “ terrestrial.” It does not follow necessarily from stated premisses that “ man ” is the whole expression, “ terrestrial animal ” ; he assumes this too. (It makes no differ-

A definition cannot be proved by division, for this *proves* nothing.

^a *An. Pr.* I. xxxi. The Platonic method of division is illustrated in *Sophist* 219 A ff., *Politicus* 258 B ff. For Aristotle's view of the proper use of division see chs. xiii and xiv.

91 b

οὐδὲν ἐπὶ πολλῶν ἢ ὀλίγων οὕτω ποιεῖν· τὸ αὐτὸ γάρ ἐστιν. ἀσυλλόγιστος μὲν οὖν καὶ ἡ χρῆσις γίγνεται τοῖς οὕτω μετιοῦσι καὶ τῶν ἐνδεχομένων
 25 συλλογισθῆναι. τί γὰρ κωλύει τοῦτο ἀληθὲς μὲν τὸ πᾶν εἶναι κατὰ τοῦ ἀνθρώπου, μὴ μέντοι τὸ τί ἐστι μῆδὲ τὸ τί ἦν εἶναι δηλοῦν; ἔτι τί κωλύει ἢ προσθεῖναι τι ἢ ἀφελεῖν ἢ ὑπερβεβηκέναι τῆς οὐσίας;

Ταῦτα μὲν οὖν παρίεται μὲν, ἐνδέχεται δὲ λῦσαι τῷ λαμβάνειν τὰ ἐν τῷ τί ἐστι πάντα, καὶ τὸ
 30 ἐφεξῆς τῇ διαιρέσει ποιεῖν, αἰτούμενον τὸ πρῶτον, καὶ μῆδὲν παραλείπειν. τοῦτο δὲ ἀναγκαῖον, εἰ ἅπαν εἰς τὴν διαίρεσιν ἐμπίπτει καὶ μῆδὲν ἐλλείπει· [τοῦτο δ' ἀναγκαῖον,]¹ ἄτομον γὰρ ἤδη δεῖ εἶναι.

Ἄλλὰ συλλογισμὸς ὅμως οὐκ ἔνεστιν,² ἀλλ' εἴπερ, ἄλλον τρόπον γνωρίζειν ποιεῖ. καὶ τοῦτο μὲν οὐδὲν
 35 ἄτοπον· οὐδὲ γὰρ ὁ ἐπάγων ἴσως ἀποδείκνυσιν, ἀλλ' ὅμως δηλοῖ τι. συλλογισμὸν δ' οὐ λέγει ὁ ἐκ τῆς διαιρέσεως λέγων τὸν ὄρισμόν· ὥσπερ γὰρ ἐν τοῖς συμπεράσμασι τοῖς ἄνευ τῶν μέσων, εἰάν τις εἴπῃ ὅτι τούτων ὄντων ἀνάγκη τοδὶ εἶναι, ἐνδέχεται ἐρωτῆσαι διὰ τί, οὕτως καὶ ἐν τοῖς διαιρητικοῖς
 92 a ὅροις. τί ἐστιν ἄνθρωπος; ζῶον, θνητόν, ὑπόπουν, δίπουν, ἄπτερον. διὰ τί; παρ' ἐκάστην πρόσθε-
 σιν· ἐρεῖ γάρ, καὶ δείξει τῇ διαιρέσει, ὡς οἶεται, ὅτι

¹ secl. Waitz.² ἔνεστιν] ἔστι n, Philoponus, Ross.

^a i.e., including a non-essential or passing over an essential element in the definition.

^b i.e., the next widest.

ence whether the process involves many steps or few; the position is just the same.) Indeed the method, when used in this way, fails to draw even those inferences that are available. It is quite possible that the whole expression should be truly predicable of "man," and yet not exhibit the essence or essential nature of man. Besides, what is there to prevent the division from adding something, or omitting something,^a or missing out a step in the definition of the real nature?

These defects are usually ignored, but they can be dealt with by (a) taking at each stage only elements in the essence, (b) dividing consecutively, always postulating the first^b <differentia>, and (c) leaving out nothing. This result is bound to follow if the term to be defined is entirely covered by the division <at each stage>, without any omission; for the process must lead directly to a term that requires no further division.

though it can be used systematically.

Even so, however, there is no inference in the process; if it conveys any knowledge to us, it does so in a different way. There is nothing abnormal in this, since presumably induction too *proves* nothing, but nevertheless it gives us some information. But in selecting the definition by means of division one does not state a logical inference. As in the case of conclusions reached without the use of middle terms, if it is stated that, given certain conditions, such-and-such must follow, one is entitled to ask "Why?", so too in definitions reached by division. What is man? An animate being—mortal—footed—two-footed—wingless. At every added predicate one may ask "Why?"; because the divider can state, and prove (as he supposes) by his division, that everything

The results of division are not reached by inference.

92 a

πάν ἢ θνητὸν ἢ ἀθάνατον. ὁ δὲ τοιοῦτος λόγος
 ἅπας οὐκ ἔστιν ὀρισμός, ὥστ' εἰ καὶ ἀπεδείκνυτο
 5 τῇ διαιρέσει, ἀλλ' ὁ γ' ὀρισμός οὐ συλλογισμός
 γίγνεται.

VI. Ἄλλ' ἄρα ἔστι καὶ ἀποδείξαι τὸ τί ἐστι κατ'
 οὐσίαν, ἐξ ὑποθέσεως δέ, λαβόντα τὸ μὲν τί ἦν εἶναι
 τὸ ἐκ τῶν ἐν τῷ τί ἐστιν ἴδιον,¹ ταδὶ δὲ ἐν τῷ τί
 ἐστι μόνα, καὶ ἴδιον τὸ πάν; τοῦτο γὰρ ἐστι τὸ
 10 εἶναι ἐκείνω. ἢ πάλιν εἴληφε τὸ τί ἦν εἶναι καὶ ἐν
 τούτῳ; ἀνάγκη γὰρ διὰ τοῦ μέσου δεῖξαι. ἔτι
 ὥσπερ οὐδ' ἐν συλλογισμῷ λαμβάνεται τί ἐστι τὸ
 συλλελογίσθαι (ἀεὶ γὰρ ὅλη ἢ μέρος ἢ πρότασις, ἐξ
 ὧν ὁ συλλογισμός), οὕτως οὐδὲ τὸ τί ἦν εἶναι δεῖ
 ἐνεῖναι ἐν τῷ συλλογισμῷ, ἀλλὰ χωρὶς τοῦτο τῶν
 15 κειμένων εἶναι, καὶ πρὸς τὸν ἀμφισβητοῦντα εἰ συλ-
 λελόγισται ἢ μή, τοῦτο ἀπαντᾷ ὅτι “ τοῦτο γὰρ
 ἦν συλλογισμός ”· καὶ πρὸς τὸν ὅτι οὐ τὸ τί ἦν
 εἶναι συλλελόγισται, ὅτι “ ναί· τοῦτο γὰρ ἔκειτο
 ἡμῖν τὸ τί ἦν εἶναι.” ὥστε ἀνάγκη καὶ ἄνευ τοῦ
 τί συλλογισμός ἢ τὸ² τί ἦν εἶναι συλλελογίσθαι τι.
 20 Κἂν ἐξ ὑποθέσεως δὲ δεικνύη, οἷον εἰ τὸ³ κακῷ

¹ ἴδιον Pacius, Ross : ἰδίῳν.

² τὸ] τοῦ Bn.

³ τὸ] τῷ Adn^a.

^a Which is here lacking, the minor premiss being a mere *petitio principii*. The hypothetical proof rejected here is used in *Top.* 153 a ff., but dialectically (cf. Cherniss, *Aristotle's Criticism of Plato and the Academy*, i. 34-6, note 28).

^b Aristotle is thinking of the first figure (which alone is

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is either mortal or immortal ; but such a proposition, taken as a whole, is not a definition. Thus even if the proposition could be proved by division, the definition still does not amount to a logical inference.

VI. It may be suggested, however, that it is actually possible to demonstrate the essential definition of a subject hypothetically by assuming that the definition consists of the elements in the essence, and is peculiar to the subject ; and that this and that are the only elements in the essence ; and that the aggregate of them is peculiar to the subject, because this aggregate represents its essential nature. But (1) surely in this <minor premiss> the definition has once more been *assumed* ; because proof must proceed through a middle term.^a (2) Just as in a syllogism we do not assume <as a premiss> the definition of syllogism (since the premisses from which the conclusion is drawn are always related as whole and part^b), so neither must the definition of definition appear in the syllogism^c—it must be something apart from the premisses laid down ; and when an opponent disputes whether there has been syllogistic proof or not, we should <be able to> answer “ Yes, because we agreed that that is what syllogism is ” ; and if one objects that the syllogism has not proved the definition, “ Yes, because that is what definition was assumed to be.” Thus we must have already drawn some inference without <using as a premiss> the definition of syllogism or of definition.^d

One suggested method of proving a definition not only assumes the essence, but improperly assumes the definition of definition as a premiss.

Equally invalid is proof from a hypothesis in the Another useful for establishing scientific facts) where the relation is normally genus : species or species : sub-species.

^c Sc. by which we hope to prove a particular definition.

^d Sc., before appealing to the said definition, which is a pre-condition, not a part, of the argument.

ἐστὶ τὸ διαιρετῶ εἶναι, τὸ¹ δ' ἐναντίῳ τὸ τῶ
ἐναντίῳ <ἐναντίῳ>² εἶναι, ὅσοις ἔστι τι ἐναντίον·
τὸ δ' ἀγαθὸν τῶ κακῶ ἐναντίον καὶ τὸ ἀδιαίρετον
τῶ διαιρετῶ· ἔστιν ἄρα τὸ ἀγαθῶ εἶναι τὸ ἀδιαί-
ρετῶ εἶναι. καὶ γὰρ ἐνταῦθα λαβὼν τὸ τί ἦν εἶναι
25 δείκνυσι· λαμβάνει δ' εἰς τὸ δεῖξαι τὸ τί ἦν εἶναι.
ἕτερον μέντοι· ἔστω· καὶ γὰρ ἐν ταῖς ἀποδείξεσιν,
ὅτι ἐστὶ τόδε κατὰ τοῦδε ἀλλὰ μὴ αὐτό, μηδὲ οὐδ' ὁ
αὐτὸς λόγος, καὶ ἀντιστρέφει.

Πρὸς ἀμφοτέρους δέ, τὸν τε κατὰ διαίρεσιν δεικ-
νύντα καὶ πρὸς τὸν οὕτω συλλογισμόν, τὸ αὐτὸ
30 ἀπόρημα· διὰ τί ἔσται ὁ ἄνθρωπος ζῶον [δίπουν]³
πεζόν, ἀλλ' οὐ ζῶον καὶ πεζόν; ἐκ γὰρ τῶν λαμ-
βανομένων οὐδεμία ἀνάγκη ἐστὶν ἐν γίγνεσθαι τὸ
κατηγορούμενον, ἀλλ' ὥσπερ ἂν ἄνθρωπος ὁ αὐτὸς
εἴη μουσικὸς καὶ γραμματικὸς.

VII. Πῶς οὖν δὴ ὁ ὀριζόμενος δείξει τὴν οὐσίαν
35 ἢ τὸ τί ἐστίν; οὔτε γὰρ ὡς ἀποδεικνὺς ἐξ ὁμολο-
γούμενων εἶναι δῆλον ποιήσῃ ὅτι ἀνάγκη ἐκείνων
ὄντων ἕτερόν τι εἶναι (ἀπόδειξις γὰρ τοῦτο), οὔθ'
ὡς ὁ ἐπάγων διὰ τῶν καθ' ἕκαστα δῆλων ὄντων,

¹ τὸ Bonitz : τῶ.

² ἐναντίῳ add. Bonitz.

³ δίπουν seclusi : δίπουν πεζόν codd. : πεζόν δίπουν comm.,
Ross, qui post καὶ πεζόν add. καὶ δίπουν.

