

## VIII

### THE DIVISIONS OF KNOWLEDGE<sup>1</sup>

When Aristotle is called, as he sometimes is, the founder of scientific method, the word 'science' is given a wider meaning than is nowadays usual. We commonly distinguish the scientist from the philosopher and the mathematician no less from the practical man of affairs. 'Science' means primarily the natural sciences, rooted in observation and experiment. The philosopher is the one who goes behind<sup>2</sup> other subjects, bringing before the bar of reason, to test their truth and falsehood, the hypotheses which the others must accept as axiomatic. Up to Aristotle's time there had been no separation between philosophy and science, or between one science and another, largely because science hardly existed. Earlier thinkers were called *physiologoi*, students of nature, but *physis* was a very wide term, and none of them assembled a systematic collection of data on which to work. Aristotle, a zealous amasser of facts and organizer of a research team, effected for the first time a conscious and deliberate separation, though still confident that the whole field of knowledge fell naturally within the province of one man, or at least of one school. The different branches were separate because they had different principles or starting-points (*archai*), so that 'one cannot prove the theorems of one science by means of another, unless one is subordinate to the other, as optics to geometry or harmonics to arithmetic'. 'One cannot demonstrate by passing from one genus to another, e.g. prove geometrical truths by arithmetic.' Every branch of knowledge involving reason, he says, concerns causes and principles, but they all mark off a particular genus of being and concern themselves with that.<sup>3</sup>

<sup>1</sup> Merlan's article 'On the terms "Metaphysics" and "Being-qua-being"' in *Monist* 1968 may be recommended as a stimulus to thought on this subject.

<sup>2</sup> Hence the fashionable taste for names beginning with 'meta', on the analogy of 'metaphysics' (p. 64 n. 2 above), signifying the philosophical foundations of a subject: metamathematics, metaethics, meta-ontology, and so on. There is even (which is surely going too far) a journal called *Metaphilosophy* (including metametaphysics?).

<sup>3</sup> *An. Post.* 75 b 14, a 37; *Met.* 1025 b 4-9.

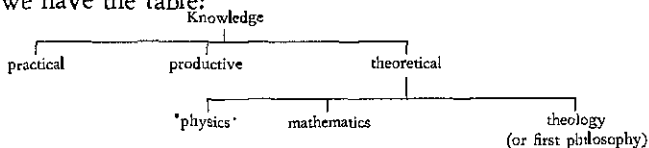
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The main divisions of knowledge according to Aristotle are as follows (from bk E of the *Met.*):

(a) All knowledge<sup>1</sup> is either practical or productive or theoretical<sup>2</sup> (1025b25).

(b) There are three theoretical philosophies, mathematics, natural philosophy, and theology (1026a18).

So we have the table:



He defines the objects of each of the theoretical sciences. *Physics* (to use the term in its wide Aristotelian sense) 'investigates things capable of movement, usually with regard to their formal being, but as not separable from matter' (1025b26–28; cf. K, 1061b6). The science of nature may sometimes seem to be admitted only on sufferance to the inner sanctum of the theoretical sciences. It is theoretical (disinterested), but concerned with what admits of change, whereas in the strict logic of *An. Post.* (71b9–12, 73a21) the object of knowledge in the full sense cannot be otherwise than it is. But elsewhere Aristotle is less exacting (pp. 172f. below): knowledge is of what is either always or for the most part, here jointly opposed to the random or accidental. (Mure put this well: 'The world of nature changes, but the laws of its changes do not,' *Arist.*, 129.) For him the essential is that it is independent of human action: its subject-matter, though not absolutely unchanging like that of first philosophy, has the cause of its motions within itself, whereas the objects of the practical and productive

<sup>1</sup> A. here uses the word δῖνασις, thought or reasoning. But ἐπιστήμη or φιλοσοφία would have conveyed the same meaning. This is the usual classification, though at *Top.* 105b19 he gives a hint of that into ethics, physics and logic which originated with Xenocrates (fr. 1 Heinze) and became customary in later schools. We must not in any case expect A. always to stick to the same divisions in different contexts. For instance at *Phys.* 198a29 he again posits three classes of systematized knowledge (πραγματεῖαι), one concerned with the Unmoved, a second with what moves but is indestructible, and the third with things perishable. Here the second study is astronomy, for the circling stars and planets were in A.'s view everlasting, and mathematics is omitted. There is no confusion.

<sup>2</sup> At *Top.* 104b5 A. illustrates the difference between a practical and a theoretical enquiry: to ask whether pleasure is a worthy object of desire is helpful as a guide to action, whereas a question like 'Is the cosmos eternal?' is pursued for the sake of knowledge alone.

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sciences depend for their actualization on an external cause, namely human action and skills. Hence natural philosophy is a theoretical science, though of the second rank.<sup>1</sup>

*The mathematician* studies solely the quantitative aspect of things in abstraction from the rest. 'He eliminates all sensible qualities like weight and lightness . . . heat and cold . . . leaving only quantity and continuity and their attributes as such, and does not study things in any other aspect' (1061a29-35). *Phys.* 1 ch. 2 compares physics and mathematics. Physical bodies themselves have surfaces, lines and so on, though these do not exist apart from material embodiment; but the mathematician does not study them as limits of physical bodies but in isolation, for they can be separated in thought and no one is deceived.<sup>2</sup> His favourite illustration of the difference is the snub and the concave. Snubness is a wholly physical concept, inseparable even in thought from matter (the flesh of the nose), but concavity can be considered as a purely mathematical concept, apart from its manifestation in noses, cups, etc. These widest divisions of science form a hierarchy, according to their distance from matter. Below first philosophy comes mathematics, which in turn is a science superior to those which take matter into account.

*Theology* is so called only here and in bk K ch. 7, where the tripartite division is repeated. Usually Aristotle talks of 'first philosophy', and in this same chapter of the *Metaphysics* (E1) he raises the question whether its field is universal or covers only a part of what exists. It is the science which tries to answer 'the eternal question, what is it that exists, that is to say, what is Being?'<sup>3</sup> (Z, 1028b2-4.) This subject, however, as he now explains, may have two branches.

<sup>1</sup> See *Met.* 1025b18-28, 1005b1-2. A. was spared the thought of test-tube babies, but it is surprising that a Greek, familiar with the cultivation of cereals, vines, olives and other fruits, should have thought of the study of nature as purely theoretical.

<sup>2</sup> I.e. no one is misled into thinking that they lead a separate existence (as the Platonists, he adds, deceived people about the Forms). A.'s view is reflected in Mill (*System of Logic* bk II, ch. 5.1): 'We are thinking, all the time, of precisely such objects as we have seen and touched, and with all the properties which naturally belong to them; but for scientific convenience, we feign them to be divested of all properties, except those in regard to which we design to consider them.' At *Met.* 1073b6-8 A. says that geometry and the science of number are not concerned with any substance. Julia Annas writes on A.'s conception of mathematics in *Met. M and N*, 29-31.

<sup>3</sup> οὐσία, the word also translated 'substance'.

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(1) First philosophy tries to discover what in the world around us may properly be called real. In *Met. Z* ch. 2 he repeats what he said in the *Categories* (pp. 140f. below), that in its most obvious sense the term substance is applicable to corporeal, physical objects like plants and animals and their parts, the four elements and their productions including the heavenly bodies. The philosopher therefore tries to explain the nature of all these so as to answer the question: in virtue of what may they be said to be what they are? If this question does not mean so much to us, it certainly meant much to Aristotle, who had to combat Plato's outright denial of Being to the world of Becoming.

(2) Nothing existing in the physical world is fully actual; everything contains an element of matter, that is, of unrealized potentiality.<sup>1</sup> Part of the task, therefore, of the philosophy which takes all Being for its province is to find out whether there exists any being which is pure actuality, unencumbered with matter which is potentiality.

1026a10-13, 27-32. If there is something eternal, unmoved and separate,<sup>2</sup> the knowledge of it is plainly theoretical, yet not physics or mathematics but prior to both... If no other substance exists but the physical, physics must be the primary science; but if there is an unmoved substance, it is prior and its science is first philosophy, and universal because it is first. Its province is the whole field of Being for its own sake, what it is and its attributes *qua* Being.

That there is a supra-natural, i.e. unmoved and divine Being, is of course Aristotle's belief (see e.g. *Met.* 1005a32-b2), so first philosophy does have this second function. In its first aspect, the search for reality in the physical world, it is the subject of *Met. Z*. In its capacity as *theologikē*, the discovery and description of some separately existing perfect being or beings, it is the subject of the self-contained treatise known as *Met. Λ*. As Aristotle reserves this topic till later (1027a19), so shall we. Here he ends with a terse, epigrammatic dictum,<sup>3</sup> that knowledge of the supreme Being is made universal by its primacy.

<sup>1</sup> Is it unfair to see a vestige of the rejected Platonism here, of γινόμενα not being fully ὄντα? A. would deny it strenuously – physical individuals are the πρῶται οὐσίαι – but early habits of thought might still be subconsciously at work, and affect the solution which he ultimately offers.

<sup>2</sup> In the repetition at K ch. 7 he adds ὅπερ παρασώμεθα δεικνύμενα.

<sup>3</sup> In Leszl's explanation of the status of theology (*Ontology*, 179) one misses any mention of the causal function of God, and what he says elsewhere about the causal aspect of the Unmoved

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Since God, the first Unmoved Mover, is the final cause of the whole universe and everything in it, to know him completely would be to understand the universe.<sup>1</sup>

Movers (pp. 191, 196) is not altogether reassuring. Merlan in *JHI* 1963, 290, summarizes the then state of the question whether the subject-matter of A.'s metaphysics is only non-material reality (i.e. metaphysics = theology) or includes the *οὐσία* of physical things. He refers to the opinions of Natorp, Ivánka and Cherniss.

<sup>1</sup> So at least I regard it. Evans (*Dialectic*, 42ff., 67) sees a more strictly philosophical argument, which he explains in terms of the relationship between a universal and the primary member of a series.

## IX

# LOGIC, THE TOOL OF PHILOSOPHY<sup>1</sup>

### Introduction

In the foregoing classification of the whole field of knowledge, there is no place for logic. Logic, called by Aristotle analytics, was not for him one of the sciences but the necessary preliminary to all science. 'The attempts', he says, 'of some who discourse on truth and the terms on which something may be accepted as true, show the effect of a lack of training in analytics.'<sup>2</sup> One must come to a subject forearmed with this, not pick it up as one goes along' (*Met.* 1005 b 2-5). Logic is thus for Aristotle neither a part of philosophy and science nor yet unrelated to them, and the name *organon* (tool, instrument) was appropriately given, even if not by Aristotle himself, to the collection of his logical treatises.<sup>3</sup> It is close to what is meant today by 'scientific method',

<sup>1</sup> Only a brief introduction sketch will be offered here, containing little about the relation of Aristotelian to modern logic and making little use of symbolism which he did not use himself. I hope it will be of some benefit to students even if of little or none to accomplished logicians. Łukasiewicz (*A.'s Syll.*, 47) suggests that 'philosophers' should 'cease to write about logic or its history before having acquired a solid knowledge of what is called "mathematical logic"'. It would otherwise be a waste of time for them as well as for their readers.<sup>2</sup> I hope a historian of A.'s thought in general may be excused this test. (On what A. would think of mathematical logicians see Allan, *Phil. of A.*, 129f.) As an authority on A.'s logic itself, Łukasiewicz should be approached with caution. What he offers, as his complete title suggests and Düring has rightly said (*Arist.*, 91), is 'the modern judgement of Aristotelian logic'. (See also the judicious remarks of Patzig, *A.'s Theory of the Syllogism*, xiv.) I shall try to show how logic served as the *organon* of the philosopher in his investigations into knowledge and being. Even in his logic A. aimed at more than answering questions of the form: 'What exactly is meant by such-and-such a sentence?' For a fuller introduction see W. and M. Kneale, *Development of Logic*, ch. 2, 'A.'s *Organon*', 23-100. Le Blond's *Logique et méthode chez A.* is an excellent work which links logic to the wider aspects of philosophy as A. would have wished. Cf. too on the genetic side Solmsen, *Entwicklung der arist. Logik*.

<sup>2</sup> *Met.* 1005 b 2. This passage tells somewhat against the opinion of M. Kneale (*D. of L.*, 7) that 'A.'s word "analytics" refers to his treatises rather than to their subject-matter'. It is true that he often refers to *The Analytics* in other works, and to make analytics co-extensive with logic perhaps goes too far. If, however, inference and demonstration (the subject of the *Analytics*) are preliminary and instrumental to philosophy proper, this must be true *a fortiori* of the study of terms and propositions which occupies the *Categories* and *De interpretatione*.

