The Uses of Argument

Updated Edition

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Preface to the Updated Edition

Books are like children. They leave home, make new friends, but rarely call home, even collect. You find out what they have been up to only by chance. A man at a party turns out to be one of those new friends. 'So you are George's father? – Imagine that!'

So has been the relation between *The Uses of Argument* and its author. When I wrote it, my aim was strictly philosophical: to criticize the assumption, made by most Anglo-American academic philosophers, that any significant argument can be put in formal terms: not just as a *syllogism*, since for Aristotle himself any inference can be called a 'syllogism' or 'linking of statements', but a rigidly demonstrative deduction of the kind to be found in Euclidean geometry. Thus was created the Platonic tradition that, some two millennia later, was revived by René Descartes. Readers of *Cosmopolis*, or my more recent *Return to Reason*, will be familiar with this general view of mine.

In no way had I set out to expound a theory of rhetoric or argumentation: my concern was with twentieth-century epistemology, not informal logic. Still less had I in mind an analytical model like that which, among scholars of Communication, came to be called 'the Toulmin model'. Many readers in fact gave me an historical background that consigned me to a premature death. When my fiancée was reading Law, for instance, a fellow-student remarked on her unusual surname: his girlfriend [he explained] had come across it in one of her textbooks, but when he reported that Donna was marrying the author, she replied, 'That's impossible: He's dead!'

My reaction to being (so to say) 'adopted' by the Communication Community was, I confess, less inquisitive than it should have been. Even the fact that the late Gilbert Ryle gave the book to Otto Bird to review, and Dr Bird wrote of it as being a "revival of the *Topics*" made no impression on me. Only when I started working in Medical Ethics, and I reread Aristotle with greater understanding, did the point of this commentary sink in. (The book, *The Abuse of Casuistry*, the scholarly research for which was largely the work of my fellow-author, Albert R. Jonsen, was the first solid product of that change of mind.) Taking all things together, our collaboration, first on the National Commission for the Protection of Human Research Subjects, and subsequently on the book, left us with a picture of Aristotle as more of a pragmatist, and less of a formalist, than historians of thought have tended to assume since the High Middle Ages.

True, the earliest books of Aristotle's *Organon* are still known as the *Prior* and *Posterior Analytics*; but this was, of course, intended to contrast them with the later books on Ethics, Politics, Aesthetics, and Rhetoric. (The opening of the *Rhetoric* in fact takes up arguments that Aristotle had included in the Nicomachean Ethics.) So, after all, Otto Bird had made an important point. If I were rewriting this book today, I would point to Aristotle's contrast between 'general' and 'special' topics as a way of throwing clearer light on the varied kinds of 'backing' relied on in different fields of practice and argument.

It was, in the event, to my great advantage that *The Uses of Argument* found a way so quickly into the world of Speech Communication. The rightly named 'analytical' philosophers in the Britain and America of the late 1950s quickly smelled an enemy. The book was roundly damned by Peter Strawson in the B.B.C.'s weekly journal, *The Listener*; and for many years English professional philosophers ignored it. Peter Alexander, a colleague at Leeds, called it 'Toulmin's *anti-logic* book'; and my *Doktorvater* at Cambridge, Richard Braithwaite, was deeply pained to see one of his own students attacking his commitment to Inductive Logic. (I only found this out years later.)

Yet the book continued to sell abroad, and the reasons became clear to me only when I visited the United States in the early 1960s. As a result, it would be churlish of me to disown the notion of 'the Toulmin model', which was one of the unforeseen by-products of *The Uses of Argument*, has kept it in print since it first appeared in 1958, and justifies the new edition for which this Preface is written, more than 40 years on.

Some people will remember David Hume's description of his *Treatise of Human Nature*—stung by its similarly hostile early reception—as having 'fallen still-born from the press'. One could hardly ask for better company.

Stephen Toulmin
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III

The Layout of Arguments

An argument is like an organism. It has both a gross, anatomical structure and a finer, as-it-were physiological one. When set out explicitly in all its detail, it may occupy a number of printed pages or take perhaps a quarter of an hour to deliver; and within this time or space one can distinguish the main phases marking the progress of the argument from the initial statement of an unsettled problem to the final presentation of a conclusion. These main phases will each of them occupy some minutes or paragraphs, and represent the chief anatomical units of the argument— its 'organs', so to speak. But within each paragraph, when one gets down to the level of individual sentences, a finer structure can be recognised, and this is the structure with which logicians have mainly concerned themselves. It is at this physiological level that the idea of logical form has been introduced, and here that the validity of our arguments has ultimately to be established or refuted.