^a This method of proof, ἐκ τοῦ ἐναντίου, is illustrated and discussed in *Topics* 153 a 26–b 24 and 147 a 29–b 25 (where it is criticized as in the present passage). It was freely used in the Academy; cf. Cherniss, *op. cit.* i. 36–38.

^b Speusippus' view; for the evidence see Cherniss, *loc. cit.*

^c Viz., that of the subject's contrary.

^d The major term.

^e To secure consistency we must either bracket δίπουν here or add καὶ δίπουν in l. 30. The former course seems

following way ^a: If evil is definable as divisibility, ^b assumes a term correlative with the essence. and if any term that has a contrary is definable by the contrary of that contrary's definition, and if good is contrary to evil, and indivisibility to divisibility, then goodness is definable as indivisibility. Here too the proof first assumes the definition, and assumes it to prove the definition. "But it is a different definition." ^c Granted, (but the objection still holds,) because in demonstrations too we assume that one term is predicable of another, but it ^d must not be the very term (that is to be proved), nor one which has the same definition or rather is correlative with it.

Both the opponent who attempts proof by division and the one who offers syllogism in this form have to face the same difficulty: why should "man" be "terrestrial animal" ^e and not "terrestrial" and "animal"? There is nothing in the assumptions to make it necessary that the predicate should be a unity, and not (consist of non-essential attributes), as the same man may be musical and literary. ^f

VII. How then can the person who is trying to define prove the essence or definition? (1) He cannot exhibit deductively from admitted facts that, given these facts, a conclusion distinct from them must follow—that is demonstration; nor can he show inductively by enumeration of manifest particular instances that every case is like this, because none

None of these proofs shows that the definition is a unity.

How can one prove the essence? (1) If neither deductively nor inductively, how else?

better. Only two attributes are required, and I believe *δίπουν* to be an intruder from the parallel passages in *Met.* 1037 b 11 ff., 1045 a 14 ff., where the attributes are *ζῶον* and *δίπουν*. The fact that the commentators have *δίπουν* after *πεζόν* may point the same way, since an added word is always liable to displacement.

^f Cf. *Met. locc. cit.* Aristotle gives his own solution of the "difficulty" in the latter passage.

92 b ὅτι πᾶν οὕτως τῷ μηδὲν ἄλλως· οὐ γὰρ τί ἐστι δείκνυσιν, ἀλλ' ὅτι ἢ ἔστιν ἢ οὐκ ἔστιν. τίς οὖν ἄλλος τρόπος λοιπός; οὐ γὰρ δὴ δείξει γε τῇ αἰσθήσει ἢ τῷ δακτύλῳ.

Ἔτι πῶς δείξει τὸ τί ἐστιν; ἀνάγκη γὰρ τὸν
 5 εἰδότα τὸ τί ἐστιν ἄνθρωπος ἢ ἄλλο ὅτιοῦν, εἰδέναι καὶ ὅτι ἔστιν· τὸ γὰρ μὴ ὄν οὐδεὶς οἶδεν ὅτι ἐστίν, ἀλλὰ τί μὲν σημαίνει ὁ λόγος ἢ τὸ ὄνομα, ὅταν εἴπω τραγέλαφος, τί δ' ἐστὶ τραγέλαφος ἀδύνατον εἰδέναι. ἀλλὰ μὴν εἰ δείξει τί ἐστι καὶ ὅτι ἔστι, πῶς τῷ αὐτῷ λόγῳ δείξει; ὃ τε γὰρ ὁρισμὸς ἐν
 10 τι δηλοῖ καὶ ἡ ἀποδείξις· τὸ δὲ τί ἐστιν ἄνθρωπος καὶ τὸ εἶναι ἄνθρωπον ἄλλο.

Εἶτα καὶ δι' ἀποδείξεώς φαμεν ἀναγκαῖον εἶναι δείκνυσθαι ἅπαν ὅτι ἔστιν, εἰ μὴ οὐσία εἴη. τὸ δ' εἶναι οὐκ οὐσία οὐδενί· οὐ γὰρ γένος τὸ ὄν. ἀπό-
 15 δειξις ἄρ' ἔσται ὅτι ἔστιν. ὅπερ καὶ νῦν ποιοῦσιν αἱ ἐπιστῆμαι· τί μὲν γὰρ σημαίνει τὸ τρίγωνον, ἔλαβεν ὁ γεωμέτρης, ὅτι δ' ἔστι, δείκνυσιν. τί οὖν δείξει ὁ ὀριζόμενος τί ἐστιν; ἢ¹ τὸ τρίγωνον; εἰδὼς ἄρα τις ὁρισμῷ τί ἐστιν, εἰ ἔστιν οὐκ εἴσεται. ἀλλ' ἀδύνατον.

Φανερόν δὲ καὶ κατὰ τοὺς νῦν τρόπους τῶν

¹ τί ἐστιν; ἢ] ἢ τί ἐστι Ross.

^a Strictly "goat-deer," a type of fabulous animal; cf. *An. Pr.* 49 a 24.

^b It is hard to accept Ross's ὃ τι ἐστιν. Aristotle could not, like a modern editor, make his meaning plain by spacing and accentuation; and without these aids, in such a context, the phrase would have been quite misleading. In b 6 above, on the other hand, the sense is sufficiently obvious.

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is otherwise ; for this does not prove *what* the subject is, but the *fact* that it is, or is not. What other way then remains ? because he cannot presumably prove (the definition) by reference to sense-perception, or point to it with his finger.

(2) How can one prove the essence ? Anyone who knows *what* "man" or any other thing is must also know *that* it is ; because no one knows *what* a non-existent thing is. (He may know the meaning of a phrase, or of a name if, *e.g.*, I speak of a unicorn ^a ; but it is impossible to know *what* a unicorn is.) But (a) if it is proposed to prove *what* a thing is and *that* it is, how can they be proved by the same argument ? Both definition and demonstration give us *one* piece of information ; but *what* man is and *that* man is are two different things.

(b) Again, we hold that it is by demonstration that everything must be proved to exist, ^b except essence ; and existence is not the essence of anything, because being is not a genus. ^c So there will be demonstration *that* a thing is. This is how the sciences actually proceed ; the geometrician assumes what "triangle" means, but proves that the triangle exists. ^d Of what, then, will the definer exhibit *what* it is ^e ? The triangle ? Then one will know by definition *what* a thing is without knowing that it exists ; but this is impossible.

(c) It is evident also from the methods of defining now in use that those who define do not prove the

^a Cf. *Met.* 998 b 22 ff.

^d *i.e.*, proves it as an attribute ; cf. 71 a 14, 76 a 35, 93 b 31.

^e Understood in this way the vulgate gives quite a good sense ; and although the commentators give some support to Ross's transposition, I question its necessity.

(2) Knowledge of essence implies knowledge of existence ; but (a) both cannot be proved by the same argument,

(b) if the proofs are distinct, we can have one without the other,

(c) definition as practised

92 b

- 20 ὁρων ὡς οὐ δεικνύουσιν οἱ ὀριζόμενοι ὅτι ἔστιν.
 εἰ γὰρ καὶ ἔστιν ἐκ τοῦ μέσου τί ἴσον, ἀλλὰ διὰ τί
 ἔστι τὸ ὀρισθέν; καὶ διὰ τί τοῦτ' ἔστι κύκλος;
 εἴη γὰρ ἂν καὶ ὀρειχάλκου φάναι εἶναι αὐτόν. οὔτε
 γὰρ ὅτι δυνατόν εἶναι τὸ λεγόμενον προσδηλοῦσιν οἱ
 ὅροι οὔτε ὅτι ἐκείνο οὐ φασὶν εἶναι ὀρισμοί, ἀλλ'
 25 αἰεὶ ἔξεστι λέγειν τὸ διὰ τί.

Εἰ ἄρα ὁ ὀριζόμενος δείκνυσιν ἢ τί ἔστιν ἢ τί
 σημαίνει τοῦνομα, εἰ μὴ ἔστι μηδαμῶς τοῦ τί ἔστιν,
 εἴη ἂν ὁ ὀρισμὸς λόγος ὀνόματι τὸ αὐτὸ σημαίνων.
 ἀλλ' ἄτοπον. πρῶτον μὲν γὰρ καὶ μὴ οὐσιῶν ἂν
 30 εἴη καὶ τῶν μὴ ὄντων· σημαίνειν γὰρ ἔστι καὶ τὰ
 μὴ ὄντα. ἔτι πάντες οἱ λόγοι ὀρισμοὶ ἂν εἴεν· εἴη
 γὰρ ἂν ὄνομα θέσθαι ὁποιοῦν λόγῳ, ὥστε ὅρους
 ἂν διαλεγοίμεθα πάντες καὶ ἡ Ἰλιάς ὀρισμὸς ἂν εἴη.
 ἔτι οὐδεμία ἀποδείξις² ἀποδείξειεν³ ἂν ὅτι τοῦτο
 τοῦνομα τουτί δηλοῖ· οὐδ' οἱ ὀρισμοὶ τοίνυν τοῦτο
 προσδηλοῦσιν.

- 35 Ἐκ μὲν τοίνυν τούτων οὔτε ὀρισμὸς καὶ συλ-
 λογισμὸς φαίνεται ταῦτόν ὄν, οὔτε ταύτου συλλο-
 γισμὸς καὶ ὀρισμός· πρὸς δὲ τούτοις, ὅτι οὔτε ὁ
 ὀρισμὸς οὐδὲν οὔτε ἀποδείκνυσιν οὔτε δείκνυσιν,
 οὔτε τὸ τί ἔστιν οὔθ' ὀρισμῶ οὔτ' ἀποδείξει ἔστι
 γνῶναι.

93 a VIII. Πάλιν δὲ σκεπτέον τί τούτων λέγεται

¹ τι] τὸ B, Bekker.

² ἀπόδειξις d : om. AB : ἐπιστήμη B²n.

³ εἴεν d.

^a Viz., a line; the reference is to a crude definition of a circle.

^b Or "non-essences." In an aporematic passage it is not

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existence of the definiendum. Even supposing that there is something ^a equidistant from the centre, why does the object so defined exist? and why is it a circle? One might equally well assert that it is the definition of mountain-copper. Definitions do not include evidence that it is possible for what they describe to exist, nor that it is identical with that which they claim to define. It is always possible to ask *why*.

proves
neither
existence
nor its own
validity.

Thus since in defining one exhibits either what the object is or what its name means, if definition is in no sense of the essence, it must be an expression meaning the same as a name. But this is absurd. (1) In the first place, there would be definition not only of non-substances ^b but also of non-existents; because even these can have a significant name. (2) All expressions would be definitions, because a name could be attached to any one of them; so we should all converse in formulae, and the *Iliad* would be a definition.^c (3) No demonstration can prove that a given name has a given meaning; therefore neither do definitions (in establishing the meaning of a term) furnish evidence also that the name has a given meaning.

It is no
solution to
say that
definition
merely ex-
plains the
name.

These considerations make it clear that definition is not the same as syllogism, and that they have not the same objects. It is also clear that definition neither demonstrates nor exhibits anything; and that neither by definition nor by demonstration can we acquire knowledge of the essence.

Conclusions
from the
arguments
of chs. iii-
vii.

VIII. We must now review what we have said above, and consider which of the arguments are valid

easy to be certain from what standpoint Aristotle is arguing.

^c Cf. *Met.* 1030 a 7 ff.

καλῶς καὶ τί οὐ καλῶς, καὶ τί ἐστὶν ὁ ὁρισμός, καὶ τοῦ τί ἐστὶν ἄρα πως ἐστὶν ἀποδείξεις καὶ ὁρισμὸς ἢ οὐδαμῶς.