<sup>3</sup> Cf. Alex. in *Top.* 74.29: 'Logic occupies in philosophy the place of an *organon*.' (*Logikē* is here used for the first time in extant literature in the sense of 'logic'.) But A. himself uses *organon* similarly, e.g. *Top.* 163 b 9-11: the ability to hold simultaneously in the mind the

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where the word 'scientific' is used in its proper, all-embracing sense.<sup>1</sup> Whatever name we give it, it is an analysis of the actual processes of thought, expressed as they must be in language, carried out with the aim of exposing inaccuracies and helping us to reason more correctly. For Aristotle it meant a particular application of one of the two fundamental principles which we have looked at. It is an example of the abstraction of form, the process of examining a number of individual instances and then, reflecting on the results of the examination, mentally isolating from their individual matter the common properties which go to make up the *eidos* of the group.

Scientific method is concerned with two things, related but not identical: (i) the formal correctness (consistency) of an argument, and (ii) truth. Suppose it is argued: All metals melt under sufficient heat, lead is a metal, therefore lead will melt if sufficiently heated. The argument is valid and we are content, if scarcely excited. But suppose the argument is: All white men are honest, Bill Sikes is a white man, therefore Bill Sikes is honest. This argument is formally as valid<sup>2</sup> as the first, but does not content us. The conclusion is not true, because the major premise was not true.<sup>3</sup> The rules of logic guard us against arguing faultily, but they cannot guarantee that we select the right premises.

To study arguments in their formal aspects we must use symbols. Instead of mentioning the things or classes which are the *matter* of argument, we use a letter or other sign which, intrinsically meaningless, is assumed to be replaceable by any thing or class of things that we consequences of each of two hypotheses, besides its usefulness in dialectical debate, 'is no mean instrument (*organon*) for acquiring knowledge and philosophical wisdom'. Who first applied the term as a title to the treatises is not known. During thinks Andronicus himself a possibility (*Ant. u. Abendland* 1954, 123), but others (Ross, Mure) mention the sixth century.

<sup>1</sup> As Grene says (*Portrait of A.*, 69), 'We may, therefore, legitimately consider Aristotelian logic not as the first adumbration of a formal system but as a discipline enabling the student to acquire scientific knowledge.' Such a system, if, like A.'s, it is intended to be universally applicable, must surely be formal, but cf. the contrast which she draws with Leibniz on p. 71. Mure put it (*Arist.*, 211 n.2) that 'he never teaches a logic of mere validity'.

<sup>2</sup> Meaning that if it were expressed formally by variables instead of concrete terms it would be faultless. For Patzig validity includes truth. ('For if a syllogism is valid, whatever values are substituted for its variables the resulting implication must be true. (That is what validity means.)' *Syllogism*, 148.) By contrast Stebbing differentiates between truth of the conclusion or premises and validity of the reasoning (*Mod. Introd. to Logic*, 83), and Ross writes (*Analytics*, 29) 'validity depends on form'.

<sup>3</sup> A. admits that false premises may lead to a true conclusion, but it will be what he calls true as to the fact only, not the reason for it (*An. Pr.* 53b8-10). Knowledge on the other hand must be of the 'why' as well as the 'what' (90a15).

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choose. With these illustrative symbols ('variables'), the statement of the argument becomes a formula or framework into which individual arguments can be fitted and against which they can be checked. Only by their use can form be properly exhibited, a fact obvious to Aristotle, to whom form was paramount in logic as in everything else. Thus his statement of the first-figure syllogism, of which we have just seen an example, is (*An. Pr.* 25 b 37):

If A is predicated of all B and B is predicated of all C, A must be predicated of all C.

Here something has been begun which could be carried much further, and even at its beginning has affinities with algebraic notation. If in this embryonic form it can scarcely be called mathematical logic, it does contain the germ of what goes by that name today. Łukasiewicz wrote (*A.'s Syll.*, 7): 'The introduction of variables is one of Aristotle's greatest inventions. It is almost incredible that till now, as far as I know, no one philosopher or philologist has drawn attention to this most important fact. I venture to say that they must all have been bad mathematicians, for every mathematician knows that the introduction of variables into arithmetic began a new epoch in that science.'<sup>1</sup>

We may call Aristotle the founder of logic, then, first because he was the first to think of the expression of our thought as itself the subject of a special science; secondly, he was the first to study the forms of our thought in abstraction from its matter. This has in recent times been considered the proper goal of logic, if not of all philosophy. Between his time and ours the possibility and the importance of developing the study and enlarging its scope were not generally recognized, and it is chiefly in the last hundred years that Aristotle's work has been appreciably surpassed. Since popular thought is generally well in arrears of that of professional philosophers and scientists, this means that the mental operations of most of us are (for the most part unconsciously) cast in an Aristotelian mould.

<sup>1</sup> More on this in connexion with the syllogism, pp. 156ff. below. His use of symbols was not, however, confined to demonstrating syllogistic form, but occurs in physical arguments, e.g. at *Phys.* 249 b 31: 'If a mover A moves an object B a distance C in time D...', and so the exposition continues with E, F, G, and H. Similarly at 214 a 31ff., b 22ff., 232 a 22ff. A contrast to Łukasiewicz is A. C. Lloyd in *Mind* 1911, 123. He denies that A.'s symbols are true variables, and speaks of the 'tragedy' of Greek mathematics.



## Logic, the tool of philosophy

*Contents of the Organon.* The elements of thought as expressed in words (and one cannot make them an object of study otherwise) are, in order of complexity, terms (single words), propositions or questions (i.e. combinations of terms; Aristotle does not consider commands),<sup>1</sup> and inferences (which combine propositions). In the *Categories* Aristotle describes and classifies terms and phrases, while the *De interpretatione* is concerned with propositions and questions. Both are preliminary to the *Prior Analytics*, which deals with the laws of inference, seen as co-extensive with the syllogism. The *Posterior Analytics* passes to the second of the two divisions of scientific method, the application of formal logic to the discovery of truth. In its formal aspect, inference is called by Aristotle *syllogismos*, and it is sufficient that it should be consistent. When concerned with the facts of nature, with truth and falsehood, it becomes demonstration (*apodeixis*). The *Topics* is a handbook of dialectic, the technique of arguing successfully, though not necessarily truthfully, against all comers on any subject. It is naturally something of a mixture, containing items relative to all the rest. In any case we must not expect Aristotle to keep his subjects in wholly separate compartments.

### (1) THE CATEGORIES OF BEING: PRIMARY AND SECONDARY SUBSTANCE

I have said that the *Categories*<sup>2</sup> studies terms, from which it might be concluded that it is a purely linguistic, or at the most logical, exercise.

<sup>1</sup> A. does not ignore the existence of other forms of speech besides propositions, e.g. prayers, but considers them to belong to rhetoric and poetry rather than logic (*De int.* 17a3-7). For a criticism see Flew, *Western Phil.*, 322f.; but to A. logic is the instrument of science, which deals only with facts.

<sup>2</sup> Whether A. actually wrote the *Cat.* has been doubted, especially by Jaeger (see his *Aristotle*, 46 with n. 3), but it is generally agreed that its content at least is Aristotelian. Some base a case against it on the Jaegerian *a priori* view of his steady development away from Plato (pp. 14ff. above). See de Vogel, *Symp. Ar.* 1, 255. G. Colli in his ed. of the *Organon* makes a case for its being an early lecture, given its present form when A. was teaching in the Lyceum, which is mentioned as an illustration of the category of place. This met with Düring's approval (*Gnomon* 1956, 207), but Mure had justly pointed out that mention of this well-known haunt of Socrates is no evidence of lateness (*Arist.*, 268 n. 1, against Jaeger, *Aristotle*, 46 n. 3). See also von Fritz in *AGPh* 1931 and L. M. de Rijk, *Mnemos.* 1951. Its doctrine is not only sound Aristotelianism,

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This is not so. Of the *Categories* it cannot be said, as Łukasiewicz said with satisfaction of the *Prior Analytics*, that it is 'entirely free from any philosophic contamination'. In Aristotle's eyes one cannot use a word correctly unless one can relate it to the reality which one wishes to express by it. If, as so often happens, a word is used ambiguously, to express more than one thing, its various senses – that is, the realities to which it corresponds in different contexts – must be carefully distinguished. The *Categories* is devoted to clarifying our various ideas of what it is to *be*, and quickly involves us in a discussion of the nature of substance. This has been censured as a confusion of metaphysics with logic,<sup>1</sup> but language and logic are only tools for conveying to others what we think and believe; and what we wish to convey – among other things of course, but primarily if we are philosophers, whether realists,

but as Ross and others have said, is at the basis of most of A.'s other works. Its authenticity was never suspected in antiquity. Düring (*Arist.*, 54f.) speaks of its authenticity and stratification. Trans. and Comm. by J. L. Ackrill. Moravcsik's *Aristotle* contains essays on the *Catt.* by Cook Wilson and himself. Notice also L. M. de Rijk, *The Place of the Categories of Being in A.'s Philosophy* and Ross's short account on pp. lxxxii–xc of vol. 1 of his *Metaphysics*. What follows here probably does not do justice to Anton's interesting article 'Some Observations on A.'s Theory of Categories' in the periodical *Diotima* for 1975. Finally there is now available in English Brentano's *On the Several Senses of Being in A.* (German original 1862), of which ch. 5 is devoted to the *Catt.* C. M. Gillespie's article 'The Aristotelian Categories' (which concludes that the *Catt.* is a genuine early work) has been reprinted as ch. 1 of *Articles on A.* 3, 1979. See also A. Graeser, 'Probleme der Kategorienlehre des A.' in *Studia Philosophica* 1977 and W. Schuppe, *Die aristotelischen Kategorien*.

<sup>1</sup> E.g. Łukasiewicz accuses A. of 'inexactitude' in speaking of 'things' (using the words *ὄντα* and *οὐσθέντα*) being predicated of other things (*An. Pr.* 43a25ff.): 'The given classification is not a division of things but a division of terms.' (On this see Patzig, *Syllogism*, 5ff.) Cf. his apparently indifferent use of *ὄντα* (1a20) and *λεγόμενα* in the *Categories*. So too G. E. R. Lloyd, *Arist.*, 113: 'The categories are primarily intended as a classification of reality of the things signified by the terms, rather than of the signifying terms themselves.'

If this means that A. when using words had in mind their meaning rather than treating them as symbols with no more content than *x* or *y*, the so-called confusion was essential to his philosophy. His indifference to the distinction appears in his use of the expressions 'predicated of' and 'present in' a subject. What is predicated, according to Łukasiewicz (p. 6), is a term, but what is *in* something must be the attribute expressed by the term. (For the distinction see pp. 142–3 below, and on the general point cf. Kneale, *D. of L.*, 27.) Again we have *De int.* 17a38, where he says that some *things* (*πράγματα*) are universal and some not, 'and by universal I mean what is naturally predicated of many'. 'Names are the signs of concepts, and so mediately the signs of things.' (Owens, *Doctrine of Being*, 120.)

Leszl has a sensible note on p. 58 of his *Ontology*: 'In my actual treatment in the present work I will sometimes talk of our conceptual apparatus and sometimes of the way in which things actually are organized (e.g. by being divided into categories), but I should not be taken as regarding Aristotle as being committed either to a completely objectivist point of view or to one that gives a preponderant role to our conceptual apparatus. The fact is that Aristotle himself tends to talk naturally as an objectivist, but does not raise the issue in a sufficiently explicit way.'

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nominalists, phenomenologists or whatever – is our belief about what really exists (τὸ ὄν in Greek) or is true (also τὸ ὄν).