The time has come to change the focus of our inquiry, and to concentrate on this finer level. Yet we cannot afford to forget what we have learned by our study of the grosser anatomy of arguments, for here as with organisms the detailed physiology proves most intelligible when expounded against a background of coarser anatomical distinctions. Physiological processes are interesting not least for the part they play in maintaining the functions of the major organs in which they take place; and micro-arguments (as one may christen them) need to be looked at from time to time with one eye on the macro-arguments in which they figure; since the precise manner in which we phrase them and set them out, to mention only the least important thing, may be affected by the role they have to play in the larger context.

In the inquiry which follows, we shall be studying the operation of arguments sentence by sentence, in order to see how their validity or invalidity is connected with the manner of laying them out, and what relevance this connection has to the traditional notion of 'logical form'. Certainly the same argument may be set out in quite a number of different forms, and some of these patterns of analysis will be more candid than others—some of them, that is, will show the validity or invalidity of an argument more clearly than others, and make more explicit the grounds it relies on and the bearing of these on the conclusion. How, then, should we lay an argument out, if we want to show the sources of its validity? And in what sense does the acceptability or unacceptability of arguments depend upon their 'formal' merits and defects?

We have before us two rival models, one mathematical, the other jurisprudential. Is the logical form of a valid argument something quasi-geometrical, comparable to the shape of a triangle or the parallelism of two straight lines? Or alternatively, is it something procedural: is a formally valid argument one *in proper form*, as lawyers would say, rather than one laid out in a tidy and simple *geometrical* form? Or does the notion of logical form somehow combine both these aspects, so that to lay an argument out in proper form necessarily requires the adoption of a particular geometrical layout? If this last answer is the right one, it at once creates a further problem for us: to see how and why proper procedure demands the adoption of simple geometrical shape, and how that shape guarantees in its turn the validity of our procedures. Supposing valid arguments can be cast in a geometrically tidy form, how does this help to make them any the more cogent?

These are the problems to be studied in the present inquiry. If we can see our way to unravelling them, their solution will be of some importance—particularly for a proper understanding of logic. But to begin with we must go cautiously, and steer clear of the philosophical issues on which we shall hope later to throw some light, concentrating for the moment on questions of a most prosaic and straightforward kind. Keeping our eyes on the categories of applied logic—on the practical business of argumentation, that is, and the notions it requires us to employ—we must ask what features a logically candid layout of arguments will need to have. The establishment of conclusions raises a number of issues of different sorts, and a practical layout will make allowance for these differences: our first question is—what are these issues, and how can we do justice to them all in subjecting our arguments to rational assessment?

Two last remarks may be made by way of introduction, the first of them simply adding one more question to our agenda. Ever since Aristotle it has been customary, when analysing the micro-structure of arguments, to set them out in a very simple manner: they have been presented three propositions at a time, 'minor premiss; major premiss; *so* conclusion'. The question now arises, whether this standard form is sufficiently elaborate or candid. Simplicity is of course a merit, but may it not in this case have been bought too dearly? Can we properly classify all the elements in our arguments under the three headings, 'major premiss', 'minor premiss' and 'conclusion', or are these categories misleadingly few in number? Is there even enough similarity between major and minor premisses for them usefully to be yoked together by the single name of 'premiss'?

Light is thrown on these questions by the analogy with jurisprudence. This would naturally lead us to adopt a layout of greater complexity than has been customary, for the questions we are asking here are, once again, more general versions of questions already familiar in jurisprudence, and in that more specialised field a whole battery of distinctions has grown up. 'What different sorts of propositions', a legal philosopher will ask, 'are uttered in the course of a law-case, and in what different ways can such propositions bear on the soundness of a legal claim?' This has always been and still is a central question for the student of jurisprudence, and we soon find that the nature of a legal process can be properly understood only if we draw a large number of distinctions. Legal utterances have many distinct functions. Statements of claim, evidence of identification, testimony about events in dispute, interpretations of a statute or discussions of its validity, claims to exemption from the application of a law, pleas in extenuation, verdicts, sentences: all these different classes of proposition have their parts to play in the legal process, and the differences between them are in practice far from trifling. When we turn from the special case of the law to consider rational arguments in general, we are faced at once by the question whether these must not be analysed in terms of an equally complex set of categories. If we are to set our arguments out with complete logical candour, and understand properly the nature of 'the logical process', surely we shall need to employ a pattern of argument no less sophisticated than is required in the law.