Ἐπεὶ δ' ἐστὶν, ὥς ἔφαμεν, ταῦτόν τὸ εἰδέναι τί
 5 ἐστὶ καὶ τὸ εἰδέναι τὸ αἷτιον τοῦ εἶ¹ ἐστὶ (λόγος δὲ
 τούτου ὅτι ἐστὶ τι τὸ αἷτιον· καὶ τοῦτο ἢ τὸ αὐτὸ ἢ
 ἄλλο, καὶ ἢ ἄλλο, ἢ ἀποδεικτὸν ἢ ἀναπόδεικτον)—
 εἰ τοίνυν ἐστὶν ἄλλο καὶ ἐνδέχεται ἀποδείξαι, ἀνάγ-
 κη μέσον εἶναι τὸ αἷτιον καὶ ἐν τῷ σχήματι τῷ
 πρώτῳ δείκνυσθαι· καθόλου τε γὰρ καὶ κατηγορι-
 κὸν τὸ δεικνύμενον.

10 Εἷς μὲν δὴ τρόπος ἂν εἴη ὁ νῦν ἐξητασμένος, τὸ
 δι' ἄλλου τὸ τί ἐστὶ δείκνυσθαι. τῶν τε γὰρ τί ἐστὶν
 ἀνάγκη τὸ μέσον εἶναι τί ἐστὶ, καὶ τῶν ἰδίων ἴδιον·
 ὥστε τὸ μὲν δείξει, τὸ δ' οὐ δείξει τῶν τί ἦν εἶναι
 τῷ αὐτῷ πράγματι.

Οὗτος μὲν οὖν ὁ τρόπος ὅτι οὐκ ἂν εἴη ἀποδείξεις,
 15 εἴρηται πρότερον· ἀλλ' ἐστὶ λογικὸς συλλογισμὸς
 τοῦ τί ἐστὶν. ὃν δὲ τρόπον ἐνδέχεται λέγωμεν,
 εἰπόντες πάλιν ἐξ ἀρχῆς. ὥσπερ γὰρ τὸ διότι ζη-
 τοῦμεν ἔχοντες τὸ ὅτι, ἐνίοτε δὲ καὶ ἅμα δῆλα
 γίννεται, ἀλλ' οὔτι πρότερόν γε τὸ διότι δυνατὸν
 γνωρίσαι τοῦ ὅτι, δῆλον ὅτι ὁμοίως καὶ τὸ τί ἦν
 20 εἶναι οὐκ ἄνευ τοῦ ὅτι ἐστὶν. ἀδύνατον γὰρ εἰδέναι
 τί ἐστὶν ἀγνοοῦντας εἰ ἐστὶν. τὸ δ' εἰ ἐστὶν ὅτε μὲν

¹ εἰ AB²d : τί Bn.

^a In ch. ii.

^b Substance has no cause other than its own form ; that which has an external cause is an attribute or event. It is with these latter that the following chapters are chiefly concerned.

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and which are not ; and what definition is ; and whether the essence is in any sense demonstrable and definable, or not at all.

As we have said above,^a to know what a thing is is the same as to know the cause of its existence ; and the reason for this is that the thing has a definite cause, which is either identical with it or distinct from it,^b and which, if distinct, is either demonstrable^c or indemonstrable. Then if this cause is distinct and can be demonstrated, it must be a middle term, and be proved in the first figure ; for <only> in this is the proved connexion universal and affirmative.

Now one way of employing such a proof will be the method which we criticized just now,^d of proving one definition by another. For the middle term through which essences are inferred must itself be essence, and that through which peculiar attributes are inferred must be a peculiar attribute. Thus for the self-same subject one statement of its essential nature will be proved and one will not.

It has been observed above^e that this method cannot have the force of a demonstration ; it is only a dialectical inference of the essence. Let us now make a fresh start and explain in what way demonstration *is* possible. It is when we are sure of the *fact* that we look for the *reason* ; sometimes we become aware of them simultaneously, but it is quite impossible to recognize the reason before the fact. Clearly in the same way the essential nature implies the fact ; it is impossible to know *what* a thing is if we do not know whether it exists. Now we may be

To know
what a thing
is we must
grasp
clearly *that*
it is.

^c Not demonstrable itself, but serviceable for demonstration, *i.e.*, for explaining the attribute or event.

^d 91 a 14-b 11.

^e 91 b 10.

93 a

κατὰ συμβεβηκὸς ἔχομεν, ὅτε δ' ἔχοντές τι αὐτοῦ
 τοῦ πράγματος, οἷον βροντήν, ὅτι ψόφος τις νεφῶν,
 καὶ ἔκλειψιν, ὅτι στερήσις τις φωτός, καὶ ἄνθρω-
 πον, ὅτι ζῶόν τι, καὶ ψυχὴν, ὅτι αὐτὸ αὐτὸ κινοῦν.
 25 ὅσα μὲν οὖν κατὰ συμβεβηκὸς οἶδαμεν ὅτι ἔστιν,
 ἀναγκαῖον μηδαμῶς ἔχειν πρὸς τὸ τί ἐστιν· οὐδὲ
 γὰρ ὅτι ἔστιν ἴσμεν· τὸ δὲ ζητεῖν τί ἐστι μὴ ἔχοντας
 ὅτι ἔστι, μηδὲν ζητεῖν ἐστιν. καθ' ὅσων δ' ἔχομέν
 τι, ῥᾶον. ὥστε ὡς ἔχομεν ὅτι ἔστιν, οὕτως ἔχομεν
 καὶ πρὸς τὸ τί ἐστιν.

Ἦν οὖν ἔχομέν τι τοῦ τί ἐστιν, ἔστω πρῶτον μὲν
 30 ὧδε· ἔκλειψις ἐφ' οὗ τὸ Α, σελήνη ἐφ' οὗ Γ,
 ἀντίφραξις γῆς ἐφ' οὗ Β. τὸ μὲν οὖν πότερον ἐκ-
 λείπει ἢ οὐ, τὸ Β ζητεῖν ἐστίν, ἅρ' ἔστιν ἢ οὐ.
 τοῦτο δ' οὐδὲν διαφέρει ζητεῖν ἢ εἰ ἔστι λόγος αὐ-
 τοῦ· καὶ ἐὰν ᾗ τοῦτο, καὶ ἐκείνὸ φάμεν εἶναι. ἢ
 ποτέρας τῆς ἀντιφάσεώς ἐστιν ὁ λόγος, πότερον
 35 τοῦ ἔχειν δύο ὀρθὰς ἢ τοῦ μὴ ἔχειν. ὅταν δ' εὖρω-
 μεν, ἅμα τὸ ὅτι καὶ τὸ διότι ἴσμεν, ἂν δι' ἀμέσων¹
 ᾗ. εἰ δὲ μή, τὸ ὅτι, τὸ διότι δ' οὐ. σελήνη Γ,
 ἔκλειψις Α, τὸ πανσελήνου σκιὰν μὴ δύνασθαι
 ποιεῖν μηδενὸς ἡμῶν μεταξὺ ὄντος φανεροῦ, ἐφ' οὗ
 Β. εἰ τοίνυν τῷ Γ ὑπάρχει τὸ Β τὸ μὴ δύνασθαι
 93 b ποιεῖν σκιὰν μηδενὸς μεταξὺ ἡμῶν ὄντος, τούτῳ

¹ δι' ἀμέσων n : διὰ μέσων.

^a i.e., on the ground of some non-essential connexion.

^b Plato's view: cf. *Phaedrus* 245 c ff., *Laws* 895 E. If Aristotle is here assuming Xenocrates' definition of soul (91 a 37 *supra*), all four examples illustrate knowledge of the genus without knowledge of the differentia.

^c Here the "grasp" is so good that the true reason is

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aware of a thing's existence either accidentally ^a or because we have some grasp of the thing itself, *e.g.*, that thunder is a noise in the clouds, that an eclipse is a privation of light, that man is a kind of animal, and that soul is self-moving.^b When our knowledge of the thing's existence is only accidental we cannot be in any position to grasp what the thing is, because we do not even *know* that it exists ; and to inquire what a thing is when we are not sure that it exists is no inquiry at all. But when we have some grasp of the thing itself, the task is easier. Thus our capacity for discovering what a thing is depends upon our awareness that it is.

Let us first take an example of something of whose essence we have some grasp, and let A stand for "eclipse," C for "moon," and B for "obstruction by the earth."^c Then to inquire whether there is an eclipse or not is to inquire whether B exists or not ; and this is equivalent to inquiring whether there is anything to account for it ; if there is, we assert that B *is* too. Similarly we may ask which of a pair of contradictories is true (*e.g.*, having or not having the sum of the angles equal to two right angles) ; and when we have discovered the answer we know simultaneously both the fact and the reason for it—if the premisses are immediate ; otherwise we know the fact but not the reason.^d C is "moon," A "eclipse," B "the inability of the moon at its full to cast a shadow, there being nothing visible in the way." Then if B, "inability to cast a shadow although there is nothing in the way," applies to C, and A, "being directly assumed, so that fact and reason are discovered simultaneously.

We may then look for immediate premisses to explain the connexion.

^d As in the following example, where the minor premiss is not immediate, and the real reason has to be sought.

93 b

δὲ τὸ Α τὸ ἐκκλειομέναι, ὅτι μὲν ἐκλείπει δῆλον, διότι δ' οὐπω, καὶ ὅτι μὲν ἔστιν ἐκκλειψίς¹ ἴσμεν, τί δ' ἔστιν οὐκ ἴσμεν. δῆλου δ' ὄντος ὅτι τὸ Α τῷ Γ
 5 ὑπάρχει, ἀλλὰ διὰ τί ὑπάρχει, τὸ ζητεῖν τὸ Β τί ἐστι, πότερον ἀντίφραξις ἢ στροφὴ τῆς σελήνης ἢ ἀπόσβεσις. τοῦτο δ' ἐστὶν ὁ λόγος τοῦ ἐτέρου ἄκρου, οἶον ἐν τούτοις τοῦ Α· ἔστι γὰρ ἡ ἐκκλειψις ἀντίφραξις ὑπὸ γῆς. τί ἐστι βροντή; πυρὸς ἀπόσβεσις ἐν νέφει. διὰ τί βροντᾷ; διὰ τὸ ἀποσβέννυσθαι τὸ
 10 πῦρ ἐν τῷ νέφει. νέφος Γ, βροντὴ Α, ἀπόσβεσις πυρὸς τὸ Β. τῷ δὲ Γ τῷ νέφει ὑπάρχει τὸ Β, ἀποσβέννυται γὰρ ἐν αὐτῷ τὸ πῦρ· τούτῳ δὲ τὸ Α, ψόφος· καὶ ἔστι γε λόγος τὸ Β τοῦ Α τοῦ πρώτου ἄκρου. ἂν δὲ πάλιν τούτου ἄλλο μέσον ᾗ, ἐκ τῶν παραλοίπων ἔσται λόγων.

15 Ὡς μὲν τοίνυν λαμβάνεται τὸ τί ἐστι καὶ γίγνεται γνῶριμον, εἴρηται, ὥστε συλλογισμὸς μὲν τοῦ τί ἐστιν οὐ γίγνεται οὐδ' ἀπόδειξις, δῆλον μέντοι διὰ συλλογισμοῦ καὶ δι' ἀποδείξεως· ὥστ' οὐτ' ἄνευ ἀποδείξεως ἔστι γινῶναι τὸ τί ἐστιν, οὐδ' ἐστὶν αἷτιον
 20 ἄλλο, οὐτ' ἔστιν ἀπόδειξις αὐτοῦ, ὥσπερ καὶ ἐν τοῖς διαπορήμασιν εἴπομεν.

IX. Ἐστὶ δὲ τῶν μὲν ἕτερόν τι αἷτιον, τῶν δ' οὐκ ἔστιν. ὥστε δῆλον ὅτι καὶ τῶν τί ἐστι τὰ μὲν

¹ ἔστιν ἐκκλειψις n : ἐκκλειψίς ἐστὶν ABd.

^a Or "explanation"; see below.

^b i.e., major.