After a brief exposition of the difference between synonyms, homonyms and paronyms,<sup>1</sup> Aristotle starts from the distinction between 'things said in combination' and 'things said without combination', i.e. between single terms and propositions.<sup>2</sup> Terms, he claims, by themselves are neither true nor false, since to utter words like 'man', 'white', 'runs', 'wine' separately is not to make a statement at all. But a combination of terms may be true or false, and must be one or the other if it forms a proposition, affirming or denying. The rest of the short work is a study of terms, which, he suggests, fall into ten classes or *kategoriai*. *Kategoria* means 'predicate',<sup>3</sup> and shows what Aristotle had in mind in making the classification. The terms or phrases which he is considering stand for all that can be said about, or predicated of, those individual things or 'thises'<sup>4</sup> which he has always in mind as the inescapable realities that demand the philosopher's attention – *this* man, *this* horse. These categories he enumerates as ten: substance, quantity, quality, relation, place where, time when, position, state, acting and being acted on. He illustrates each with brief examples, not intended to replace a definition, but simply to assure the reader of his drift.<sup>5</sup> For substance; (a) man or (a) horse;<sup>6</sup> quality: white or literate; quantity:

<sup>1</sup> An Academic classification attributed also to Speusippus. See vol. v, 465f. συνώνυμα are not synonyms in our sense, words with the same meaning, but *things* with the same name and nature, as animals are the same whether instantiated in man or ox (A.'s example). On the whole subject see Owens, *Doctrine of Being*, 49ff., and for further discussions (Hambruth, Barnes) Tarán in *Hermes* 1978.

<sup>2</sup> For his present purpose A. so limits it, though not quite accurately. Obviously 'white man' is a combination of terms as much as 'Socrates is white', and 'things said without combination' may include more than one word. His word for combination (συμπλοκή, lit. 'interweaving') is that used by Plato in the *Sophist* to denote the union of noun and verb which constitutes a proposition (262c; Moravcsik in *Aristotle*, 126f.). A.'s debt to P.'s discussion in the present passage is obvious.

<sup>3</sup> A. also calls them τὰ κοινά, to indicate that they are the only completely universal predicates. See *Phys.* 200b34–36, *Met.* 1070b1–2.

<sup>4</sup> On the meaning of A.'s favourite phrase for an individual, τὸδε τι ('a certain this'), see Ross, *Metaph.* 1, 247. τὸδε has deictic force. One can point to a τὸδε τι and say 'There it is'. That sensible individuals cannot be predicated of anything else is expressly stated at *An. Pr.* 43a25.

<sup>5</sup> ὡς τῷ πρῶτῳ εἰπεῖν, 1b27. The immediate reference of verbs like κείσθαι and ἔχειν would not be so obvious as that of their English equivalents. In Greek all the examples except that of place consist of one word.

<sup>6</sup> It was probably convenient for A. at this moment that Greek has no indefinite article. The difference between primary and secondary substance, individual and universal, is to be explained a

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two- or three-cubits-long; relation: double, half, larger; place: in the Lyceum, in the agora; time: yesterday, last year; position: lying, sitting; state: is shod, is armed;<sup>1</sup> acting: cuts, burns; being acted on: is cut, is burned.

The chief interest of the list is that it shows Aristotle prepared, probably at an early date, simply to enumerate a number of ways in which the word 'is' can be used. Much has happened since the Sophists set their Parmenidean puzzles based on the assumption that the verb 'to be' was univocal: to want Clinias to 'be no longer' what he is (i.e. ignorant) was to wish for his death (Plato *Euthyd.* 283d). We are simply presented with a list – no agonizing over whether such equivocity is possible – and it has even been suggested that the whole doctrine was developed in the Academy and only taken over by Aristotle.<sup>2</sup> In any case the main distinction has been made between substance and the other nine, and further subdivision was a minor matter. In other works he takes the doctrine for granted as established, yet the detailed composition of the list of ten categories is unimportant and seems to have been experimental; for instance at *Phys.* 225b5 he names eight only.<sup>3</sup> This is not surprising, for not all of them seem to represent fundamental distinctions between modes of being. Moreover it is possible to classify them on quite a different basis from that of the categories, e.g. into potential and actual or accidental and essential, as he points out in *Met.* E ch. 2.

### *Primary and secondary substance*

*Catt.* 2a11–17. Substance in the properest, primary and most intensive sense of the word is what is neither predicated of a subject nor present in a subject, e.g. an individual man or horse. 'Secondary substance' is the name given to the species in which the things called primary substances are

little later. He can distinguish the individual when he likes: cf. 1b21 δ ἑνὸς ἀνθρώπου καθ' ὅποσον μένου λέγεται τοῦ τινὸς ἀνθρώπου.

<sup>1</sup> Anscombe cites 'awake' among predicates 'which certainly fall under none of the categories'. Is it not a τίς, falling under ἔχειν in the list?

<sup>2</sup> See Ross, *Arist.*, 22 with n. 6, Burnet, *Ethics*, p. 1.

<sup>3</sup> 'About the number of the categories he takes no pains to be consistent' (Ross, *loc.*). But in the last century Brentano (*Several Senses*, 50f.) followed Brandis and Zeller in maintaining that the number of categories (either ten or eight) was deliberately chosen by A. and offered as correct and complete. The list of ten in the *Catt.* is repeated exactly in the *Topics* (103b21–23).

## Logic, the tool of philosophy

included, and also the genera of those species. Thus the individual man is in the species man, and the genus of the species is animal. These then – man and animal – are called secondary substances.

2b3. Everything except primary substances is either predicated of primary substances as subjects or else present in them. Therefore without the primary substances there can be none of the rest. Of secondary substances the species is more of a substance<sup>1</sup> than the genus, for it is nearer the primary substance.

Aristotle's categories fall under two broad heads, the first – substance – standing apart from the rest, which may be grouped together as the various ways in which substances are qualified. In view of the supreme importance of the notions of a substance or substantial being (ὄν or οὐσία) in Aristotle's philosophy,<sup>2</sup> we must pay particular attention to his formal definition of it, though he has much more to say about it than is to be found in the *Organon*.<sup>3</sup> His use of 'predicated of' and 'present in' a subject may sound arbitrary, but has been clearly explained (1a20). What is predicated<sup>4</sup> of a subject is the species or genus to which it belongs, as 'man' is predicated of John Smith. Present in a subject are its attributes, e.g. paleness or courage are in John Smith.<sup>5</sup> The distinction is important, because species and genera are secondary substances, but instances of a quality like white are not (3b3–23). Species and genera are of course universals, but Aristotle

<sup>1</sup> We might wish to say 'more substantial', but the Greek is μᾶλλον οὐσία. The use of the comparative adverb with the noun, and indeed the whole idea of being more or less of a substance, sounds strange, and just hints at the great *aporia* which will later emerge, the *aporia* concerning the ontological status of universals. For the moment the meaning is plain enough.

<sup>2</sup> I still prefer 'substance' to 'reality' as the usual translation of οὐσία, in spite of the objections of Charlton (*Phys.* 1 and 11, 56), who says that it has 'none of the connotations of the English "substance" or Latin "substantia"'. But a colour or a smell is real (ὄν; see *Met.* 1061a8–10) though not strictly a substance, only an attribute of a substance. It should not be difficult to avoid any confusion between οὐσία and ὑποκειμένον. (Evans's remarks in *Dialectic*, 15, are more moderate.)

<sup>3</sup> See ch. XI below. For further explanations of the primary and subordinate meanings of οὐσία (the doctrine of πρὸς ἑν relationship or 'focal meaning' as Owen has christened it) see *Met.* 1 ch. 2 *ab initio*. ("Being" is used in various ways, but with reference to one and the same subject, not equivocally"), and also Z, 1030a34–b, K3 *ab initio*.

<sup>4</sup> Or said: κατηγορεῖσθαι and λέγεσθαι are used indifferently (*pace* Anton in *Diotima* 1975, 76).

<sup>5</sup> Many have written on the distinction, among the more recent von Fritz, 'Once more καθ' ὑποκειμένου and ἐν ὑποκειμένῳ', in *Phron.* 1958; Chung Hwan Chen, 'On A.'s Two Expressions καθ' ὑποκειμένου λέγεσθαι and ἐν ὑποκειμένῳ εἶναι', *Phron.* 1957; J. Duerlinger, 'Predication and Inherence in A.'s Categories', *Phron.* 1970 (with ref. to Ackrill and other earlier discussions). Anscombe gives her own explanation and examples in *Three Phils.*, 9. Add the discussion between Owen and R. E. Allen in *Phron.* 1965 and 1969.

## The Categories of Being

here treats the attribute as particular, the paleness in John Smith,<sup>1</sup> though whiteness as such is a universal, not predicated of Smith but inherent in its own individuals, the several patches of white colour. Some things therefore can be both predicated of something and in something, only not the same thing; e.g. knowledge is present in the soul but predicated of its species literacy.<sup>2</sup>

So substance is reduced by definition to what we knew it was for Aristotle, the individual.<sup>3</sup> Since it alone had independent existence, it alone deserved to be called substance or being (*ousia*) in the full and proper sense. Here his reaction against Plato appears at its strongest and is concisely summed up in the *Posterior Analytics* (77a 5-9, on the subject of demonstration). 'For demonstration to be possible it is not necessary that there should be [Platonic] Forms, i.e. a One apart from the many, but it must be true to say that there is one *throughout* the many.<sup>4</sup> Without this there will be no universal, and if the universal does not exist, there will be no middle term, and hence no demonstration.' Again, at *Met.* 1086 b 5, 'Without the universal, knowledge is impossible; the difficulty about the Forms arose from their separation [from particulars].' The Forms, in the sense of species and genera, true substances for Plato, are relegated to the status of predicates of real things, of which the species is nearer to substance than its genus, the narrower to the more general (*Catt.* 2 b 7, again a reversal of Platonism). They approach substances more nearly than do attributes, and Aristotle therefore grants them the title of secondary substances, deriving a sort of being from the primary.<sup>5</sup> This he does with obvious reluctance,

<sup>1</sup> τὸ τὴ λευκόν, 1 a 27. On this point see Allan, *Catt. and De int.*, 74f., Duerlinger *Phron.* 1970, 183ff., Annas in *Phron.* 1974 (commenting on an earlier article by Barington Jones).

<sup>2</sup> On 'predicated of' and 'present in' see Anscombe in *Three Phils.*, 7-9. R. E. Allen says (*Exegesis and Argument*, 367): 'If Socrates is just, there is, according to the *Categories*, an instance of justice in him.' This suggests to me that the idea of 'present in' may be a lingering vestige of Platonism. One can hardly help thinking of the 'largeness in us' of *Pho.* 105d.

<sup>3</sup> The description of sensible individuals as the subjects of all predication and never themselves predicates is not confined to the *Catt.* See *An. Pr.* 43 a 25-29 and *An. Post.* 71 a 23-24. In the *Met.* it is usually applied to οὐσία.

<sup>4</sup> κατά, the word usually translated in logical contexts 'predicated of', a development of its meaning in Plato's *Meno*, 73d. Musicianship exists only in the musicians who display it (p. 103 above).

<sup>5</sup> On the contention of Ross and others that substance cannot exist without qualities any more than qualities can exist without substance, see Anscombe, *Three Phils.*, 10f., E. Hartman, *Substance*, 15-17.

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because from the ontological or metaphysical point of view he is unwilling to admit that they are substances at all. Metaphysics investigates the nature of the real ('being *qua* being, and what pertains to it *qua* being', *Met.* 1005a13), and it is against Aristotle's principles to call anything real except independently existing individuals. Nevertheless in logic, the instrument of scientific knowledge, there was a compelling reason why he had to admit them among substances.