The Pattern of an Argument: Data and Warrants

'What, then, is involved in establishing conclusions by the production of arguments?' Can we, by considering this question in a general form,

build up from scratch a pattern of analysis which will do justice to all the distinctions which proper procedure forces upon us? That is the problem facing us.

Let it be supposed that we make an assertion, and commit ourselves thereby to the claim which any assertion necessarily involves. If this claim is challenged, we must be able to establish it—that is, make it good, and show that it was justifiable. How is this to be done? Unless the assertion was made quite wildly and irresponsibly, we shall normally have some facts to which we can point in its support: if the claim is challenged, it is up to us to appeal to these facts, and present them as the foundation upon which our claim is based. Of course we may not get the challenger even to agree about the correctness of these facts, and in that case we have to clear his objection out of the way by a preliminary argument: only when this prior issue or 'lemma', as geometers would call it, has been dealt with, are we in a position to return to the original argument. But this complication we need only mention: supposing the lemma to have been disposed of, our question is how to set the original argument out most fully and explicitly. 'Harry's hair is not black', we assert. What have we got to go on? we are asked. Our personal knowledge that it is in fact red: that is our datum, the ground which we produce as support for the original assertion. Petersen, we may say, will not be a Roman Catholic: why?: we base our claim on the knowledge that he is a Swede, which makes it very unlikely that he will be a Roman Catholic. Wilkinson, asserts the prosecutor in Court, has committed an offence against the Road Traffic Acts: in support of this claim, two policemen are prepared to testify that they timed him driving at 45 m.p.h. in a built-up area. In each case, an original assertion is supported by producing other facts bearing on it.

We already have, therefore, one distinction to start with: between the *claim* or conclusion whose merits we are seeking to establish (C) and the facts we appeal to as a foundation for the claim—what I shall refer to as our *data* (D). If our challenger's question is, 'What have you got to go on?', producing the data or information on which the claim is based may serve to answer him; but this is only one of the ways in which our conclusion may be challenged. Even after we have produced our data, we may find ourselves being asked further questions of another kind. We may now be required not to add more factual information to that which we have already provided, but rather to indicate the bearing on our conclusion of the data already produced. Colloquially, the question may now be, not 'What have you got to go on?', but 'How do you get there?'. To present a particular set of data as the basis for some specified conclusion commits

us to a certain *step*; and the question is now one about the nature and justification of this step.

Supposing we encounter this fresh challenge, we must bring forward not further data, for about these the same query may immediately be raised again, but propositions of a rather different kind: rules, principles, inference-licences or what you will, instead of additional items of information. Our task is no longer to strengthen the ground on which our argument is constructed, but is rather to show that, taking these data as a starting point, the step to the original claim or conclusion is an appropriate and legitimate one. At this point, therefore, what are needed are general, hypothetical statements, which can act as bridges, and authorise the sort of step to which our particular argument commits us. These may normally be written very briefly (in the form 'If D, then C'); but, for candour's sake, they can profitably be expanded, and made more explicit: 'Data such as D entitle one to draw conclusions, or make claims, such as C', or alternatively 'Given data D, one may take it that C.'

Propositions of this kind I shall call *warrants* (W), to distinguish them from both conclusions and data. (These 'warrants', it will be observed, correspond to the practical standards or canons of argument referred to in our earlier essays.) To pursue our previous examples: the knowledge that Harry's hair is red entitles us to set aside any suggestion that it is black, on account of the warrant, 'If anything is red, it will not also be black.' (The very triviality of this warrant is connected with the fact that we are concerned here as much with a counter-assertion as with an argument.) The fact that Petersen is a Swede is directly relevant to the question of his religious denomination for, as we should probably put it, 'A Swede can be taken almost certainly not to be a Roman Catholic.' (The step involved here is not trivial, so the warrant is not self-authenticating.) Likewise in the third case: our warrant will now be some such statement as that 'A man who is proved to have driven at more than 30 m.p.h. in a built-up area can be found to have committed an offence against the Road Traffic Acts.'

The question will at once be asked, how absolute is this distinction between data, on the one hand, and warrants, on the other. Will it always be clear whether a man who challenges an assertion is calling for the production of his adversary's data, or for the warrants authorising his steps? Can one, in other words, draw any sharp distinction between the force of the two questions, 'What have you got to go on?' and 'How do you get there?'? By grammatical tests alone, the distinction may appear far from

absolute, and the same English sentence may serve a double function: it may be uttered, that is, in one situation to convey a piece of information, in another to authorise a step in an argument, and even perhaps in some contexts to do both these things at once. (All these possibilities will be illustrated before too long.) For the moment, the important thing is not to be too cut-and-dried in our treatment of the subject, nor to commit ourselves in advance to a rigid terminology. At any rate we shall find it possible in *some* situations to distinguish clearly two different logical functions; and the nature of this distinction is hinted at if one contrasts the two sentences, 'Whenever A, one *has found* that B' and 'Whenever A, one *may take it* that B.'