^c λόγος seems to have a wider meaning here than in b 6. Aristotle means that B either is itself the definition or implies

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eclipsed," to B, it is obvious that there is an eclipse, but it is not yet obvious *why*; and we know that the eclipse is a fact, but we do not know *what* it is. When it is clear that A applies to C, to ask *why* it does so is equivalent to asking what B is: whether an obstruction or a rotation or an extinction of the moon; and this is the definition ^a of the other extreme ^b term, *viz.* (in these examples) A; because an eclipse is an obstruction by the earth of the moon's light. What is thunder? An extinction of fire in a cloud. Why does it thunder? Because the fire is being extinguished in the cloud. "Cloud" is C, "thunder" A, "extinction of fire" B. Then B applies to the cloud, C, because the fire is being extinguished in it; and A, "noise," applies to B; and B is undoubtedly the explanation of A, the major term. If B in its turn has another middle term for its cause, this will be one of the remaining explanations ^c of A.

and the middle term or terms will constitute the definition.

We have now stated how the essence is apprehended, and becomes known to us, to the effect that although it does not admit of syllogism or demonstration, yet it is through syllogism and demonstration that it becomes clear to us.^d It follows that the essence of a thing which has a cause other than itself cannot be known apart from demonstration, while at the same time it cannot be demonstrated; as we said ^e in reviewing the difficulties of the subject.

Thus demonstration does not prove but reveals the essence.

IX. Some things have a cause distinct from themselves, and others have not.^f Thus it is clear that of

Immediate essences

an additional cause which, together with B, constitutes the definition.

^d Although the essence or definition cannot be proved as the conclusion of a syllogism, yet syllogism enables us to see the facts in their true relation.

^e In chs. ii and iii.

^f Cf. note on 93 a 5.

93 b

ἄμεσα καὶ ἀρχαί εἰσιν, ἃ καὶ εἶναι καὶ τί ἐστὶν
 ὑποθέσθαι δεῖ ἢ ἄλλον τρόπον φανερά ποιῆσαι (ὅπερ
 25 ὁ ἀριθμητικὸς ποιεῖ· καὶ γὰρ τί ἐστὶ τὴν μονάδα
 ὑποτίθεται, καὶ ὅτι ἐστὶν). τῶν δ' ἐχόντων μέσον,
 καὶ ὧν ἐστὶ τι ἕτερον αἷτιον τῆς οὐσίας, ἐστὶ δι'
 ἀποδείξεως, ὥσπερ εἵπομεν, δηλῶσαι, μὴ τὸ τί
 ἐστὶν ἀποδεικνύντας.

X. Ὅρισμός δ' ἐπειδὴ λέγεται εἶναι λόγος τοῦ
 30 τί ἐστὶ, φανερόν ὅτι ὁ μὲν τις ἔσται λόγος τοῦ τί
 σημαίνει τὸ ὄνομα ἢ λόγος ἕτερος ὀνοματῶδης, οἷον
 τὸ¹ τί σημαίνει [τί ἐστὶ]² τρίγωνον. ὅπερ ἔχοντες
 ὅτι ἐστὶ, ζητοῦμεν διὰ τί ἐστὶν· χαλεπὸν δ' οὕτως
 ἐστὶ λαβεῖν ἃ μὴ ἴσμεν ὅτι ἐστὶν. ἢ δ' αἰτία
 εἴρηται πρότερον τῆς χαλεπότητος, ὅτι οὐδ' εἰ
 35 ἐστὶν ἢ μὴ ἴσμεν, ἀλλ' ἢ κατὰ συμβεβηκός. (λόγος
 δ' εἷς ἐστὶ διχῶς, ὁ μὲν συνδέσμων, ὥσπερ ἡ Ἰλιάς,
 ὁ δὲ τῶ ἐν καθ' ἑνὸς δηλοῦν μὴ κατὰ συμβεβηκός.)

Εἷς μὲν δὴ ὅρος ἐστὶν ὅρου ὁ εἰρημένος, ἄλλος δ'
 ἐστὶν ὅρος λόγος ὁ δηλῶν διὰ τί ἐστὶν· ὥστε ὁ μὲν
 94 a πρότερος σημαίνει μὲν, δείκνυσιν δ' οὐ, ὁ δ' ὕστερος
 φανερόν ὅτι ἐστὶ οἷον ἀπόδειξις τοῦ τί ἐστὶ, τῇ
 θέσει διαφέρων τῆς ἀποδείξεως. διαφέρει γὰρ
 εἰπεῖν διὰ τί βροντᾷ καὶ τί ἐστὶ βροντή· ἐρεῖ γὰρ
 οὕτω μὲν διότι ἀποσβέννυται τὸ πῦρ ἐν τοῖς νέφεσι·

¹ τὸ om. n¹.² τί ἐστὶ secl. Ross : τί ἐστὶν ἢ Ad.^a In ch. viii.^b Considered (apparently) as an attribute, not as a subject of geometry ; for then it would be a quasi-substance and its definition would fall under type (3).^c 93 a 24 ff.^d Cf. *Met.* 1045 a 13, and *supra* 92 b 32.

POSTERIOR ANALYTICS, II. IX-X

essences too some are immediate ; *i.e.*, they are first principles, and both their existence and their definition have to be assumed or exhibited in some other way. (This is what an arithmetician does : he assumes both what a unit is, and that it exists.) As for things which have a middle term, *i.e.*, something distinct from themselves which is a cause of their being, it is possible (as we have said ^a) to exhibit their essence by demonstration, although we do not actually demonstrate it.

X. Since definition means " an account of what a thing is," obviously (1) one kind of definition will be an explanation of the meaning of the name, or of an equivalent denomination ; *e.g.*, it will explain the meaning of " triangularity." ^b If we are aware that such a thing exists, we inquire why it exists ; but it is difficult to apprehend in this way the definition of things which we do not know to exist. We have explained above ^c the cause of this difficulty, *viz.*, that we do not really know, except in an accidental sense, whether the thing exists or not. (An account may be a unity in two ways : either by connexion, like the *Iliad*, ^d or because it exhibits one term as predicated of one other term in a non-accidental relation.)

The above is one definition of definition ; but (2) in another sense definition is a form of words which explains *why* a thing exists. Thus type (1) conveys a meaning but does not prove, whereas type (2) will obviously be a quasi-demonstration of the essence, differing from demonstration in the arrangement of its terms. To explain why it thunders is not the same as to explain what thunder is. In the former case we shall say " because the fire is being extinguished in

must be assumed or found by another method.

The three kinds of definition.

94 a

- 5 τί δ' ἐστὶ βροντή; ψόφος ἀποσβεννυμένου πυρὸς ἐν νέφεσιν· ὥστε ὁ αὐτὸς λόγος ἄλλον τρόπον λέγεται, καὶ ὡδὶ μὲν ἀπόδειξις συνεχῆς, ὡδὶ δὲ ὀρισμός. ἔτι ἐστὶν ὅρος βροντῆς ψόφος ἐν νέφεσι· τοῦτο δ' ἐστὶ τῆς τοῦ τί ἐστὶν ἀποδείξεως συμπέρασμα. ὁ δὲ τῶν ἀμέσων ὀρισμὸς θέσις ἐστὶ τοῦ τί ἐστὶν ἀναπόδεικτος.

- "Εστὶν ἄρα ὀρισμὸς εἰς μὲν λόγος τοῦ τί ἐστὶν ἀναπόδεικτος, εἰς δὲ συλλογισμὸς τοῦ τί ἐστὶ πτώσει διαφέρων τῆς ἀποδείξεως, τρίτος δὲ τῆς τοῦ τί ἐστὶν ἀποδείξεως συμπέρασμα. φανερόν οὖν ἐκ τῶν εἰρημένων καὶ πῶς ἔστι τοῦ τί ἐστὶν ἀπόδειξις καὶ πῶς οὐκ ἔστι, καὶ τίνων ἔστι καὶ τίνων οὐκ ἔστιν, ἔτι δ' ὀρισμὸς ποσαχῶς τε λέγεται καὶ πῶς τὸ τί ἐστὶ δείκνυσι καὶ πῶς οὔ, καὶ τίνων ἔστι καὶ τίνων οὔ, ἔτι δὲ πρὸς ἀπόδειξιν πῶς ἔχει, καὶ πῶς ἐνδέχεται τοῦ αὐτοῦ εἶναι καὶ πῶς οὐκ ἐνδέχεται.
- 20 XI. Ἐπεὶ δὲ ἐπίστασθαι οἰόμεθα ὅταν εἰδῶμεν τὴν αἰτίαν, αἰτίαι δὲ τέτταρες, μία μὲν τὸ τί ἦν εἶναι, μία δὲ τὸ τίνων ὄντων ἀνάγκη τοῦτ' εἶναι, ἑτέρα δὲ ἡ τί πρῶτον ἐκίνησε, τετάρτη δὲ τὸ τίνος ἔνεκα, πᾶσαι αὗται διὰ τοῦ μέσου δείκνυνται. τό τε

^a Continuous "because its premisses are parts which are conterminous (as linked by middle terms), and there is a movement from premisses to conclusion. Definition resembles rather the indivisible simplicity of a point" (Mure).

^b See 93 b 21 ff.

^c The three types are recapitulated in reverse order.

^d i.e., in the arrangement of the terms (cf. 94 a 2).

^e Three of these causes belong to Aristotle's standard doctrine of causation as set out in *Phys.* II. iii; but here the place of the material cause, which is inappropriate for the present logical purpose, is taken by the "necessitating con-

the clouds ” ; but the answer to the question “ What is thunder ? ” is “ Noise due to the extinguishing of fire in the clouds.” Thus the same account is expressed in a different way ; in one form it is a continuous ^a demonstration, in the other a definition. Further, whereas thunder can be defined as a noise in the clouds, which is the conclusion of the syllogism that demonstrates the essence, (3) the definition of immediate terms ^b consists in an indemonstrable assumption of their essence.

Thus in one sense ^c definition is an indemonstrable account of the essence ; in another it is a logical inference of the essence, differing from demonstration in grammatical form ^d ; and in a third it is the conclusion of the syllogism which demonstrates the essence. The foregoing discussion shows clearly (a) in what sense essence is demonstrable, and in what sense it is not ; (b) of what things the essence is demonstrable, and of what it is not ; (c) the different aspects of definition ; (d) in what sense it does or does not exhibit the essence ; (e) what things are or are not definable ; (f) the relation of definition to demonstration ; (g) in what sense there can be definition and demonstration of the same thing.

Summary of this and the two preceding chapters.

XI. We only think that we have knowledge of a thing when we know its cause. There are four kinds of cause : the essence, the necessitating conditions, the efficient cause which started the process, and the final cause.^e All these are exhibited through the

The four kinds of logical cause are all exhibited through a middle term. (1) The ground,

dition ” or “ ground.” The formula (barely reproducible in English) by which Aristotle describes this recalls the definition of syllogism (*An. Pr.* 24 b 18 ff.), and in l. 24 it becomes plain that he has in mind the conjunction of two premisses as the ground of their conclusion. Although there is some analogy between this ground and the material cause, there

25 γὰρ οὐ ὄντος τοδὶ ἀνάγκη εἶναι μιᾶς μὲν προτάσεως
 ληφθείσης οὐκ ἔστι, δυοῖν δὲ τοῦλάχιστον· τοῦτο δ'
 ἐστὶν ὅταν ἐν μέσον ἔχωσι. τούτου οὖν ἐνὸς ληφ-
 θέντος τὸ συμπέρασμα ἀνάγκη εἶναι. δῆλον δὲ καὶ
 ὧδε. διὰ τί ὀρθὴ ἢ ἐν ἡμικυκλίῳ; τίνος¹ ὄντος
 ὀρθή; ἔστω δὴ ὀρθὴ ἐφ' ἧς Α, ἡμίσεια δυοῖν ὀρ-
 30 θαῖν ἐφ' ἧς Β, ἢ ἐν ἡμικυκλίῳ ἐφ' ἧς Γ. τοῦ δὴ
 τὸ Α τὴν ὀρθὴν ὑπάρχειν τῷ Γ τῇ ἐν τῷ ἡμικυκλίῳ
 αἴτιον τὸ Β. αὕτη μὲν γὰρ τῇ Α ἴση· ἢ δὲ τὸ Γ
 τῇ Β· δύο γὰρ ὀρθῶν ἡμίσεια. τοῦ Β οὖν ὄντος
 ἡμίσεος δύο ὀρθῶν τὸ Α τῷ Γ ὑπάρχει· τοῦτο δ'
 ἦν τὸ ἐν ἡμικυκλίῳ ὀρθὴν εἶναι. τοῦτο δὲ ταυτόν
¹ τίνος] ἢ τίνος D.

is no reason to suppose that Aristotle means to identify them. The error of such a view is fully demonstrated by Ross *ad loc.* Here it is enough to point out that the material could never be equated with the formal cause (a 34 *infra*). Aristotle is simply trying (with qualified success) to offer an analysis of causation which will enable him to represent each type of cause as a kind of middle term.