We have seen how reality was to become knowable, namely by the philosopher's examination of a set of particulars in order to extract their common form. It is a development of the Socratic method. When Socrates asks 'What is justice?' or 'What is virtue?', naming in fact a class of actions, and his companion starts by mentioning an instance of that class and saying 'It is that', Socrates makes it his business to lead him on from enumeration of instances to a grasp of the *eidos* common to them all, expression of which supplies the definition of the general term with which they started. When the philosopher has described by genus and differentiae the *infima species* to which an individual belongs – what Plato called its atomic Form – he can go no further towards defining that individual; that is, he can say no more about it as an object of scientific, demonstrable knowledge (*epistēmē*). The further differences between two members of the same *infima species* elude verbal definition. We necessarily perceive things one by one, but knowledge is of the universal (*An. Post.* 87b38). This Aristotle saw as a crux; it would appear at the same time that the realities demanding explanation are individuals and that there can be no knowledge of them (for so one cannot avoid translating *epistēmē*) because, as such, they have no definable essence. 'Of individual sensible substances there is neither definition nor demonstration' (*Met.* 1039b27–29); and as he says, 'all *epistēmē* is with *logos*' (reasoning accomplished through words) (*An. Post.* 100b10). This 'most intractable and urgent of all problems', as he called it, has been touched on in vol. v<sup>1</sup> in a comparison with

<sup>1</sup> v, 414f. See also *Met.* 999a24, quoted *ib.* 61, and *PA* 644a25: particulars are 'formally undifferentiated'. The problem figured in the lost *De ideis* (fr. 3 Ross): 'The sciences are concerned with something other than individuals, for individuals are infinitely many and indefinable, whereas the sciences deal with things defined' (Plato's lesson at *Phil.* 16d–e). Notice again A.'s carefree attitude to terminology. παρά τὰ καθ' ἑκάστα here, like παρά τὰ πολλά at *An. Post.* 10 means the same as κατὰ πολλῶν at *An. Post.* 77a5–6, where παρά is applied to the rejected

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Plato, and will recur in a fuller discussion of the concept of substance. Briefly the solution is that *epistēmē* is not our only means of acquaintance with the world of nature. Ultimately it comes from sensation and what he calls *nous* or *noesis*.<sup>1</sup> In vol. v I emphasized the universality of Aristotle's problem, and as a reminder will only add one more to our scientific witnesses. 'Science', wrote the physicist Jacques Monod, 'can neither say nor do anything about a unique occurrence. It can only consider events which form a class.'<sup>2</sup>

In spite of Aristotle's loyalty to the commonsense principle that only individuals have independent existence, this need not have worried him unduly. One understands an individual, as far as is humanly possible, by abstracting and studying the specific form which it shares with others of its kind. Each specimen is a compound of form and matter, and if the matter of each eludes definition, it is for reasons which make it at the same time entirely unimportant. 'The problem posed at the end of the *Theaetetus* about the unknowability of the particular may indeed remain, but may also be deemed trivial' (Iris Murdoch, *The Fire and the Sun*, 47). This is obviously true of pure or primary matter, which is by definition quite featureless, simply a substratum in which some *eidos* always inheres. When matter is called, as it often is, the principle of individuation,<sup>3</sup> this matter by which we (i.e. our senses) tell one Siamese cat from another cannot be pure matter, but it is matter informed at so low a level as to be stripped of all the qualities which members of the species have in common. What remains, Aristotle

Platonic Forms. No change of doctrine is implied. Though P. was wrong to make forms χωριστὰ ἐπὶ λόγῳ, they are still χωριστὰ λόγῳ (p. 219) below.

<sup>1</sup> For these and their relation to *epistēmē* see pp. 183f. below.

<sup>2</sup> *Chance and Necessity*, 136. This does not necessarily imply an Aristotelian theory of form. On the contrary, cf. Needham, *Hist. of Embryol.*, 59: 'As for the formal cause, Bacon expressly excluded it from physics, and it quietly disappeared as soon as men saw that scientific laws depended on the repeatableness of phenomena, and that anything unique or individual stood outside the scope of science.'

<sup>3</sup> For matter as principle of differentiation between individuals see *Met.* 1013a27 (ἐπεὶ οὐ μὲν διὰ τὴν ὕλην . . . ταῦτόν ἐστιν εἶναι), 1069b29, 1074a33. J. E. Boodin in *JHI* 1943, 184, translates οὐ ποιεῖ δὲ διαφορὰν ἡ ὕλη at 1058b6 'matter does not create a difference', and seems to argue from this that matter is not a source of differentiation. But it seems to mean rather 'matter does not constitute a (specific) differentia'. Cf. Ross's summary (*Metaph.* II, 103): 'Whiteness does not make a differentiation of man; for colour belongs to man on his material side, and matter does not make a differentia. Individual men are not species of man, though their flesh and bones are different.'



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might with some justification believe, is in each instance philosophically negligible, so that he has a right to say that he knows the specimen when he understands its character as a member of a defined *infima species*.

Justified or not, the important point for his logic is that he did believe this, namely that only species or higher universals can be the objects of discursive thought – thought-processes in so far as they can be put into words – and discursive thought is the subject of logic. Hence when he speaks as a logician his unit must be the species and not the individual; and he could not deny the name of substance altogether to that which was to be the unit in his logical system. He calls it therefore substance in a secondary sense. (See also ch. xi on Substances.)

Substance is included in the list of categories or predicables (1b26), but a little later (2a11–14) described as primarily what is not predicated of anything else. This should not cause difficulty. Substance as a category is not any particular example of a substance, but the universal, the class of all substances as such, or the term (namely *ousia*) denoting that class, as the language of 1b25–26 makes clear. It is only the individual substances themselves, substances in the primary sense, that are not predicable of anything. ‘Substance’ is a predicate; Socrates and my cat Whiskers are not.<sup>1</sup>

### (2) DEFINITION, PROPRIUM, GENUS AND ACCIDENT

Aristotle has also enumerated in a different way the relations in which a predicate may stand to its subject. This second scheme cuts across the categories<sup>2</sup> and is more important both as a permanent framework of his thought and for its influence on later philosophy. It shows him still progressing on lines laid down by Socrates and Plato, and he introduces it thus (*Top.* 101b17, trans. Pickard-Cambridge):

Every proposition<sup>3</sup> and every problem indicates either a genus or a

<sup>1</sup> Using the words of 1a21 (p. 140 n. 6 above) one may say *ἡ οὐσία καθ’ ὑποκειμένου λέγεται τῆς τινὸς οὐσίας*.

<sup>2</sup> For its relation to them see *Top.* 1.9, and S. Mansion’s paper in *Symp. Ar.* III on the categories in the *Topics*.

<sup>3</sup> *πρότασις*, defined at *An. Pr.* 24a16 as ‘a form of words which affirms or denies one thing of another’. I would tentatively suggest, though Ross thought otherwise (see his *Analytics*, 288, 290), that *πρωτελεῖν* still means ‘to stretch’, as a line between two points, boundaries or landmarks (*ἄποι*: hence A.’s use of the word in logic to mean what has come down to us through

## Definition, proprium, genus and accident

peculiarity or an accident—for the differentia too, applying as it does to a class (or genus), should be ranked together with the genus. Since, however, of what is peculiar to anything part signifies its essence, while part does not, let us adopt the terminology which is generally current about these things and speak of it as a 'property'. What we have said, then, makes it clear that according to our present division, the elements turn out to be four, all told, namely either property or definition or genus or accident.

Here then are four types of predicate or descriptive formula, one or more of which must be stated in any proposition about the subject: its definition (ὅρος), proprium (ἴδιον; I shall use this word in preference to Pickard-Cambridge's 'property'), genus (γένος) and accident (συμβεβηκός). He proceeds to explain them in turn (101 b 37ff.).

A definition states the essence of its subject, to use the customary translation of Aristotle's famous phrase τὸ τί ἦν εἶναι αὐτῷ, literally 'the what-it-is-to-be-that-thing'.<sup>1</sup>

A proprium is a single attribute which belongs necessarily to the subject, and to nothing else, but is not a part of its essence and therefore not included in the definition. Aristotle instances the faculty of learning to read as a proprium of the human race.

The genus is what can be predicated of several species in common, in spite of their specific differences, and counts as part of their being. It must be mentioned in the definition, but is not the whole of it. To say

Latin as a *term*, which the πρότασις connects with another term, *terminus* being simply the Latin for ὅρος). This would be consistent with the definition of προτείνεσθαι at *Top.* 164 b 4 as 'making several into one'. πρότασις itself acquired a more specialized meaning as the premise of a syllogism. In dialectic it could even be a question, i.e. one in the form of a proposition put interrogatively ('Is it true that . . .?') rather than an offer of alternatives ('Is it so or not?') (101 b 28–36). But A. is perhaps not quite consistent here. Cf. *An. Pr.* 24 b 1–2. Ross notes that A. is apparently the first to use the word πρότασις, and to give ὅρος the sense of 'term of a proposition.'

<sup>1</sup> Regarding the imperfect as equivalent to a continuous, or (perhaps better) timeless, present, somewhat like the 'gnomic' use of the aorist in verbs which have one. I cannot easily relate Kahn's 'being-what-it-is' either to the Greek or to the required meaning, as Grene does (*Portrait of A.*, 256f.). Alexander *ad loc.* suggests the reason why A. was not content with the simple language of Antisthenes: 'A definition is a formula signifying what a thing is' (τί ἦν ἢ ἐστίν, D.L. 6.3). This is insufficient because it does not distinguish a definition from a mere statement of the genus. To the question 'What is a man?', the answer 'An animal' is correct, but does not describe his essence—what it really means to be a man (Alex. *Top.* 42.13; see Antisthenes frs. 45 and 46 Caizzi). The definition of man must point to what is *exclusively* human. Cf. *An. Post.* 96a 24–b 14 on the constituents of definable essence. It must be added, however, that A. himself frequently uses τὸ τί ἐστίν as the equivalent of τὸ τί ἦν εἶναι, Owens has a long passage on τὸ τί ἦν εἶναι (*Doctrine of Being*, 93–5). His notes are a mine of information on the history of its interpretation, but I do not find his own account entirely satisfactory. In particular the dative to which the phrase is regularly linked receives terdy and inadequate attention.

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'Man is an animal' is to take a step towards defining him, but no more, since there are other animals besides man.

An accident is an attribute which may or may not belong to a subject, without affecting its essence, e.g. of a man, being seated (Aristotle's example) or having fair hair. Strictly speaking therefore it is an intruder in this list, in which only species are being considered as subjects. But one cannot well define a proprium without at the same time implying, by exclusion, the nature of an accident. Knowledge of the one implies knowledge of the other.

Elsewhere, however, we may be surprised to encounter what sounds like 'essential accidents',<sup>1</sup> which must obviously be distinguished from the accidents of the *Topics* text. They are more closely linked to the literal meaning of the word usually translated 'accident', namely what 'goes along with' something, for they are characteristics always and necessarily present in the subject though not a part of its definition. Thus 'plane figure bounded by three straight lines' is a complete definition of a triangle, but in every triangle the sum of its internal angles must equal two right angles, and this property therefore is an 'essential concomitant' of the triangle (*Met.* 1025a30). In this sense it is simply a different expression for what in the *Topics* is called a proprium.

For a quick illustration, take a circle. We may say of it:

1. A circle is a plane figure bounded by a line which is everywhere equidistant from the same point. This is its definition, telling what it is to be a circle.

2. A circle is a plane figure. This gives its genus, telling part but not all of what it means to be a circle. It does not yet isolate it completely from everything else.

3. A circle is such that an angle in the segment subtending the diameter is a right angle. This describes a proprium of the circle. If it is a circle this must be true of it, and it cannot be true of anything else. But it does not itself express the essence, nor answer the question, What was it for it to be a circle?

4. A circle may have a diameter of four inches. If it does, that is an

<sup>1</sup> συμβεβηκότα καθ' αὐτό, e.g. *Phys.* 193b27, 203b33 (and see also Bonitz, *Index*, 713b43ff.). Regularly of course καθ' αὐτό and κατά συμβεβηκός are mutually antithetic.

## Inference

accident. A difference of size would not have affected its being a circle, i.e. its essence.

These are the ways in which a predicate may be attached to its subject, whereby, in Aristotle's view, a proposition is formed. (This undue emphasis on the subject-predicate form of proposition has often been pointed out as a fault.) His *De interpretatione*, in Sir David Ross's words, 'traces with passionate interest the possible linguistic varieties of the proposition'. Those who share this passion may be referred to the short but difficult treatise itself.<sup>1</sup>

### (3) INFERENCE

As propositions exhibited the relations between terms, inference, or reasoning from premises, brings propositions themselves into logical relationships with each other. Aristotle's word for it is *sylogismos*, which with its cognate verb occurs a number of times in Plato in a general sense, sometimes to be translated 'reckoning up', 'working out' or 'understanding'.<sup>2</sup> For Aristotle it meant the drawing of conclusions from premises, deductive reasoning or, in Aristotle's eyes, reasoning in general. (Induction itself is treated formally as a species of syllogism. See pp. 187ff. below.) It includes syllogism *per se*, purely as a formal argument expressible with symbols, and two main sub-classes which bring it into relation with experience: *apodeixis* (demonstration) or the apodeictic syllogism (*An. Pr.* 68 b 10, *An. Post.* 74 b 10-11), which enlists reason in the cause of science,<sup>3</sup> and dialectic, the chief use of which is to vanquish an opponent in debate.

<sup>1</sup> Aided by Ackrill's translation (1963), with notes and a brief bibliography. In particular, Ackrill has a full discussion of the rebuttal of determinism in ch. 9 (pp. 132-42), which has aroused so much interest in recent years, and refers to articles on the subject in his bibliography, p. 157. Further ref. to this argument (known from A.'s illustration as the 'sea-battle' argument), including Anscombe, will be found in Düring, *Arist.*, 68 n. 105, Dorothea Frede, *A. und die 'Seeschlacht'* (1970) and V. R. McKim, 'Fatalism and the Future: A's Way Out', *R. of Metaph.* 1971-2, nn. 5-7 (pp. 82f.). See too Flew's discussion of the problem, *Western Phil.*, 244ff., and Anne Dickason, 'A., the Sea Fight and the Cloud' in *JHP* 1976. Taylor's article from *PR* 1957 has been reprinted in Anton and Kustas, *Essays*, 522-45 (bibliography on p. 542, n. 2.) A.'s error is briefly pointed out by Patzig, *Syllogism*, 24f. Add now L. D. Harris, 'Solving the "Naval Battle"', *FAS* n.s. 78 (1978) 45-6.

<sup>2</sup> E.g. *Tim.* 87c, *Pol.* 280a9, *Rep.* 531d. *Gorg.* 498e10 on the other hand (συλλογίσαι... ἐκ τῶν ὁμολογουμένων) describes the procedure as understood by Aristotle.

<sup>3</sup> See pp. 170ff. below.

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### (a) *Dialectic*<sup>1</sup>

Dialectic is the subject of the treatise called *Topics*,<sup>2</sup> from *topoi* (lit. 'places'), described in the *Rhetoric* (1358a12) as 'arguments applicable in common to questions of ethics, the natural sciences, politics and many heterogeneous subjects'.<sup>3</sup> It employs both syllogistic and inductive reasoning,<sup>4</sup> but is most commonly referred to as one of two contrasted applications of the syllogism, the other being apodeictic (scientific or philosophical reasoning). It might therefore seem more appropriate to speak of both of these after the syllogism itself. On the other hand the way through syllogism, *apodeixis* and induction leads straight to the heart of the problem of knowledge and its foundations, and to interrupt this magisterial progress in order to accommodate something which in the eyes of the author himself was not relevant to

<sup>1</sup> As Owen says in the preface to *Symp. Ar.* III, 'The place and the value of A.'s dialectic in philosophy have seized the attention of scholars increasingly in recent years.' Perhaps too much so, considering its comparatively lowly station in his own eyes. Some may agree with Brunschwig in the Budé *Topics* (p. vii) that A.'s fame as philosopher and logician will certainly not depend on a book which (so he said) is no longer much read and which one feels little remorse for not reading. In the very next year (1968) were published the proceedings of the third *Symposium Aristotelicum*, containing sixteen papers entirely devoted to his dialectic. See also J. D. G. Evans's favourable account, *A.'s Concept of Dialectic* (1977) and pr. 1 ch. 1 of Le Blond's *Logique et méthode chez A.* For a full analysis of the detailed precepts of the middle books as well as the more general advice of bks 1 and 8, one still cannot improve on the 165-page ninth chapter of Grote's *Aristotle*. E. Weil's essay, 'The Place of Logic in A.'s Thought' (Eng. tr. in *Articles on A.* 1), is in fact mainly concerned with the *Topics* and dialectic.

As to questions of development and relative chronology, I agree with Solmsen (*Symp. Ar.* III, 52f.) that 'it seems preferable to study the status of Aristotle's dialectic without becoming involved in these controversial subjects'. *An. Pr.* refers to *Top.* at 24 b 12 and 46 a 28, and *Top.* contains reff. to *An. Pr.* (162 a 11, b 32; also *SE* 165 b 9).

<sup>2</sup> Including the *Sophistici Elenchi*, a kind of appendix to the *Topics* sometimes referred to as *Top.* bk 9. Its end is noteworthy as (a) an example of something written out in full for oral delivery; and (b) containing, in Grote's words, 'a brief but memorable recapitulation of the *Analytica* and *Topica* considered as one scheme'.

<sup>3</sup> The notion of a *topos* is analysed by W. A. de Pater in *Les Topiques d'A.*, ch. 2. More briefly, see S. Raphael in *Phron.* 1974, 153f. For Leszl, *topoi* are 'logical rules' (*Ontology*, 38-9); his section on dialectic offers a clear account).

<sup>4</sup> From the opening chapter one would assume that the method of dialectic was entirely syllogistic (δ διαλεκτικός συλλογισμός, 100 a 22; see also 161 a 36, 162 a 16), but cf. 105 a 10-12, 157 a 18-20. To understand the four types of predicate is, as Raphael rightly says (*Phron.* 1974, 156), a necessary preparation for syllogistic reasoning, and they are therefore explained early in the treatise (bk 1, chli. 4-5; see pp. 146-9 above). The reader should be warned that many believe (strangely to my mind) the dialectic of the *Topics* to be wholly 'a presyllogistic exercise' (Raphael, *loc.*, 166). The generally accepted thesis of its priority to *An. Pr.* goes back to Brandis in 1833. See Kapp, *Syllogistic*, 36.

### *Inference: dialectic*

philosophy at all,<sup>1</sup> could only be an irritation. But the choice of order is in the reader's hands.

The name 'dialectic' is familiar from Plato, but the concept has changed almost out of recognition. From the *Republic* (book 7) we know it as the coping-stone of all the sciences, the final, highest study of the true philosopher, who bases his arguments not on opinion but on the truth (534 b), leading him to a comprehension of the essence or reality of everything and finally to a grasp of the Form of Good, supreme cause both of the other Forms and through them of the world of human experience. In Aristotle it reverts to a much humbler station, closer to its original meaning ('skill in talking') and to that given to it by the Sophists. It retains the method of question and answer (*Crat.* 390c, *Rep.* 534d), but for Aristotle this simply emphasizes its unphilosophical character; by that method, he says, one can never demonstrate the real nature of anything (*SE* 172a 15). Its primary aim is not truth at all, but victory in a battle of wits, and its arguments are always *ad hominem*.<sup>2</sup> In contrast to the philosophic dialectician of the *Republic*, Aristotle's dialectician is not concerned with the truth of his premises, but only with their conformity to a currently held opinion, whether lay or expert.<sup>3</sup> Since Protagoras, 'verbal contests' or debating duels had been a speciality of the Sophists, and from Aristotle we can see that they were set pieces conducted in his own school according to elaborate rules. Even the duration was fixed, the questions must be so framed as to invite answers of 'yes' and 'no' only, and so on.<sup>4</sup> The respondent undertook to defend a thesis, which might be the paradoxical tenet of a single philosopher (like the impossibility of contradiction maintained by Antisthenes) or a commonly held belief;<sup>5</sup> and it was the questioner's task to trip him into making an obviously untrue or

<sup>1</sup> See e.g. *Top.* 105 b 30, 155 b 7. Moraux claims (*Symp. Ar.* 111, 110) that the distinction between dialectic and philosophy is a new feature of bk 8, not made in the central books, but one has only to read them to see that their whole purpose is alien to philosophy as A. understood it.

<sup>2</sup> πρὸς ἕτερον, which sometimes necessitates concealing one's hand (*155b 26-28*).

<sup>3</sup> See the opening words, 100a 18-20. But it is often repeated. Cf. 100b 21, 105b 30, *SE* 165b 3, *Met.* 995b 23, *An. Pr.* 46a 8-10, *An. Post.* 81b 18. (I have touched on this subject in vol. 11, 82.)

<sup>4</sup> 161a 10 ('Some people raise objections which it would take longer to answer than the time allowed for the discussion in progress'); 158a 14-17.

<sup>5</sup> *Top.* 1 chh. 11 and 12, especially 104a 8ff. b 19ff; also 105b 19ff. Cf. Moraux, *Symp. Ar.* 111, 278f.

## *Logic, the tool of philosophy*

absurd statement. The respondent may not even have chosen his own thesis, and it is open to him, if cornered, to dissociate himself from it, claiming that an impossible or absurd conclusion is not his fault but the subject's! He may for instance undertake to maintain *ex persona Heracliti* that good and evil are the same. Moreover the two champions may exchange roles.<sup>1</sup>

The object of dialectic, then, as the first sentence of the *Topics* puts it, is 'to discover a procedure whereby we shall be able to reason, about any problem set before us, from received opinions, and in our turn stand up to the arguments of others without self-contradiction'. Aristotle distinguishes it not only from philosophy itself, based on demonstration from premises known to be true, but from forms of argument which he still regards with disfavour, such as sophistic and eristic. From rhetoric it differs only outwardly, in being conducted by man-to-man discussion instead of public speaking. Rhetoric is in fact its 'counterpart', 'semblance' or even a branch of it. Only by these two techniques can one draw opposite conclusions indifferently. Neither is a science of any definite subject, both represent simply a certain facility in producing arguments. Aristotle admits frankly that the dialectician, prepared as he is to argue on any subject, does not speak from knowledge like a man discussing his own speciality, but relies on general principles common to every science, art or faculty.<sup>2</sup>

Aristotle righteously distinguishes his dialectic from the disreputable arts of sophistic, eristic and agonistic, all closely related to each other. Eristic and agonistic were the arts of the Sophist according to Plato (*Soph.* 231e), and eristic and sophistic syllogisms are equated by Aristotle at *Top.* 162a16-17 and *SE* 171b8. The men are distinguished solely by their motives: sophists are out for fame and money, eristics solely for victory, by fair means or foul (*SE* 171b23-29). Sophistic, Aristotle claims, only *appears* to do what dialectic *does*, that is, genuinely test the views of those who claim to know but do not,<sup>3</sup>

<sup>1</sup> *Top.* 159a20-22, b30-35.

<sup>2</sup> *SE* 170a36. See also for this paragraph *Rhet.* 1354a1, 1356a30, 1355a34, 1359b12.

<sup>3</sup> *Met.* 1004b26, *SE* 171b3-7. The spirit of Socrates still lives! A. has learned much from Plato's *Sophist*, e.g. the question of seeming without being (the sophists' 'hiding place') no longer troubles him. Nevertheless in the *Metaphysics* dialectic is united with sophistic as not concerned with the attributes of *ὄντα* *qua* *ὄντα* nor with Being itself *qua* Being.

### *Inference: dialectic*

and its premises are only bogus, not genuinely believed, opinions (165b7). The sophistic or eristic syllogism is only an apparent syllogism (or at least irrelevant, *SE* 169b20–23), and the same applies to the agonistic.<sup>1</sup> The dialectician of course takes part in *agōnes*, but the typical agonistic betrays himself by a tendency to lose his temper (*SE* 169a23) and to judge by the arguments attributed to him at 165b12ff., a rather petty mind.

In spite of Aristotle's righteous indignation at the unfair tactics of others (*SE* 171b21–25), his own instruction-manual makes it difficult to credit his protestations about the superiority of dialectic to its wicked 'neighbour' (183b2) sophistic as of a genuine to a counterfeit art. The dialectician is trained to talk on any subject without real knowledge, which in Plato (*Soph.* 232b–33a) is the mark of the Sophist. Like the Sophist he regularly engages in contests with an opponent.<sup>2</sup> The *Topics* teaches him to argue, like Protagoras, on both sides of the same question. He must not only study sophistic refutations but be able to produce them, and in dialectic it is sometimes necessary to use sophistic ploys (172b5–8, 111b32ff.). For us this makes it tantalisingly difficult to know whether a philosophical statement introduced as premise of a dialectical argument represents Aristotle's own view or not.<sup>3</sup> What sound like serious contributions to philosophy are introduced as moves in the dialectical game. All alike are *topoi*, to be used constructively or destructively as the occasion requires. The method has its value for philosophy, as we shall see, but that is an incidental bonus. Here are a few random examples of dialectical technique.

(111b12–16.) If you are at a loss for a handle against your opponent's thesis, look among the definitions of the subject in hand, *whether real or apparent*, and if one is not enough, use several. It will be easier to attack someone committed to a definition, for definitions are easier targets.

(156b18–20) One should occasionally bring an objection against oneself, for the appearance of arguing impartially allays the answerer's suspicions.

<sup>1</sup> Since *eris* = strife and *agōn* = contest, there can hardly be much difference between them.

<sup>2</sup> With *πρὸς ἑτέρον* (p. 151 n. 2 above) cf. *SE* 170a12–23 *πρὸς τινα*.

<sup>3</sup> Cf. de Vogel's essay in *Symp. Ar.* 111 on A.'s attitude to Plato as revealed by the *Topics*, and its criticism by Owen in the same volume.