^a From the sequel it appears that this odd and perhaps deliberately vague phrase is intended to mean that each type can actually serve as middle term in a syllogism.

^b i.e., common.

^c The choice of "the half of two right angles" as middle term clearly implies that Aristotle had in mind a proof in 210

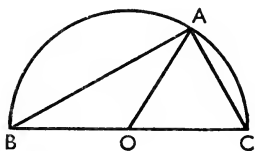
middle term.^a (1) There is no necessitating ground if only one premiss is assumed; two at least are necessary; and the condition is satisfied when the premisses have one ^b middle term. Thus the assumption of this one term necessitates the conclusion. This is clear from the following example. Why is the angle in a semicircle a right angle? What is the ground of its being a right angle? Let A be a right angle, B the half of two right angles, C the angle in a semicircle.^c Then the cause for the attachment of A, right angle, to C, the angle in a semicircle, is B; for this is equal to A, and the angle C to B, since B is the half of two right angles. Thus the fact that B is the half of two right angles is the ground necessitating that A applies to C, *i.e.* (by our assumption), that the angle in a semicircle is a right angle. Now

which this expression occurred (probably) at the penultimate step; *e.g.*, not the proof of *Met.* 1051 a 27 (cited by Ross), nor that of Euclid iii. 21, but the interpolated proof which follows the latter, to this effect:

BAC is an $\angle$ in the semicircle ABC, centre O. Since OB, OA, OC are radii, $\angle OBA = \angle OAB$ and $\angle OCA = \angle OAC$. Then $\angle AOC = 2\angle BAO$, and $\angle AOB = 2\angle CAO$.

$\therefore \angle BAC = \angle BAO + \angle CAO = \frac{1}{2}(\angle AOC + \angle AOB) = \frac{1}{2}\angle BOC = \frac{1}{2}(2 \text{ rt. } \angle s) = \text{a rt } \angle$.

(So Heath, *Mathematics in Aristotle*, p. 72.) It is tempting to think that Aristotle might have directly perceived that $\angle BAC = \frac{1}{2}$ the flat $\angle BOC$ standing on the same arc; for this would go far to justify "some such definition of the rightness of the angle in a semicircle as its being right in consequence of being the half of two right angles," for which "little can be said" (Ross *ad loc.*). But although Aristotle was an acute mathematician, it is hardly likely that he was so far in advance of his times.



94 a

35 ἔστι τῷ τί ἦν εἶναι, τῷ τοῦτο σημαίνειν τὸν λόγον.
ἀλλὰ μὴν καὶ τὸ τί ἦν εἶναι αἷτιον δέδεικται τὸ
μέσον ὄν.¹ τὸ δὲ διὰ τί ὁ Μηδικὸς πόλεμος ἐγένετο
Ἀθηναίοις; τίς αἰτία τοῦ πολεμεῖσθαι Ἀθηναίους;

94 b

ὅτι εἰς Σάρδεις μετ' Ἐρετριέων ἐνέβαλον· τοῦτο
γὰρ ἐκίνησε πρῶτον. πόλεμος ἐφ' οὗ A, προ-
τέρους² εἰσβαλεῖν B, Ἀθηναῖοι τὸ Γ. ὑπάρχει δὴ
τὸ B τῷ Γ, τὸ προτέρους³ ἐμβαλεῖν τοῖς Ἀθηναίοις.
5 τὸ δὲ A τῷ B· πολεμοῦσι γὰρ τοῖς πρότερον ἀδική-
σασιν. ὑπάρχει ἄρα τῷ μὲν B τὸ A, τὸ πολεμεῖ-
σθαι τοῖς προτέρους⁴ ἄρξασιν· τοῦτο δὲ τὸ B⁵ τοῖς
Ἀθηναίοις· πρότεροι γὰρ ἦρξαν. μέσον ἄρα καὶ ἐν-
ταῦθα τὸ αἷτιον τὸ πρῶτον κινήσαν. ὅσων δὲ αἷτιον
τὸ ἕνεκά τινος, οἷον διὰ τί περιπατεῖ; ὅπως ὑγιαίνει·
10 διὰ τί οἰκία ἔστιν; ὅπως σώζεται τὰ σκεύη· τὸ
μὲν ἕνεκα τοῦ ὑγιαίνειν, τὸ δὲ ἕνεκα τοῦ σώζεσθαι.
διὰ τί δὲ ἀπὸ δείπνου δεῖ περιπατεῖν, καὶ ἕνεκα
τίνος δεῖ, οὐδὲν διαφέρει. περίπατος ἀπὸ δείπνου
Γ, τὸ μὴ ἐπιπολάζειν τὰ σιτία ἐφ' οὗ B, τὸ ὑγιαί-
νειν ἐφ' οὗ A. ἔστω δὴ τῷ ἀπὸ δείπνου περιπατεῖν
15 ὑπάρχον τὸ ποιεῖν μὴ ἐπιπολάζειν τὰ σιτία πρὸς
τῷ στόματι τῆς κοιλίας, καὶ τοῦτο ὑγιεινόν. δοκεῖ
γὰρ ὑπάρχειν τῷ περιπατεῖν τῷ Γ τὸ B τὸ μὴ
ἐπιπολάζειν τὰ σιτία, τούτῳ δὲ τὸ A τὸ ὑγιεινόν.
τί οὖν αἷτιον τῷ Γ τοῦ τὸ A ὑπάρχειν τὸ οὗ ἕνεκα;

¹ ὄν om. ABdn¹.² πρότερον Bekker.³ πρότερον D, Bekker.⁴ προτέρους] πρότερον D.⁵ B τῷ Γ D² f.^a i.e., the necessitating ground.

this ^a is the same as the essence, inasmuch as it is what the definition implies. (2) The cause in the sense of essence has also been proved to be the middle.^b (3) Why did the Persian expedition ^c come against Athens? or in other words, what was the cause of her becoming involved in war? Because Athens had, in company with Eretria, raided Sardis ^d; this was what first started the war. A is "war," B "unprovoked aggression," C "Athens." Then B, unprovoked aggression, applies to C, Athens; and A applies to B, because war is made upon those who commit an aggressive wrong. So A, becoming involved in war, applies to B, the side which began hostilities; and B in its turn applies to C, Athens, because she began hostilities. Thus here too the cause—the efficient cause—is a middle. (4) Now take the case where the cause is final: *e.g.*, Why does one take a walk? In order to be healthy. What is the object of a house? Preservation of the contents. The final causes are respectively health and preservation. It makes no difference whether we ask *why* or *for what purpose* one should take a walk after dinner. C stands for "walking after dinner," B for "normal digestion," ^e and A for "health." Let us assume that walking after dinner possesses the attribute of promoting normal digestion, and that the latter is conducive to health; because it is generally accepted that B, normal digestion, applies to C, taking a walk, and that A, healthful, applies to B. Then what is the reason why A, the final cause, applies to C? The

(2) the essence,

(3) the efficient cause,

and (4) the final cause, can all stand as middle terms.

^b In ch. viii; *cf.* also 93 b 38 ff.

^c Under Datis in 490 B.C.

^d Under Aristagoras in 497 B.C.

^e Literally "food not floating on the surface," with the added qualification in l. 15 "at the mouth of the stomach."

94 b

τὸ Β τὸ μὴ ἐπιπολάζειν. τοῦτο δ' ἐστὶν ὥσπερ
 20 ἐκείνου λόγος· τὸ γὰρ Α οὕτως ἀποδοθήσεται. διὰ
 τί δὲ¹ τὸ Β τῷ Γ ἐστίν; ὅτι τοῦτ' ἔστι τὸ ὑγιαί-
 νειν, τὸ οὕτως ἔχειν. δεῖ δὲ μεταλαμβάνειν τοὺς
 λόγους, καὶ οὕτως μᾶλλον ἕκαστα φανέεται. αἱ δὲ
 γενέσεις ἀνάπαλιν ἐνταῦθα καὶ ἐπὶ τῶν κατὰ κίνη-
 σιν αἰτίων· ἐκεῖ μὲν γὰρ τὸ μέσον δεῖ γενέσθαι
 25 πρῶτον, ἐνταῦθα δὲ τὸ Γ τὸ ἔσχατον· τελευταῖον
 δὲ τὸ οὗ ἕνεκα.

Ἐνδέχεται δὲ τὸ αὐτὸ καὶ ἕνεκά τινος εἶναι καὶ
 ἐξ ἀνάγκης, οἷον διὰ τοῦ λαμπτήρος τὸ φῶς· καὶ

¹ δὲ om. D.

^a This passage is not clearly thought out, and interpreta-
 tion can only be tentative. It seems that up to this point
 Aristotle only professes to enunciate a syllogism of which the
major term is a final cause. In so doing he overlooks (or
 disregards) the fact that a final cause can only function as
 such in a "practical" syllogism, whereas the one which he
 has in mind seems to be demonstrative, *viz.*,

What promotes digestion is healthful
 Walking after dinner promotes digestion
 ∴ Walking after dinner is healthful.

This is valid, but it proves nothing about health *qua* final
 cause. Aristotle would probably justify his reasoning on
 teleological grounds by arguing that walking, etc., is healthful
 because it is an activity subserving a natural end; but this
 is really another matter.

Ross, who interprets the passage quite differently, supposing
 that Aristotle is already trying to exhibit the final cause as
 middle term, shows that in this case the middle term must
 be not "health" but "desirous of being healthy" (Those
 who wish to be healthy walk after dinner, This man desires
 to be healthy, Therefore this man walks after dinner), and
 comments "Aristotle is in fact mistaken in his use of the

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answer is "B, normal digestion."^a This is a sort of definition of A, because A will be explained by this means.^b Why does B apply to C? Because health is the condition represented by B. The expressions^c should be transposed, and then the several facts will become clearer. In these examples the order of events is the reverse of what it is in the case of efficient causes. There it is the middle term that must come first^d; but here it is the minor term C, and the end or purpose comes last.

The same effect may obtain both for a purpose and as a necessary consequence, as, *e.g.*, light shines

Possibility
of double
causation.

notion of final cause. It is never the so-called final cause that is operative, but the desire of an object; and this desire operates as an efficient cause, being what corresponds, in the case of purposive action, to a mechanical or chemical cause in physical action." If my view is right, this criticism is scarcely justified. Moreover, it obscures the correlativity of the final and efficient causes: if it is the desire that "operates," that desire is still excited by the object of desire (the mouse wants the cheese, and the cheese attracts the mouse); the two are always complementary and often no more than different aspects of a single fact.

^b Aristotle now tries to show that A, the final cause, can stand as middle between B and C. The steps seem to be: (1) B is "a sort of definition" of A; *i.e.*, the final is expressible in terms of the efficient cause. (2) Similarly *vice versa*. (3) Therefore A and B are convertible, and B can be proved of C through A.

If this interpretation (which is virtually the same as Mure's) is correct, Aristotle can hardly be acquitted of juggling with terms, although the interdependence of efficient and final causes (noted above) and the tendency of both to merge in the formal cause (*Met.* 1044 b 1, 1070 b 26) provide some justification.

^c Or perhaps "definitions," A being defined in terms of B, and *vice versa*. The vagueness of the language suggests that Aristotle is not quite satisfied with his demonstration.

^d Not really first, but before the major.