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(157a1-5.) [It is useful] also to spin out the argument and put in things of no use to it, like people who draw misleading diagrams; for amid so much it is not easy to pinpoint the fallacy.

What is the value of this dubious-sounding technique, to which Aristotle devotes the equivalent of 250 printed pages? It is useful, he thought, in three fields (101a25-b4).

(1) First comes training (*gymnasia*). Its use here, he says, is obvious, since to be in possession of a method must fit us better to argue about any subject proposed, and dialectic teaches method. The *Topics* shows that a course of dialectical disputations formed part of the curriculum of his own school, and in detail how they were conducted and the recipes for success.<sup>1</sup> As training or testing exercises they are expressly distinguished from instruction, which must always seek to impart truth (159a26-30, 161a24-29). It brings to life the bare sentence of Diogenes Laertius (3.5) that Aristotle trained his pupils to contend on a set theme (*thesis*) and practised them in rhetoric. (Unlike Plato he did not despise this sister-art to dialectic, but carried on his popular classes (pp. 41, 44 above) as well as writing a practical manual on the subject.) In this first aim he had a Platonic model, for the second part of the *Parmenides* is by its own confession an exercise in Aristotelian-type dialectic carried out for purposes of training.<sup>2</sup>

(2) Secondly it is useful for casual conversational encounters. With its aid we can meet people on their own ground, argue from their premises, and if these are faulty show them up. Here speaks the man who, as we have seen (pp. 91f.), was convinced that every sincere belief contains a kernel of truth. Equipped with a dialectical training, he trusted himself to discover it and to reject the errors.

(3) Lastly, though of its nature incapable of contributing positively to the store of philosophical knowledge, dialectic is a useful adjunct to philosophy and science because to see the difficulties on both sides of a subject makes it easier to sift the true from the false. We have observed

<sup>1</sup> On dialectical 'jousts', their conduct, rules and conventions, see especially Moraux's essay in *Symp. Ar.* 111.

<sup>2</sup> See *Parm.* 135c-136a. For reasons given in vol. v, 36, I think Plato expressly prevents us from identifying the young respondent with our Aristotle, but in choosing one of that name he may have intended us to associate them in our minds, and the possibility is exciting.

## *Inference: dialectic*

the application of this to philosophical questions in *Metaphysics B*.<sup>1</sup> It even has a bearing on the discovery of the first principles of particular sciences, which cannot be reached by demonstration, since every demonstration has to presuppose them.<sup>2</sup> Here dialectic is especially relevant, 'for', he claims, 'since its function is critical, it opens the way to the first principles (*archai*) of every science'.

Not all dialectic is competitive. Aristotle also mentions dialectical discussions held 'not in rivalry but for testing and investigation', and claims to be the first to lay down rules for them (159a32-37). In two of its aspects it is *peirastic* and *exetastic*,<sup>3</sup> meaning respectively testing or probing and examining critically. As *peirastic* it tests, Socratically, men rather than theories:

172a30ff. Even the unskilled use dialectic or *peirastic* in some way, for everyone tries to test the pretentious to some extent... Everyone in fact engages in refutation, undertaking as amateurs what the dialectician does professionally, for a dialectician is a man who tests by syllogistic technique.

There can be such an art, he continues, different from the arts of demonstration, and capable of applying tests in any subjects on general principles.

To conclude, dialectic is obviously an aid to mental agility and clear thinking in general (detecting ambiguities, being alive to resemblances and differences, seeing through specious arguments and so on), such as cannot but assist the philosopher; but at the same time the bulk of Aristotle's instructions and advice show it as a fiercely competitive pursuit, conducted according to set rules between two people, interrogator and respondent. Only if no opponent is available are we reduced to arguing with ourselves (163b3). Philosophy is the pursuit of knowledge; dialectic at its best is criticism of pretended knowledge.<sup>4</sup>

<sup>1</sup> P. 90 above. Note the importance of διαπορῆσαι in both treatises (101a35, 995a28), and cf. *Top.* 163b9-12, where τὸ εἶναι συνόρεον καὶ συνεωρημένον recalls Plato's ὁ γὰρ συνοπτικός διαλεκτικός. The relations between the two dialectics have their subtleties, and in spite of many discussions (e.g. in *Symp. Ar.* iii), are probably not yet fully worked out.

<sup>2</sup> Pp. 173f. below may throw light on this.

<sup>3</sup> *Exetastic*, 101b3. *Peirastic* is a part or kind of dialectic (μέρος, διαλεκτική τις, *SE* 169b25, 171b4), though classified separately at 165a38-39.

<sup>4</sup> ἴστί δ' ἡ διαλεκτικὴ περαστική περὶ ὧν ἡ φιλοσοφία γνωριστική, *Met.* 1004b25. As examples of dialectical method in A. himself, G. Frappier in *Laval Th. et Ph.* 1977 refers to the

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### (b) *The Syllogism*<sup>1</sup>

We must remember that Aristotle undertook the study of syllogism as a stage on the way to the study of scientific method.

Sir David Ross

The giants of nineteenth-century exegesis of the syllogism, such as Prantl and Maier, have come under heavy fire from recent expositors like Łukasiewicz and Patzig, in particular for the link which they saw between Aristotle's logic and his metaphysics. Thus Patzig writes on p. 83 of his book that 'the theory that Aristotle's syllogistic depends and is founded on the principles of his so-called conceptual metaphysics . . . has blocked, and does still block, the path to a true understanding of the nature of logic'.<sup>2</sup> Our present aim is to understand the mind of Aristotle in all its many facets, rather than to re-write a familiar chapter in the history of logic. In that history it is impossible to exaggerate the influence, up to a mere century ago, of Aristotle's syllogistic system of reasoning. Since the rapid widening of the field by the development of mathematical logic and the logic of propositions, logicians do not entirely agree in their estimates. Most still praise him for his introduction of variables, as entitling him to be called the inventor of formal logic, while at the same time criticizing him severely for the narrowness and incompleteness of his system (for we can no longer say with Kant that since Aristotle logic 'has not been able to advance a single step, and is thus to all appearance a closed and completed body of

examinations of previous theories prefixed to many of the treatises, and as a particular illustration looks at some arguments in *De an.* bk 1.

<sup>1</sup> A reference to G. Patzig, *A.'s Theory of the Syllogism*, Eng. trans by J. Barnes 1968 (revised by the author; there is also a third German edition of 1969), renders the mention of earlier works superfluous, for besides being the best available work on the subject, it has an extensive bibliography. (Ref. to 'Patzig' hereafter are to the English version of this work.) Essential are also Łukasiewicz, *A.'s Syll.* (2nd ed. 1957, hereafter 'Łukasiewicz') and the introduction to Ross's edition of the *Analytics*. (See his preface for a few outstanding older works.) E. Kapp's article on 'Syllogistic' in the *RE* has appeared in English trans. in *Articles on A.* 1. For a discussion mainly devoted to Patzig's work see Offenberger, *Zur modernen Deutung der ar. Syllogistik* in *AGPh* 1971; and for a stimulating review of Łukasiewicz, Austin in *Mind* 1952. The beginner will find the rules of the syllogism simply set out by Stebbing, *Mod. Introd. to Logic*, 86ff.

<sup>2</sup> For examples see Patzig *o.c.* 87 n. 36, and cf. pp. 79 and 194 (but also the admission on p. xvi). The criticisms can be severe. What Maier wrote shows, in the eyes of Łukasiewicz, 'ignorance of logic' (*A.'s Syll.*, 50), is 'logically nonsense' or a 'logical absurdity' (p. 37), 'manifestly false' (p. 12). Prantl too shows 'entire ignorance of logic' (p. 35). 'From the standpoint of logic', the work of both these once respected commentators 'is useless' (pp. 36, 47).

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doctrine');<sup>1</sup> and their general verdict depends on how much weight they attach to one or the other of these aspects. Łukasiewicz found it 'almost incredible' that to his knowledge neither philosophers nor philologists had drawn attention to the introduction of variables as one of Aristotle's greatest inventions, and concluded that they must all have been bad mathematicians.<sup>2</sup> For Ross, Aristotle's theory of the syllogism 'will always be regarded as the indispensable foundation of formal logic'; by using variables he 'makes it plain that validity depends on form, and thus becomes the originator of formal logic'. A. C. Lloyd was unusual in denying Aristotle the merit of having led the way to formal logic, on the ground that his syllogistic is not only narrow but *incapable* of extension, and his variables are not true variables but only abbreviations.<sup>3</sup>

Syllogism as such (as distinct from its applications in dialectic and demonstration) is exhaustively treated in the *Prior Analytics*, which defines it at the outset thus (24b 18):

A syllogism is a formula<sup>4</sup> in which, certain things having been laid down, something different from them comes about of necessity through their being what they are.

This is a remarkably wide definition, indeed a definition of inference<sup>5</sup> in general, and it is true that in his logical works Aristotle did try to reduce all inference to syllogistic form. In particular he is censured for three faults of omission:

1. He takes account only of the subject-predicate relation between terms, a practice facilitated by Plato's and his own conception of a proposition as essentially composed of noun and verb.<sup>6</sup> Modern logic

<sup>1</sup> *Critique of Pure Reason*, trans. Kemp Smith.

<sup>2</sup> *A.'s Syll.*, 7f. The generalization is much too sweeping. See Austin, *Mind* 1952, 396f.

<sup>3</sup> Ross, *Analytics*, 29, 39; Lloyd in *Mind* 1951, 123. In the same passage Lloyd speaks of the 'tragedy' of Greek mathematics.

<sup>4</sup> *Logos*. 'Argument' (Allan), 'discourse' (Stebbing and Kapp's translator), 'Rede' or 'Gespräch' (Kapp). Perhaps 'form of speech'.

<sup>5</sup> I speak of inference rather than proof, as fitting better with the 'something different' to which A. claims that the syllogism leads. But Patzig, a meticulous writer, often uses the word 'proof'; and Duerlinger has maintained that a syllogism is an argument introduced in support of something, a proof for a proposition already stated, rather than an inference, that is, the drawing of a conclusion from premises. (For Duerlinger's work on the syllogism see Bibliography.)

<sup>6</sup> Plato *Soph.* 262 d (Cornford, *PTK*, 307f.); Arist. *Rhet.* 1404 b 25. For a comment on A.'s neglect of relational arguments see Allan, *Phil. of A.*, 141f.

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recognizes such relationships as 'greater than', 'equal to', 'to the right of' as different in kind from that of subject to predicate. To be fair to Aristotle, however, the belief that every correctly-formed proposition must attribute a predicate to a subject prevailed until the publication of Russell and Whitehead's *Principia Mathematica* in the present century. Ross found at least partial justification for Aristotle in the fact that many propositions use the subject-predicate relationship as well as the special relation on which they are based. 'If we say *A* is equal to *B*, we say that *A* is related to *B* by the relation of equality, but we also say that *A* is related to *equality to B* by the subject-predicate relation.'<sup>1</sup> He adds that while the varieties of the syllogism can be explored completely, and rules for them laid down, any attempt to work out exhaustively the logic of relational forms of judgement must fail.

2. He implies that all inference is deductive. Undoubtedly Aristotle recognized inductive as well as deductive inference. He both employs induction and treats it explicitly for its own sake and under a name of its own (*epagōgē*). Yet in his formal logic (*An. Pr.* 2 ch. 23) he does try to show that induction itself can be reduced to, or expressed in, syllogistic form. We shall return to induction later (pp. 186ff. below).

3. He did not develop the logic of propositions. Modern logicians, from Frege through Russell and Whitehead, have adopted a system of logic in which the units, for which variables are made to stand, are whole propositions instead of terms. Aristotle worked with an *A*, *B* and *C* which stood for single terms like 'man' or 'horse'. Propositional logic has its own variables, such as *p* and *q*, each standing for a whole proposition, which may be of the subject-predicate kind that figures in the syllogism ('whales are mammals') or quite a different kind like 'it will rain tomorrow'. It can thus formulate a new set of rules of inference, of which one of the most basic is 'If *p* then *q*; but *p*; therefore *q*' — *p* and *q* standing for propositions. Łukasiewicz wrote: 'No one can fully understand Aristotle's proofs who does not know that there exists besides the Aristotelian system another system of logic more fundamental than the theory of the syllogism. It is the logic of propositions.' Again, after mentioning the 'everlasting merit' of Aristotle's

<sup>1</sup> A. presumably had something like this in mind when he included πρὸς τὶ among the categories (1b29-2a1).

### *Inference: the syllogism*

syllogistic, he adds in the same paragraph, 'The logic of the Stoics, the inventors of the ancient form of the propositional calculus, was much more important than all the syllogisms of Aristotle.' The best that can be said for Aristotle, it seems, is that he made use of the laws of propositional logic intuitively, without realizing what he was doing, and therefore without developing it into a system.<sup>1</sup>

For the history of Greek logic it is interesting that the propositional formula set out above was first used by the Stoics, who have been called the inventors of propositional logic.<sup>2</sup> Almost to the end of the nineteenth century, the claim of the Aristotelian syllogism, in its medieval modifications, to be the sole foundation of logic remained unchallenged, and the Stoic innovations were dismissed by authorities of the stature of Prantl, Maier and Zeller as trivial and uninteresting. Now their system has come into its own as a masterpiece equal to, if not surpassing, the logic of Aristotle.

The *syllogismos* of Aristotle, then, is what is now<sup>3</sup> called the categorical syllogism (*kategoria*=predicate) and defined thus (Stebbing, p. 81):

A categorical syllogism is a form of reasoning consisting of three and only three terms, which are so related that the first two propositions jointly imply the third.

People are constantly using syllogisms in everyday conversation without realizing it, usually in the abbreviated form known as enthymeme. Two examples from Stebbing (p. 83):

'You can't expect Baldwin to keep all his promises, for after all he is in the difficult position of Prime Minister.' (Maj. prem. omitted: 'No Prime Minister can be expected to keep all his promises.')

'No spoilt children are attractive, for no selfish child is.' (Min. prem. omitted.)

<sup>1</sup> Łukasiewicz, 47-51, 131. Patzig is more favourably inclined. See his pp. 134, 180, and n. 7 on p. 184. For more about this see pp. 168f. below.

<sup>2</sup> A reader wanting full information on the Stoic logic of propositions must be referred to Mates's *Stoic Logic*, but a brief, clear statement will be found in Sandbach, *The Stoics*, 97-9. For the contribution of the Megarians see Sandbach p. 99 and Patzig's talk of 'Megaro-stoic discoveries' and reference to Bochenski on p. 137.

<sup>3</sup> The phrase κατηγορηκὸς συλλογισμὸς occurs in A., but means one with a positive conclusion (*An. Post.* 79a26).

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A letter to *The Times* in 1971 concluded: 'One last point. The car is inanimate. It is only people who make it dangerous.' The last sentence is doubtless true, but the suppressed major premise – 'No inanimate thing is dangerous' – casts some doubt on the argument as such.

If the conclusion is omitted, we have innuendo, as in the undeserved epigram: 'The Germans at Greek are sadly to seek . . . all except Hermann – and Hermann's a German.'<sup>1</sup>

I do not propose to examine the syllogism once again<sup>2</sup> in all its varieties, but we may take a look at a first-figure syllogism to see what Aristotle meant by one that is 'perfect' or 'complete' (τέλειος).

*An. Pr.* 25b 32 (trans. Ross): When three terms are so related to one another that the last is included in the middle as in a whole, and the middle is included or is not included in the first as in a whole, there is necessarily a perfect syllogism connecting the extremes . . . Thus if *A* is predicated of all *B* and *B* of all *C*, *A* is necessarily predicated of all *C* . . . (26b 3). This I call the first figure.

We are all familiar with something called the traditional syllogism, which was the basic of logic in the Middle Ages and beyond. The stock example is

All men are mortal;  
Socrates is a man;  
therefore Socrates is mortal.

This was supposed to represent the Aristotelian syllogism, but differs from it in more than one way. Formally it is an inference, consisting of three separate propositions, the third being a conclusion drawn from the first two. As Aristotle defines it, the syllogism is a single compound proposition of the form 'If . . . then', and he regularly states it in this way, rather than in the form of two separate propositions and a conclusion introduced by 'therefore'.<sup>3</sup> So stated, it is not an inference but

<sup>1</sup> Modelled on *Anth. Pal.* xi. 236 (x. 39 in Mackail's selection).

<sup>2</sup> Even for J. S. Mill in 1843 the analysis of the syllogism had been 'so accurately and fully performed in the common manuals of logic' that he felt it enough simply to recapitulate its leading results. His recapitulation, however, is pretty comprehensive (*System of Logic* bk 11, ch. 2). For Aristotelian syllogisms see the table in Ross's *Analytics*, after p. 285.

<sup>3</sup> Not always. Patzig (p. 4) mentions eight examples from the *Analytics* of syllogisms expressed in the traditional form with *ἐπεὶ*. With *A*, there are exceptions to every rule. For syllogisms with singular minor premise and conclusion see *An. Pr.* 70a 24–28, *Met.* 1086b 34–37.

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an implication, and, as a single proposition, must be true or false, whether expressed with concrete terms or variables.<sup>1</sup> However, since as Aristotle presents it the syllogism simply states a formal requirement ('If *A* is predicated of (or belongs to) all *B*, and *B* is predicated of all *C*, *A* must be predicated of all *C*'), it is difficult to think of it as conveying truth or falsehood. Aristotle's word is not 'true' but 'necessary', and his usual way of saying that an argument is invalid is 'there will be no syllogism' or 'one cannot syllogize' (i.e. drawn an inference).<sup>2</sup>

A second difference was surely more important to Aristotle himself. In the example of the traditional syllogism the minor premise is a *singular* proposition, having for its subject a proper name which can only refer to a single individual; and we have seen already (pp. 143f. above) why for Aristotle the units in a logical system must be species and not individuals. He held that 'as a rule it is with these that arguments and scientific enquiries are concerned' (*An. Pr.* 43a42-43).

To become an Aristotelian first-figure syllogism, then, the traditional syllogism must be modified in these two ways, and will read (if retained in concrete rather than formulaic terms): 'If all animals are mortal, and all men are animals, then all men are mortal.' There remains the minor<sup>3</sup> difference that instead of saying 'If all animals are mortal' and so on, Aristotle says 'If mortal is predicated of (or "if being mortal belongs to (ὕπάρχει)") all animals'. The position of the

<sup>1</sup> Łukasiewicz regarded this difference as fundamental, but others have wished to modify his view. See Austin, *Mind* 1952, 397f., and Prior, *Formal Logic*, 116 (quoted by L. E. Rose, *A's Syl.*, 25; Rose in his turn has been criticized by Charlton, *CR* 1969, 284, for his disagreement with Łukasiewicz). Cf. also Kneale, *D. of L.*, 8of. I. Thomas, in a review in *Phil. of Sci.* 1968, 197, says of the writer: 'He adopts without criticism Łukasiewicz's position that *A*. states his syllogisms as implications rather than as rules of inference, without regard to the rather damaging fire to which it has been subjected from various quarters.' As an advantage of setting out a whole argument in hypothetical form, Flew, in his highly readable little book *Thinking about Thinking* (p. 11), notes that it 'makes it clear why, in order to know whether the exemplary argument... is valid, we do not need to know whether any of its constituent propositions is true'.

<sup>2</sup> οὐκ ἔστιν συλλογισμὸς ὅς οὐκ ἔστι συλλογισσάσθαι. Cf. *An. Pr.* 53b7: 'One cannot infer (συλλογισσάσθαι) a falsehood from true premises, but may infer a true conclusion from false premises.' At 26a4-5 *A.* says why nothing can be inferred from premises related in a certain way: 'There will be no syllogism between the extreme terms because nothing necessary follows from their being as they are.'

<sup>3</sup> I had thought it trivial, because as Patzig says (p. 49), 'the logical relation between *A* and *B* of course remains the same', but am impressed by the importance which he attaches to it on pp. 8-12. Russell, in *My Philosophical Development*, attributes to 'Aristotle and the accepted doctrine of the syllogism' a failure to separate propositions of the form 'Socrates is mortal' from those of the form 'All Greeks are mortal'. 'The accepted doctrine' perhaps, but need we accuse *A.* of the fault?



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terms, compared with the traditional syllogism, is inverted, which makes it natural for him to choose *B* for the middle term, as one would expect from its position in the alphabet. Modern logicians use the significant letters *S*, *P* (for Subject and Predicate of the conclusion) and *M* (for Middle term).

The 'perfect' syllogism, then, consists of two premises (προτάσεις) and a conclusion (συμπέρασμα), containing between them only three terms (ὅροι).<sup>1</sup> Of these the middle (ὅρος μέσος) is the term common to the two premises, which does not appear in the conclusion; the extreme terms (ἄκρα) are identified as major or greater (μείζων), which is the predicate of the conclusion, and minor (ἐλάττω), which is its subject. So we have what was later famous as the *dictum de omni et nullo*: If all (or no) *M* is *P*, and *S* is *M*, all (or no) *S* must be *P*. In this figure the major premise must be universal, and may be either affirmative or negative, and the minor premise must be affirmative. The conclusion will be universal and either affirmative or negative. Aristotle points out that the middle term gives the reason why *S* is or is not *P* (*An. Post.* 90a6-7). To illustrate with two sets of concrete terms: (1) If all metals are fusible, and lead is a metal, lead must be fusible; and (2) If no gods are mortal, and all Olympians are gods, then no Olympians are mortal.

This figure alone yields what Aristotle calls a perfect syllogism. His conditions for perfection are two: like every syllogism it must be valid for every case, and secondly its validity must be self-evident, that is, seen to follow directly from the premises with no need to insert another proposition before the conclusion can be seen to be necessary. To this form he believed that all inference can be reduced. So far we have seen one or two objections which attack it only on the score of inadequacy, as being too narrow. One, that it ignores induction, may

<sup>1</sup> ὅρος is literally a boundary or landmark, Latin *terminus* (whence 'term'). (Its use instead of ὁρισμός, a definition, is quite different.) πρότασις is commonly connected with προτείνω in its sense of 'offer' for debate, but in view of the associations of ὅρος A. may also have had in mind the more literal sense of 'stretching', as of a line joining two points. This would not be inconsistent with the description of προτείνεσθαι at *Top.* 164 b4 as 'making several into one'. Neither ὅρος in the sense of 'term' nor πρότασις is found before A. (Ross, *Analytics*, 288, 290) and A.'s own definition of πρότασις is simply 'a form of words' which affirms or denies one thing of another' (*An. Pr.* 24a16). In dialectic, however, it could be a question in the form of a proposition put interrogatively (Is it true that...?) (*Top.* 101 b28-36). See also Barnes, *Articles on A.* 1, 81 n. 74.

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be somewhat curiously rebutted by pointing out that in this matter Aristotle's practice differed from his principles. Another should be mentioned, which throws doubt on the usefulness of the syllogism in its own sphere. It first occurs in Sextus Empiricus (*Pyrrh. Hyp.* 195-203) and has been repeated in later times.

The criticism (discussed by Ross, *Analytics*, 38-40) is that the syllogism involves a *petitio principii*. Aristotle claims that the conclusion is 'something different' from the premises, but in fact the premises cannot even be stated without assuming the conclusion to be true. As R. W. Newell in his book *The Concept of Philosophy* (p. 2) describes this doctrine (which he himself subsequently attacks), to reason deductively 'is to repeat, laboriously, what one already knows'. I argue 'All *M* is *P*, *S* is *M*, therefore *S* is *P*', but I had no right to say that all *M* is *P* unless I already knew *S*, which is an *M*, to be *P*. If I already knew lead to be a metal, and did not yet know that lead melts, I had no right to say that all metals melt. We cannot, said J. S. Mill, know by direct observation that the Duke of Wellington is mortal, since he is not yet dead; so we say that he is mortal because all men are. But 'a general truth is but an aggregate of particular truths'. There is no contradiction in supposing that so many millions have died up to now and that the Duke of Wellington may nevertheless live for ever. Contradiction only enters if we have first made a general assertion including the Duke of Wellington ('All men are mortal') and then refused to stand to it in the individual case.<sup>1</sup>

Aristotle would reply that the criticism assumes the necessity of examining every single instance of a class before asserting that a certain predicate applies to the whole class. This he did not believe to be true. In mathematics it is certainly not true. Examination of only one triangle will reveal certain properties which follow necessarily from its nature as a triangle and can be assumed at once to belong to all

<sup>1</sup> Mill, *System of Logic* bk II, ch. 3, 'Of the functions, and logical value, of the syllogism'. Mill did not on these grounds condemn syllogistic reasoning outright. In fact he enters a strong protest 'against the doctrine that the syllogistic art is useless for the purposes of reasoning. The reasoning lies in the act of generalisation', for 'the general principle presents a larger object to the imagination than any of the singular propositions which it contains'. This, one might think, lies, logically speaking, uneasily with his earlier assertion that generalization is no more than an aggregate of particular truths. (On Mill's argument cf. Newell, *Concept*, 73-5, together with what he says on pp. 18-22.)