ARISTOTLE

94 b

γὰρ ἐξ ἀνάγκης διέρχεται τὸ μικρομερέστερον διὰ
 30 τῶν μειζόνων πόρων, εἴπερ φῶς γίγνεται τῷ δι-
 ιέναι, καὶ ἔνεκά τινος, ὅπως μὴ πταίωμεν. ἄρ' οὖν
 εἰ εἶναι ἐνδέχεται, καὶ γίνεσθαι ἐνδέχεται, ὥσπερ εἰ
 βροντᾶ <ὅτι>¹ ἀποσβεννυμένου τε τοῦ πυρὸς ἀνάγκη
 σίζειν καὶ ψοφεῖν, καὶ εἰ ὡς οἱ Πυθαγόρειοί φασιν,
 ἀπειλῆς ἔνεκα τοῖς ἐν τῷ ταρτάρῳ, ὅπως φοβῶνται;
 35 πλεῖστα δὲ τοιαῦτ' ἔστι, καὶ μάλιστα ἐν τοῖς κατὰ
 φύσιν συνισταμένοις καὶ συνεστῶσιν· ἡ μὲν γὰρ
 ἔνεκά του ποιεῖ φύσις, ἡ δ' ἐξ ἀνάγκης. ἡ δ' ἀνάγκη
 95 a κη διττή· ἡ μὲν γὰρ κατὰ φύσιν καὶ τὴν ὁρμήν, ἡ
 δὲ βία ἡ παρὰ τὴν ὁρμήν, ὥσπερ λίθος ἐξ ἀνάγκης
 καὶ ἄνω καὶ κάτω φέρεται, ἀλλ' οὐ διὰ τὴν αὐτὴν
 ἀνάγκην. ἐν δὲ τοῖς ἀπὸ διανοίας τὰ μὲν οὐδέποτε
 ἀπὸ τοῦ αὐτομάτου ὑπάρχει, οἷον οἰκία ἢ ἀνδριάς,
 5 οὐδ' ἐξ ἀνάγκης, ἀλλ' ἔνεκά του, τὰ δὲ καὶ ἀπὸ
 τύχης, οἷον ὑγίεια καὶ σωτηρία. μάλιστα δὲ ἐν
 ὅσοις ἐνδέχεται καὶ ᾧδε καὶ ἄλλως, ὅταν μὴ ἀπὸ
 τύχης ἢ γένεσις ἢ ὥστε τὸ τέλος ἀγαθόν, ἔνεκά του

¹ ὅτι add. Ross, habent comm. (?).

^a The lantern is probably of the type implied by A. in *Hist. An.* 531 a 5, with a cylindrical parchment shield (τὸ κύκλῳ δέρμα); and the light-particles pass through the pores of the parchment. The theory goes back to Empedocles (fr. 84, quoted in *De Sensu* 437 b 26 ff.), as no doubt does the similar theory about the burning-glass (*supra* 88 a 14) attributed to Gorgias, who was his pupil.

^b The purpose is surely artificial, not (as Ross thinks) an instance of natural design; for the translucence of (oiled?) parchment can hardly be tied to this particular use. If the example is meant to be exactly parallel with that which follows, it is ill-chosen.

through a lantern. Being composed of particles smaller than the pores (in the shield) of the lantern,^a it cannot help passing through them (assuming that this is how the light is propagated); but it also shines for a purpose, so that we may not stumble.^b If, then, an effect can obtain for two causes, can it also be brought about by two causes?—e.g., if it thunders both because there must be a hissing and roaring as the fire ^c is extinguished, and also (as the Pythagoreans hold) to threaten the souls in Tartarus and make them fear.^d There are plenty of such examples, especially among the processes and products of nature; because nature in one aspect acts with a purpose and in another from necessity. Now necessity is of two kinds: one acts in accordance with the nature or natural tendency of an object, the other forcibly opposes it (thus both the upward and the downward movements of a stone are due to necessity, but not to the same necessity^e). Among the products of rational thought some, such as a house or a statue, never owe their existence to spontaneity or necessity but always to some purpose; others, like health and security, may also be due to chance. It is especially in circumstances that admit of more than one result, when the process is not due to chance, so that the end is some good, that design

^c *Sc.*, of the lightning. The Greek seems to call for Ross's *στῦ*, which has some support from the commentators; but I am by no means confident that Aristotle wrote it. It really looks as though the *εἰ* before *βροντᾶ* were intended to serve twice over.

^d I know of no other authority for this doctrine.

^e The downward movement is the stone's natural tendency to find its proper place in the universe (*cf. De Caelo* IV. iv); the upward is imparted by some external force.

γίγνεται, καὶ ἢ φύσει ἢ τέχνῃ. ἀπὸ τύχης δ' οὐδὲν ἕνεκά του γίγνεται.

- 10 XII. Τὸ δ' αὐτὸ αἴτιον ἐστὶ τοῖς γιγνομένοις καὶ τοῖς γεγενημένοις καὶ τοῖς ἐσομένοις ὅπερ καὶ τοῖς οὖσι (τὸ γὰρ μέσον αἴτιον), πλὴν τοῖς μὲν οὖσιν ὄν, τοῖς δὲ γιγνομένοις γιγνόμενον, τοῖς δὲ γεγενη-
 μένοις γεγενημένον καὶ ἐσομένοις ἐσόμενον. οἷον
 15 διὰ τί γέγονεν ἔκλειψις; διότι ἐν μέσῳ γέγονεν ἡ γῆ· γίγνεται δὲ διότι γίγνεται, ἔσται δὲ διότι ἔσται ἐν μέσῳ, καὶ ἔστι διότι¹ ἔστιν. τί ἐστὶ κρύσταλλος; εἰλήφθω δὴ ὅτι ὕδωρ πεπηγός. ὕδωρ ἐφ' οὗ Γ, πεπηγός ἐφ' οὗ Α, αἴτιον τὸ μέσον ἐφ' οὗ Β, ἔκ-
 λειψις θερμοῦ παντελής. ὑπάρχει δὴ τῷ Γ τὸ Β,
 20 τούτῳ δὲ τὸ πεπηγέναι τὸ ἐφ' οὗ Α. γίγνεται δὲ κρύσταλλος γιγνομένου τοῦ Β, γεγένηται δὲ γεγενη-
 μένου, ἔσται δ' ἐσόμενου.

Τὸ μὲν οὖν οὕτως αἴτιον καὶ οὐ αἴτιον ἅμα γίγ-
 νεται, ὅταν γίγνηται, καὶ ἔστιν, ὅταν ᾗ· καὶ ἐπὶ τοῦ
 γεγονέναι καὶ ἔσεσθαι ὡσαύτως. ἐπὶ δὲ τῶν μὴ
 25 ἅμα ἂρ' ἔστιν ἐν τῷ συνεχεῖ χρόνῳ, ὥσπερ δοκεῖ
 ἡμῖν, ἄλλα ἄλλων αἴτια εἶναι, τοῦ τόδε γενέσθαι
 ἕτερον γεγόμενον, καὶ τοῦ ἔσεσθαι ἕτερον ἐσόμενον,
 καὶ τοῦ γίγνεσθαι δέ, εἴ τι ἔμπροσθεν ἐγένετο;
 ἔστι δὴ ἀπὸ τοῦ ὕστερον γεγονότος ὁ συλλογισμός
 (ἀρχὴ δὲ καὶ τούτων τὰ γεγονότα)· διὸ καὶ ἐπὶ τῶν

¹ διότι Dn : om. d : δὲ ὅτι AB.

^a In the preceding examples the causes are both formal and efficient. Aristotle does not say explicitly that causes which are not simultaneous with their effects are not formal

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occurs ; it may be either natural or artificial. No designed result is due to chance.

XII. Present, past and future events are caused in just the same way as existing facts. The cause is always the middle term ; but whereas the cause of a fact is a fact, the cause of a present event is a present event, and similarly with the past and the future. *E.g.*, why has an eclipse occurred ? Because the earth has come in between ; and an eclipse *is coming* about because the earth *is coming* in between, *will be* because the earth *will be* in between, and *is* because the earth *is* in between. What is ice ? Assume that it is frozen water. Water is C, frozen A ; the cause is the middle term B, complete failure of heat. Then B applies to C, and A, "frozen," applies to B. Ice forms when B comes about, has formed or will form when B has come or will come about.

Causes correspond in time with their effects.

Causes and effects which are related in this way^a occur simultaneously when they occur at all, whether in the present, past or future ; and co-exist when they exist. But the question suggests itself whether, as is commonly supposed, events which do *not* occur simultaneously in continuous time can be related as cause and effect—a past effect having a cause in the remoter past, a future effect a cause in the nearer future, and a present effect too a cause prior to it ?

Can causes ever precede their effects ?

On this view inference is possible from the posterior past event (although past events have their origin in previous events^b)—and therefore the same is true of but may be efficient or material ; but he may intend to imply it.

If so, we can infer the cause from the effect, but not the effect from the cause.

^b This qualification comes in oddly here. It seems to be merely a reminder that Aristotle does not dispute the causal connexion, although he does not accept it as a sufficient basis for inference.

95 a

30 γιγνομένων ὡσαύτως. ἀπὸ δὲ τοῦ προτέρου οὐκ ἔστιν· οἷον ἐπεὶ τόδε γέγονεν, ὅτι τόδ' ὕστερον γέγονεν· καὶ ἐπὶ τοῦ ἔσεσθαι ὡσαύτως. οὔτε γὰρ ἀόριστου οὔθ' ὀρισθέντος ἔσται τοῦ χρόνου ὥστ' ἐπεὶ τοῦτ' ἀληθὲς εἰπεῖν γεγονέναι, τόδ' ἀληθὲς εἰπεῖν γεγονέναι τὸ ὕστερον· ἐν γὰρ τῷ μεταξὺ

35 ψεῦδος ἔσται τὸ εἰπεῖν τοῦτο, ἥδη θατέρου γεγονότος. ὁ δ' αὐτὸς λόγος καὶ ἐπὶ τοῦ ἐσομένου, οὐδ' ἐπεὶ τόδε γέγονε, τόδ' ἔσται. τὸ γὰρ μέσον ὁμόγονον δεῖ εἶναι, τῶν γενομένων γενόμενον, τῶν ἐσόμενων ἐσόμενον, τῶν γιγνομένων γιγνόμενον, τῶν ὄντων ὄν· τοῦ δὲ γέγονε καὶ τοῦ ἔσται οὐκ ἐνδέχεται

40 εἶναι ὁμόγονον. ἔτι οὔτε ἀόριστον ἐνδέχεται εἶναι

95 b τὸν χρόνον τὸν μεταξὺ οὔθ' ὠρισμένον· ψεῦδος γὰρ ἔσται τὸ εἰπεῖν ἐν τῷ μεταξύ. ἐπισκεπτέον δὲ τί τὸ συνέχον ὥστε μετὰ τὸ γεγονέναι τὸ γίγνεσθαι ὑπάρχειν ἐν τοῖς πράγμασιν. ἢ δῆλον ὅτι οὐκ ἔστιν

^a But it might, of course, be true to say that *Y will* happen; therefore Aristotle proceeds to deal with this possibility.

^b As Ross points out, "Aristotle says more than he means here," for this principle would exclude inference from present to past events, which he explicitly allows.

^c If the effect does not follow immediately (as it does when "simultaneous" with its cause) other factors may either delay it so that it does not occur within a definite period of time, or prevent it from happening at all. Thus while the cause can be inferred as a necessary precondition of the effect, the effect cannot be inferred to be a necessary consequence. On the whole question see *Introd.* pp. 15 f.