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triangles alike. As for the natural world, we may so far anticipate the discussion of induction as to say that he believed the same to be generally true: there came a point in the examination of particulars at which one could stop, and know by a kind of intuition that there was a law which applied to them all, and would therefore apply to any member of the class which one might meet in the future. This solution was connected with his doctrine of substantial form, and was not open to Mill and his empirical contemporaries owing to their different conception of a universal as nothing more than the sum of its particulars. It was, said Mill, suited to an abandoned scheme of metaphysics. To Aristotle, still half a Platonist, universals, identified with specific form, possessed a certain substantiality. They were, as Mill rightly said, 'regarded as a peculiar kind of substances ["secondary substances"]', having an objective existence', though *not*, as he continues, 'distinct from the objects classed under them', save conceptually.

The criticism was also directed at the minor premise: one had no right to assert '*S* is *M*' unless one already knew *S* to be *P*, because all *M* is *P*; you cannot say lead is a metal unless you already know it to be fusible, because all metals are fusible. To answer this Aristotle could point to his distinction between essence and proprium, which we now know. Necessary attributes were of two kinds: those included in the definition because they are parts of the essence, and those which, though necessary and attributes themselves, have no place in the definition. To repeat our earlier example (p. 148), one would know that a given figure was a circle if one knew it to be a plane figure bounded by a line which is everywhere equidistant from the same point. It could not then be anything else, but the definition does not tell that if we draw a diameter the angle in that particular semi-circle will be a right angle.<sup>1</sup>

These criticisms may raise the suspicion that syllogistic reasoning can add little to our knowledge. 'The point is that the *informative content* of the conclusion can never exceed that of the premises.'<sup>2</sup> In

<sup>1</sup> The point has been made clear by Ross (*Analytics*, 39): 'Among the attributes necessarily involved in being *B* he distinguishes a certain set of fundamental attributes which is necessary and sufficient to distinguish *B* from anything else; and he regards its other necessary attributes as flowing from and demonstrable from these. To know *C* is *B* it is enough to know that it has the essential nature of *B* — the genus and the differentiae; it is not necessary to know that it has the properties of *B*.'

<sup>2</sup> Popper, *Self and Brain*, 80 (his italics).

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other words, knowledge of the conclusion is implicit in knowledge of the premises. But what, one may ask, does 'implicit knowledge' mean? Can we be said to *know* anything unless it is consciously and *explicitly* before our minds? Is this not what inference is: the correct use of data in themselves sufficient to suggest a conclusion in order to make us consciously aware of it?<sup>1</sup> Aristotle himself was aware of this no less than modern thinkers: 'When one grasps the two premises, one has grasped and put together the conclusion' (*De motu an.* 701a10), and what happens is best expressed in his own terms: it is the actualization of knowledge which was potential (*An. Post.* 86a22-26). This actualization lays bare our thought-processes and reveals their faults, which is his justification for giving so much attention to the formal side of logic. A careless observer, seeing that lead melts, might hastily conclude that it was a metal; but of course it is equally true of wax. The rules of the syllogism would have saved him from arguing 'All *P* is *M*, *S* is *M*, therefore *S* is *P*'. It is one of the invalid moods of the second figure. Paramount is the need to start off with the right premises, the *archai* or starting-points of the syllogism.<sup>2</sup> The first figure is preferred because it is the most scientific (*epistemonik*, knowledge-giving, *An. Post.* 79a17), and therefore the one used in *apodeixis*.

Without giving disproportionate attention to logic, we may look at the definition of the second figure in order to see what Aristotle meant by an imperfect syllogism.<sup>3</sup>

Whenever the same thing belongs to all of one subject, and to none of another, or to all of each subject or to none of either, I call such a figure the

<sup>1</sup> Ch. 2 of Ewing's *Fundamental Questions* is useful reading. After an entertaining story to illustrate his point (p. 29), he concludes: 'The importance of syllogisms has often been exaggerated, but they are as important as any kind of inference, and we cannot deny that in many cases a syllogism has given people information of which they were not in any ordinary sense aware before they used the syllogism and which they did not acquire by observation.' Cf. also 31f. The pragmatist C. S. Peirce, 'While assenting to the view that the conclusion of every deductive inference is "already contained" in the premises, [he] insists that there is nevertheless an observational, and even in an extended sense an experimental, element in all deductive procedures' (Gallie, *Peirce and Pragmatism*, 93).

<sup>2</sup> See *An. Pr.* 1.30. Note especially 46a10, 'We have now treated generally of the *archai* of syllogisms, their characteristics and how to hunt for them', together with 1.28, 'how to choose one's premises'. The modern logician's divorce of his subject from epistemology is not Aristotelian.

<sup>3</sup> *An. Pr.* 26b34 in the Oxford trans. by A. J. Jenkinson. The expression shows the equivalence of 'belong to' (ἐπάχθην) and 'be predicated of' (κατηγορεῖσθαι). The Greek for 'valid' is δυνάτος (having force).

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second; by middle term in it I mean that which is predicated of both subjects, by extremes the terms of which this is said, by major extreme that which lies near the middle, by minor that which is further away from the middle. The middle term stands outside the extremes, and is first in position. A syllogism cannot be perfect anyhow in this figure, but it may be valid whether the terms are related universally or not.

Thus we have (in the traditional order of terms)

<i>1st fig.</i>	<i>2nd fig.</i>
M-P	P-M
S-M	S-M
<hr/> S-P	<hr/> S-P

Concretely, (1) If all metals are fusible and lead is a metal, lead is fusible.

(2) If all living things are self-moving, and no stone is self-moving, no stone is living.

The difference between the figures is determined by the status of the middle term: in fig. 1 it is subject in the major and predicate in the minor premise (i.e. between the two in extension, *An. Pr.* 26 b 35), in fig. 2 it is predicate in both, and in fig. 3 it is subject in both.<sup>1</sup> Aristotle's term 'figure' (σχήμα), then, refers to the relative position (and hence extension, cf. 26a21) of middle and extreme terms in a syllogism. 'Mood'<sup>2</sup> is usually employed to denote differences of quantity and quality in its constituent *propositions*, universal or particular, negative or positive. Thus second-figure syllogisms are valid or not according to their mood. A universal affirmative major and universal negative minor yield a universal negative conclusion, as in example (2) above. From a universal negative major and particular positive minor a

<sup>1</sup> Traditional logic includes a fourth figure, not recognized as a separate figure by A. At 41 b 1-3 he states emphatically that his three figures cover all demonstration and every syllogism. For this one may refer to Łukasiewicz, *A.'s Syll.*, 23-8, Ross, *Analytic*, 34f, Patzig, *Syllogism*, 109-27. Cf. also Cohen and Nagel, *Introd. to Logic*, 821 'If the distinction between figures is made on the basis of the *position* of the middle term, there can be no dispute that there are four distinct figures. But Aristotle did not distinguish the figures in this way. His principle of distinction was the *width* or extent of the middle term as compared with the other two. On this basis there are just three figures: the middle may be wider than one and narrower than the other, wider than either and narrower than either.'

<sup>2</sup> Not a technical term in A. On τρόπος and πρῶσις see Patzig, *Syllogism*, 101. 'Modus' was a term of the Latin commentators introduced by Boethius.

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particular conclusion may follow. (No sane man ignores traffic lights: some motorists ignore traffic lights: some motorists are not sane.) If both premises are universal and affirmative, no valid conclusion follows as it did in fig. 1. In certain actual cases the conclusion may happen to be *true*, but formally 'There is no syllogism'. Contrast 'All men are mortal: all philosophers are mortal: all philosophers are men' with 'All men are mortal: all dogs are mortal: all dogs are men'. This figure, it will be seen, admits of only negative conclusions.

We see what Aristotle means by saying that syllogisms in this figure *may* be valid, according to their mood. By saying that they cannot be perfect, he means that he does not consider this figure (and the same applies of course to the third) to be an independent mode of reasoning – independent, that is, of the first – because only in a first-figure syllogism was the conclusion immediately evident from the original premises alone. Syllogisms of the other figures, he believed, had to be converted<sup>1</sup> into first-figure form to make the inference clear. This seems unnecessary, and his refusal to recognize the independence of the other figures is not generally accepted,<sup>2</sup> though it is true that any syllogisms in the other figures *can* be converted into the first figure, which can therefore be said to be more basic and the only necessary one. Thus in concrete terms:

- fig. 2                      No insect has eight legs.  
                              All spiders have eight legs.  
                              No spider is an insect.

Converting the major premise we get:

- fig. 1                      No eight-legged creature is an insect.  
                              All spiders are eight-legged.  
                              No spider is an insect.

In fig. 2, 'insect' is subject in its premise and predicate in the conclusion. In fig. 1 it is predicate in both.

<sup>1</sup> Traditional and modern logicians use 'reduction' for this process, corresponding to A.'s ἐναγωγή. (For this and other expressions for the process in A., see Patzig, *Syllogism*, 184 nn. 8 and 9.)

<sup>2</sup> Ross, however (*Analytics*, 33f.), has attempted a justification based on the fact that the study of syllogisms was for A. a preliminary to the study of scientific method.

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Not all second-figure syllogisms can be converted so simply; e.g. if the argument is expressed thus:

All insects have six legs.  
No spider has six legs.  
Spiders are not insects.

we cannot get the first-figure syllogism simply by converting the first premise, for it is not convertible; it only tells us that 'some six-legged animals are insects'. The procedure in this case therefore is to convert the minor premise and make it the major of our first-figure syllogism, thus:

No six-legged animal is a spider.  
Insects have six legs.  
No insect is a spider.

The conclusion is convertible, and, by conversion, gives the original conclusion.

It has been pointed out<sup>1</sup> that in his proofs of imperfect syllogisms Aristotle uses intuitively the laws of propositional logic without recognizing it as an independent logical system in its own right. Just occasionally he even employs variables to stand for whole propositions instead of terms.<sup>2</sup> At 57 b 1 he writes:

When two things are so related to one another that if the one is, the other necessarily is, then if the latter is not, the former will not be either.

In more modern terms:

If (if  $p$  then  $q$ ), then if not  $q$  then not  $p$ .

Explaining this by an example he goes on:

Whenever if  $A$  is white, then  $B$  should necessarily be large, and if  $B$  is large, then  $C$  should not be white, then it is necessary if  $A$  is white that  $C$  should not be white.

In simpler, propositional terminology (without using full modern symbolism):

<sup>1</sup> Łukasiewicz, *A.'s Syll.*, 49. See also pp. 159f. above.

<sup>2</sup> See *An. Pr.* 53b 12, with Patzig's comments on pp. 134 and 184 n. 8. The passage is exceptional as W. Kneale noted (*JHS* 1957 (1), 64): 'In propositional logic he did not ordinarily use variables but relied on examples.'

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If (if  $p$  then  $q$ ) and (if  $q$  then  $r$ ), then (if  $p$  then  $r$ ).

If Aristotle had habituated himself to using variables to stand for whole propositions, he could have based a new logical system on the kind of arguments that he illustrates here. But he did not, its beginnings among the Stoics were ignored, and logic remained tied to the traditional, 'Aristotelian' syllogism not only through the Middle Ages and Renaissance but down to the conscious creation of propositional logic in the second half of the nineteenth century.<sup>1</sup>

<sup>1</sup> I shall not in this general work go into A.'s modal syllogisms, i.e. syllogisms in which at least one of the premises contains the words 'necessary', 'possible' or their equivalents. There is a section on it in Kneale (ch. II, 7), which opens with a definition, and in which we read: 'the Aristotelian theory of modal syllogisms is generally recognized to be confused and unsatisfactory' (p. 86) and in his theory of syllogisms with problematic premises he 'seems to have been almost wholly mistaken' (87). Ross (*Aristotle*, 36) speaks of errors in its formal logic, and for Patzig (86) it is 'still a realm of darkness'. Among recent contributions may be mentioned Hintikka's *Time and Necessity: Studies in A.'s Theory of Modality* (1973, but containing ten papers previously published between 1957 and 1970). For discussions of the famous 'sea-battle argument' on the logic of future events, see p. 149 n. 1 above.