^d The discussion is inconclusive; its superficiality is at least partly due to an ambiguity in the terms used, and to the lack of a Greek participle expressing continuous action

present events—but not from the prior; *e.g.*, we cannot argue that because X happened Y happened subsequently (and similarly in the case of future events); whether the interval be defined or not, it will not follow that because it is true to say that X has happened, it is also true to say that the posterior event Y has happened; because during the interval it will be false to say that Y has happened,^a whereas X has happened already. The same argument applies to future events: it does not follow, because X has happened, that Y will happen. (1) The middle term must be homogeneous with the extremes: past when they are past, future when they are future, present when they are present, existent fact when they are existent facts^b; and nothing can be homogeneous at once with what is past and what is future. (2) The interval between cause and effect can neither be indefinite nor definite; because during the interval it will be false to assert the effect.^c We must investigate what is the bond of continuity that makes a present process follow the completion of a past event.^d It is surely obvious that a present process is not con-

What is the causal link between events distinct in time?

in past time. Aristotle asks what is the connexion between a past event (*γεγονός* or *γενόμενον*, “a thing-having-happened”) and a present one (*γινόμενον*, “a thing-happening”). But the former also means a completed process, or the completion of a process, and the latter a process still continuing. Since the completion of a process is momentary, it is indivisible and has no extremes (*Phys.* 235 b 30 ff.) and cannot be contiguous (*i.e.*, immediately successive: *Phys.* 227 a 6, *Met.* 1069 a 2) either to another completion or to a process; just as a point cannot be contiguous either to another point or to a line (which is not, of course, to be thought of as a finite aggregate of points). What Aristotle overlooks is that the completion of one process might coincide with the terminal point of a line: in other words, two processes may be actually continuous and separable only at an imaginary moment.

ἐχόμενον γεγονότος γιγνόμενον; οὐδὲ γὰρ γενόμενον
 5 μενον γενομένου· πέρατα γὰρ καὶ ἄτομα· ὥσπερ
 οὖν οὐδὲ στιγμαί εἰσιν ἀλλήλων ἐχόμεναι, οὐδὲ
 γενόμενα· ἄμφω γὰρ ἀδιαίρετα. οὐδὲ δὴ γιγνόμε-
 νον γεγεννημένου διὰ τὸ αὐτό· τὸ μὲν γὰρ γιγνό-
 μενον διαιρετόν, τὸ δὲ γεγονὸς ἀδιαίρετον. ὥσπερ
 οὖν γραμμὴ πρὸς στιγμήν ἔχει, οὕτω τὸ γιγνό-
 10 μενον πρὸς τὸ γεγονός· ἐνυπάρχει γὰρ ἅπειρα γεγο-
 νότα ἐν τῷ γιγνομένῳ. μᾶλλον δὲ φανερώς ἐν τοῖς
 καθόλου περὶ κινήσεως δεῖ λεχθῆναι περὶ τούτων.

Περὶ μὲν οὖν τοῦ πῶς ἂν ἐφεξῆς γιγνομένης τῆς
 γενέσεως ἔχοι τὸ μέσον τὸ αἷτιον ἐπὶ τοσοῦτον
 15 εἰλήφθω. ἀνάγκη γὰρ καὶ ἐν τούτοις τὸ μέσον
 καὶ τὸ πρῶτον ἄμεσα εἶναι. οἷον τὸ Α γέγονεν
 ἐπεὶ τὸ Γ γέγονεν (ὑστερον δὲ τὸ Γ γέγονεν, ἔμ-
 προσθεν δὲ τὸ Α· ἀρχὴ δὲ τὸ Γ διὰ τὸ ἐγγύτερον
 τοῦ νῦν εἶναι, ὃ ἐστὶν ἀρχὴ τοῦ χρόνου). τὸ δὲ Γ
 γέγονεν εἰ τὸ Δ γέγονε· τοῦ δὴ Δ γενομένου ἀνάγκη
 20 τὸ Α γεγονέναι. αἷτιον δὲ τὸ Γ· τοῦ γὰρ Δ γενο-
 μένου τὸ Γ ἀνάγκη γεγονέναι, τοῦ δὲ Γ γεγονότος
 ἀνάγκη πρότερον τὸ Α γεγονέναι. οὕτω δὲ λαμ-
 βάνοντι τὸ μέσον στήσεταιί που εἰς ἄμεσον, ἣ αἰὲ
 παρεμπεσεῖται διὰ τὸ ἅπειρον; οὐ γὰρ ἐστὶν ἐχόμε-
 νον γεγονὸς γεγονότος, ὥσπερ ἐλέχθη. ἀλλ' ἄρξα-
 25 σθαί γε ὅμως ἀνάγκη ἀπ' ἀμέσου¹ καὶ ἀπὸ τοῦ νῦν

¹ ἀπ' ἀμέσου n, Waitz: ἀπὸ μέσου ABd: ἀπὸ τοῦ μέσου comm.

^a See *Phys.* IV. x-xiv and VI, where Aristotle discusses problems relating to time and continuity, and cf. *Introd.* p. 15.

^b i.e., the immediate cause (*causa cognoscendi*).

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tiguous with a past completion ; no more than one completed process is with another. Such completions are limits and indivisible. They are no more contiguous than are points in a line ; both are equally indivisible. For the same reason a present process cannot be contiguous with the completion of a past event, because the former is divisible and the latter is not. Thus the relation of a present process to the completion of a past event is like that of a line to a point because in a process there is an infinite number of completions. We must treat this subject more explicitly, however, in our general discussion of Motion.^a

We may take it that we have now shown how, in a sequence of events, the middle term can contain the cause. Here again the middle and major terms must be immediately connected. *E.g.*, A has happened because C has happened. C is the later, A the earlier event ; but C is the starting-point, because it is nearer to the present, which is the starting-point in time. Now C has happened if D has happened. Then if D happens A must have happened. But the cause ^b is C, because if D happens C must have happened, and if C has happened A must have happened first. But if we take the middle term in this way, will the series terminate somewhere in an immediate premiss, or will it be infinite and always admit of the insertion of another term ?—because one past event is not contiguous with another, as we have observed above.^c In any case we must start from an immediate connexion and the present time.^d

In reasoning from effect to cause we must proceed by immediate connexions ;

A-c-D

but will the series ever terminate ?

^c 95 b 3-6.

^d Or perhaps (as Ross, following the commentators, prefers), " we must start from a connexion that is immediate and is the first of the series, reckoning back from the present."

95 b

πρώτον. ὁμοίως δὲ καὶ ἐπὶ τοῦ ἔσται. εἰ γὰρ ἀλη-
 θὲς εἰπεῖν ὅτι ἔσται τὸ Δ, ἀνάγκη πρότερον ἀληθὲς
 εἰπεῖν ὅτι τὸ Α ἔσται. τούτου δ' αἷτιον τὸ Γ· εἰ μὲν
 γὰρ τὸ Δ ἔσται, πρότερον τὸ Γ ἔσται· εἰ δὲ τὸ Γ
 30 ἔσται, πρότερον τὸ Α ἔσται. ὁμοίως δ' ἄπειρος ἡ
 τομὴ καὶ ἐν τούτοις· οὐ γὰρ ἔστιν ἐσόμενα ἐχόμενα
 ἀλλήλων. ἀρχὴ δὲ καὶ ἐν τούτοις ἄμεσος ληπτέα.
 ἔχει δὲ οὕτως ἐπὶ τῶν ἔργων· εἰ γέγονεν οἰκία,
 ἀνάγκη τετμηῆσθαι λίθους καὶ γεγονέναι. τοῦτο διὰ
 τί; ὅτι ἀνάγκη θεμέλιον γεγονέναι, εἴπερ καὶ οἰκία
 35 γέγονεν¹. εἰ δὲ θεμέλιον, πρότερον λίθους γεγο-
 νέναι ἀνάγκη. πάλιν εἰ ἔσται οἰκία, ὡσαύτως
 πρότερον ἔσονται λίθοι. δείκνυται δὲ διὰ τοῦ μέσου
 ὁμοίως· ἔσται γὰρ θεμέλιος² πρότερον.

Ἐπεὶ δ' ὁρῶμεν ἐν τοῖς γιγνομένοις κύκλῳ τινὰ
 γένεσιν οὖσαν, ἐνδέχεται τοῦτο εἶναι εἴπερ ἔποιντο
 40 ἀλλήλοις τὸ μέσον καὶ οἱ ἄκροι· ἐν γὰρ τούτοις τὸ
 96 a ἀντιστρέφειν ἐστίν. δέδεικται δὲ τοῦτο ἐν τοῖς
 πρώτοις, ὅτι ἀντιστρέφει τὰ συμπεράσματα· τὸ δὲ
 κύκλῳ τοῦτό ἐστιν. ἐπὶ δὲ τῶν ἔργων φαίνεται
 ὧδε· βεβρεγμένης τῆς γῆς ἀνάγκη ἀτμίδα γενέσθαι,³
 τούτου δὲ γενομένου νέφος, τούτου δὲ γενομένου
 5 ὕδωρ· τούτου δὲ γενομένου ἀνάγκη βεβρέχθαι
 τὴν γῆν· τοῦτο δ' ἦν τὸ ἐξ ἀρχῆς, ὥστε κύκλῳ περι-
 ελήλυθεν· ἐνὸς γὰρ αὐτῶν ὅτουοῦν ὄντος ἕτερον
 ἔστι, κακείνου ἄλλο, καὶ τούτου τὸ πρῶτον.

Ἔστι δ' ἓνα μὲν γιγνόμενα καθόλου (ἀεὶ τε γὰρ

¹ οἰκία γέγονεν Ross, habet Eustratius: οἰκίαν γεγονέναι codd.

² θεμέλιος n, Eustratius: θεμέλιον.

³ γίνεσθαι Aldina, Bekker.

Similarly too in respect of the future. If it is true to say that D will be, it must be true at an earlier time to say that A will be. But C is the cause of A ; because if D will be, C will be before it ; and if C will be, A will be before C is. Here again the series will be infinitely divisible in the same way as before, because future events are not contiguous with one another. In this case too we must take as our starting-point an immediate connexion. The principle is exemplified in practical affairs. If a house has come into being, stones must have been cut and come into being. Why ? Because the fact that a house has come into being implies that so has a foundation ; and if so, stones must have come into being first. Again, if there is to be a house, similarly there will be stones first. The proof, as before, is by the middle term ; there will be a foundation before there is a house.

Practical examples of such inference.

It is a matter of observation that events sometimes occur in a cycle. This is possible when the middle and extreme terms are reciprocal consequents ; because under these conditions the sequence is convertible. It has been shown in the first part of our treatise that conclusions are convertible,^a and this is a form of cyclic sequence. The following is a practical example. When the earth is wet mist must form, and after mist comes cloud, and after cloud rain, and after rain the earth must be wet. This was the point from which we started, so events have moved in a cycle. Any one of them leads to another, and that to a third, and that back to the first.

How events can occur in a cycle.

Some events occur universally (for a given state or

Inference of usual events.

^a *Sc.*, if both premisses are convertible. *Cf. An. Pr. II. v, and supra 73 a 6 ff.*

96 a

καὶ ἐπὶ παντὸς οὕτως ἢ ἔχει ἢ γίγνεται), τὰ δὲ αἰ
 10 μὲν οὖν, ὥς ἐπὶ τὸ πολὺ δέ, οἷον οὐ πᾶς ἄνθρωπος
 ἄρρην τὸ γένειον τριχοῦται, ἀλλ' ὥς ἐπὶ τὸ πολὺ.
 τῶν δὴ τοιούτων ἀνάγκη καὶ τὸ μέσον ὥς ἐπὶ τὸ
 πολὺ εἶναι. εἰ γὰρ τὸ Α κατὰ τοῦ Β καθόλου κατη-
 γορεῖται, καὶ τοῦτο κατὰ τοῦ Γ καθόλου, ἀνάγκη
 καὶ τὸ Α κατὰ τοῦ Γ αἰεὶ καὶ ἐπὶ παντὸς κατ-
 15 ηγορεῖσθαι· τοῦτο γάρ ἐστι τὸ καθόλου, τὸ¹ ἐπὶ
 παντὶ καὶ αἰεὶ. ἀλλ' ὑπέκειτο ὥς ἐπὶ τὸ πολὺ· ἀν-
 ἀγκη ἄρα καὶ τὸ μέσον ὥς ἐπὶ τὸ πολὺ εἶναι τὸ ἐφ'
 οὗ τὸ Β. ἔσονται τοίνυν καὶ τῶν ὥς ἐπὶ τὸ πολὺ
 ἀρχαὶ ἄμεσοι, ὅσα ὥς ἐπὶ τὸ πολὺ οὕτως ἔστιν ἢ
 γίγνεται.

20 XIII. Πῶς μὲν οὖν τὸ τί ἐστὶν εἰς τοὺς ὅρους
 ἀποδίδοται, καὶ τίνα τρόπον ἀπόδειξις ἢ ὁρισμὸς
 ἔστιν αὐτοῦ ἢ οὐκ ἔστιν, εἴρηται πρότερον· πῶς δὲ
 δεῖ θηρεύειν τὰ ἐν τῷ τί ἐστὶ κατηγορούμενα, νῦν
 λέγωμεν.

Τῶν δὴ ὑπαρχόντων αἰεὶ ἐκάστω ἔνια ἐπεκτείνει
 25 ἐπὶ πλεόν, οὐ μέντοι ἔξω τοῦ γένους. λέγω δὲ ἐπὶ
 πλεόν ὑπάρχειν ὅσα ὑπάρχει μὲν ἐκάστω καθόλου,
 οὐ μὴν ἀλλὰ καὶ ἄλλω. οἷον ἔστι τι ὃ πάσῃ τριάδι
 ὑπάρχει, ἀλλὰ καὶ μὴ τριάδι, ὥσπερ τὸ ὄν ὑπάρχει
 τῇ τριάδι, ἀλλὰ καὶ μὴ ἀριθμῷ· ἀλλὰ καὶ τὸ περιτ-
 30 τὸν ὑπάρχει τε πάσῃ τριάδι καὶ ἐπὶ πλεόν ὑπάρχει

¹ τὸ n : καὶ ABd.

^a For "usual" events as objects of science cf. *Met.* 1026
 b 27 ff., 1064 b 32 ff.

^b *Viz.*, that in a syllogism which leads to a causal defini-
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process may be true always and of every case), while others occur not always but usually^a; *e.g.*, not every male human being grows hair on the chin, but it happens usually. In such cases the middle term too must be a usual event. If A is predicated universally of B, and B universally of C, A must also be predicated of C, and of *all* C; because "universally" means always and in every case. But *ex hypothesi* A is predicated usually of C. Then the middle term B must also be "usual." Thus the immediate premisses of usual events must also describe states or processes which are usual.

XIII. We have explained above how the essence is distributed among the terms,^b and in what sense it does or does not admit of demonstration or definition.^c Let us now consider how we should hunt for the attributes which are predicated as elements in the definition.

How to find the elements in a definition,

Of the permanent^d attributes of any given subject some^e have a wider application—not, however, beyond the genus. By an attribute with a wider application I mean one which applies universally to a particular subject, and also to some other. *E.g.*, there are attributes which apply to every 3 and also to what is not 3, in the way that "being" applies to 3 and also to subjects which are not numbers.^f On the other hand, oddness applies to every 3, and has a

by collecting attributes shared with other species but not with other genera.

tion of an attribute the attribute must be the major, the cause the middle, and the subject the minor term (93 a 14 ff.).

^c In chs. viii-x.

^d *i.e.*, non-accidental.

^e Others—*viz.*, properties and some differentiae—do not; but they are not in question here. Note that we are now concerned with the definition of substances.

^f This type is mentioned only to be dismissed, because it extends beyond the genus, number.

96 a

(καὶ γὰρ τῇ πεντάδι ὑπάρχει), ἀλλ' οὐκ ἔξω τοῦ γένους· ἡ μὲν γὰρ πεντὰς ἀριθμός, οὐδὲν δὲ ἔξω ἀριθμοῦ περιττόν. τὰ δὲ τοιαῦτα ληπτέον μέχρι τούτου, ἕως τοσαῦτα ληφθῇ πρῶτον ὧν ἕκαστον μὲν ἐπὶ πλεόν ὑπάρξει, ἅπαντα δὲ μὴ ἐπὶ πλεόν·

35 ταύτην γὰρ ἀνάγκη οὐσίαν εἶναι τοῦ πράγματος. οἷον τριάδι ὑπάρχει πάση ἀριθμός, τὸ περιττόν, τὸ πρῶτον ἀμφοτέρως, καὶ ὡς μὴ μετρεῖσθαι ἀριθμῶ καὶ ὡς μὴ συγκεῖσθαι ἐξ ἀριθμῶν. τοῦτο τοίνυν ἤδη ἐστὶν ἡ τριάς, ἀριθμὸς περιττὸς πρῶτος καὶ ὠδὶ πρῶτος. τούτων γὰρ ἕκαστον τὰ μὲν καὶ

96 b τοῖς περιττοῖς πᾶσιν ὑπάρχει, τὸ δὲ τελευταῖον καὶ τῇ δυάδι, πάντα δὲ οὐδενί. ἐπεὶ δὲ δεδηλωται ἡμῖν ἐν τοῖς ἄνω ὅτι καθόλου¹ μὲν ἐστὶ τὰ ἐν τῷ τί ἐστὶ κατηγορούμενα, τὰ καθόλου δὲ ἀναγκαῖα, τῇ δὲ τριάδι καὶ ἐφ' οὗ ἄλλου οὕτω λαμβάνεται ἐν τῷ
5 τί ἐστὶ τὰ λαμβανόμενα, οὕτως ἐξ ἀνάγκης μὲν ἂν εἴη τριάς ταῦτα. ὅτι δ' οὐσία, ἐκ τῶνδε δῆλον. ἀνάγκη γάρ, εἰ μὴ τοῦτο ἦν τριάδι εἶναι, οἷον γένος τι εἶναι τοῦτο, ἢ ὠνομασμένον ἢ ἀνώνυμον. ἔσται τοίνυν ἐπὶ πλεόν² ἢ τῇ τριάδι ὑπάρχον. ὑποκεῖσθω γὰρ τοιοῦτον εἶναι τὸ γένος ὥστε ὑπάρχειν κατὰ
10 δύναμιν ἐπὶ πλεόν.³ εἰ τοίνυν μηδενὶ ὑπάρχει ἄλλῳ ἢ ταῖς ἀτόμοις τριάσι, τοῦτ' ἂν εἴη τὸ τριάδι εἶναι· ὑποκεῖσθω γὰρ καὶ τοῦτο, ἡ οὐσία ἢ ἐκάστου εἶναι

¹ καθόλου Ross : ἀναγκαῖα codd.

² πλείον AB.

³ πλείον D, Bekker.

^a i.e., this complex of attributes.

^b i.e., as neither having factors nor being the sum of two or more numbers. $3=2+1$, but 1 was regarded not as a number itself but as the "measure" or "starting-point" of number (*Met.* 1088 a 4 ff.).

wider application, because it applies to 5 too ; but it does not extend beyond the genus, because 5 is a number, and nothing outside the genus number is odd. It is attributes of this kind that we must select, up to the point where, although singly they have a wider extension of meaning than the subject, collectively they have not ; for this ^a must be the essence of the thing. *E.g.*, 3 has the following universal attributes : it is a number, it is odd, it is prime in both senses, as being neither measurable by number nor composed of numbers.^b We now have the essence of 3 : a number, odd, prime, and prime in this particular sense. The first two of these attributes apply to all odd numbers, and the last also applies to 2 ; but no other number has them all. Now since we have shown above ^c that attributes which are predicated as elements in the definition are universal,^d and that universal attributes are necessary, and since the selected attributes are elements in the definition of 3 (or of any other subject in the case of which they are so selected), then “ threeness ” must consist in just these attributes. That they constitute its essence is clear from the following argument. If this combination of attributes were not the essence of 3, it must be a sort of genus, either with or without a name of its own. Then its application must extend beyond 3. Let us assume that the genus is such as to have the widest possible application. Then if it applies to nothing else but individual 3s, it must be “ threeness ” ; for we must further assume that the essence of any given thing is the

The complex of these will give the essence.

Proof that this is so.

^c Book I, ch. iv.

^d Ross's emendation, though supported by no evidence, seems to be required by the argument.

96 b

ἢ ἐπὶ τοῖς¹ ἀτόμοις ἔσχατος τοιαύτη κατηγορία· ὥστε ὁμοίως καὶ ἄλλω ὁτῶν τῶν οὕτω δειχθέντων τὸ αὐτῷ εἶναι ἔσται.

- 15 Χρὴ δέ, ὅταν ὅλον τι πραγματεύηται τις, διελεῖν τὸ γένος εἰς τὰ ἄτομα τῷ εἶδει τὰ πρῶτα, οἷον ἀριθμὸν εἰς τριάδα καὶ δυάδα, εἶθ' οὕτως ἐκείνων ὀρισμοὺς πειρᾶσθαι λαμβάνειν, οἷον εὐθείας γραμμῆς καὶ κύκλου καὶ ὀρθῆς γωνίας, μετὰ δὲ τοῦτο λαβόν-
- 20 τα τί τὸ γένος, οἷον πότερον τῶν ποσῶν ἢ τῶν ποιῶν, τὰ ἴδια πάθη θεωρεῖν διὰ τῶν κοινῶν πρώτων. τοῖς γὰρ συντιθεμένοις ἐκ τῶν ἀτόμων τὰ συμβαίνοντα ἐκ τῶν ὀρισμῶν ἔσται δῆλα, διὰ τὸ ἀρχὴν εἶναι πάντων τὸν ὀρισμὸν καὶ τὸ ἀπλοῦν καὶ τοῖς ἀπλοῖς καθ' αὐτὰ ὑπάρχειν τὰ συμβαίνοντα
- 25 μόνοις, τοῖς δ' ἄλλοις κατ' ἐκείνα. αἱ δὲ διαιρέσεις αἱ κατὰ τὰς διαφορὰς χρήσιμοί εἰσιν εἰς τὸ οὕτω μετιέναι· ὥς μέντοι δεικνύουσιν, εἴρηται ἐν τοῖς πρότερον. χρήσιμοι δ' ἂν εἶεν ὧδε μόνον πρὸς τὸ συλλογίζεσθαι τὸ τί ἐστίν. καίτοι δόξειεν γ' ἂν οὐδέν, ἀλλ' εὐθὺς λαμβάνειν ἅπαντα, ὥσπερ ἂν εἰ
- 30 ἐξ ἀρχῆς ἐλάμβανέ τις ἄνευ τῆς διαιρέσεως. διαφέρει δέ τι τὸ πρῶτον καὶ ὕστερον τῶν κατηγορουμένων κατηγορεῖσθαι, οἷον εἰπεῖν ζῶον ἡμερον δίπουν ἢ δίπουν ζῶον ἡμερον. εἰ γὰρ ἅπαν ἐκ

¹ τοῖς Ross : ταῖς.

^a i.e., those which exhibit the properties of the genus in their simplest form. 3 and 2 are the first odd and even numbers; straight lines and circles are the simplest lines; the right angle is that by which other angles are measured

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last predicate of this kind that applies to the individuals. Similarly any other combination of attributes thus exhibited will be the essence of the subject in question.

In making a systematic study of a whole class of objects, one should first divide the genus into the primary ^a *infimae species* (e.g., number into 3 and 2), and then try to arrive at the definitions of these (e.g., of straight line, circle and right angle) by the methods described above ; then, after ascertaining what the category of the genus is (e.g., whether it is quantity or quality), examine its peculiar properties in the light of the primary common attributes. The attributes of subjects which are compounded of these *infimae species* will become clear from the definitions (of the latter), because in every case the starting-point is the definition and the simple subject and attributes belong *per se* only to simple subjects, and to others indirectly. For investigations of this kind division in accordance with the differentiae is useful ; how it exhibits the facts has been explained above.^b But for inferring the essential nature of a subject its use is limited, as I shall explain. It might indeed seem that it has no use at all, but proceeds by direct assumption, just as if one took the facts for granted without employing division ; but it makes an appreciable difference whether the predicates are stated in the right order, e.g., whether you say " animal, tame, two-footed," or " two-footed, animal, tame," because if every definiendum consists of and defined. When the essence of these has been grasped and formulated, we can compare their properties with those of the other *infimae species*, and so, working steadily upwards, systematize the whole genus.

Division aids the systematic study of a genus.

In a search for the essence it enables us to take attributes in the right order,

^b In ch. v ; cf. also *An. Pr.* I. xxxi.