We now have the terms we need to compose the first skeleton of a pattern for analysing arguments. We may symbolise the relation between the data and the claim in support of which they are produced by an arrow, and indicate the authority for taking the step from one to the other by writing the warrant immediately below the arrow:

$$D \xrightarrow{\quad\quad\quad} \text{So C}$$
$$\text{Since}$$
$$W$$

Or, to give an example:

$$\left.\begin{array}{c}\text{Harry was born}\\ \text{in Bermuda}\end{array}\right\} \xrightarrow{\quad\quad\quad} \text{So} \left\{\begin{array}{l}\text{Harry is a}\\ \text{British subject}\end{array}\right.$$

$$\text{Since}$$

A man born in Bermuda
will be a British subject
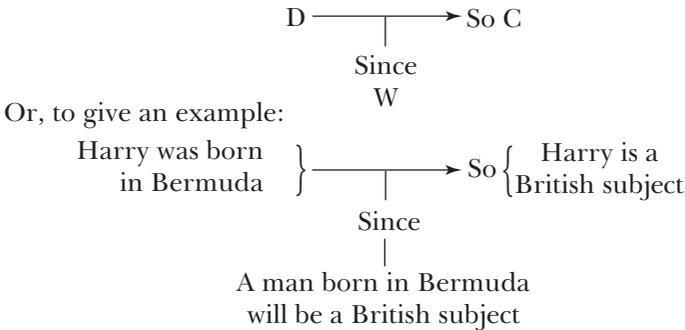
As this pattern makes clear, the explicit appeal in this argument goes directly back from the claim to the data relied on as foundation: the warrant is, in a sense, incidental and explanatory, its task being simply to register explicitly the legitimacy of the step involved and to refer it back to the larger class of steps whose legitimacy is being presupposed.

This is one of the reasons for distinguishing between data and warrants: data are appealed to explicitly, warrants implicitly. In addition, one may remark that warrants are general, certifying the soundness of *all* arguments of the appropriate type, and have accordingly to be established in quite a different way from the facts we produce as data. This distinction, between data and warrants, is similar to the distinction drawn in the law-courts between questions of fact and questions of law, and the legal distinction is indeed a special case of the more general one—we

may argue, for instance, that a man whom we know to have been born in Bermuda is presumably a British subject, simply because the relevant laws give us a warrant to draw this conclusion.

One more general point in passing: unless, in any particular field of argument, we are prepared to work with warrants of *some* kind, it will become impossible in that field to subject arguments to rational assessment. The data we cite if a claim is challenged depend on the warrants we are prepared to operate with in that field, and the warrants to which we commit ourselves are implicit in the particular steps from data to claims we are prepared to take and to admit. But supposing a man rejects all warrants whatever authorising (say) steps from data about the present and past to conclusions about the future, then for him rational prediction will become impossible; and many philosophers have in fact denied the possibility of rational prediction just because they thought they could discredit equally the claims of all past-to-future warrants.

The skeleton of a pattern which we have obtained so far is only a beginning. Further questions may now arise, to which we must pay attention. Warrants are of different kinds, and may confer different degrees of force on the conclusions they justify. Some warrants authorise us to accept a claim unequivocally, given the appropriate data—these warrants entitle us in suitable cases to qualify our conclusion with the adverb 'necessarily'; others authorise us to make the step from data to conclusion either tentatively, or else subject to conditions, exceptions, or qualifications—in these cases other modal qualifiers, such as 'probably' and 'presumably', are in place. It may not be sufficient, therefore, simply to specify our data, warrant and claim: we may need to add some explicit reference to the degree of force which our data confer on our claim in virtue of our warrant. In a word, we may have to put in a *qualifier*. Again, it is often necessary in the law-courts, not just to appeal to a given statue or common-law doctrine, but to discuss explicitly the extent to which this particular law fits the case under consideration, whether it must inevitably be applied in this particular case, or whether special facts may make the case an exception to the rule or one in which the law can be applied only subject to certain qualifications.

If we are to take account of these features of our argument also, our pattern will become more complex. Modal qualifiers (Q) and conditions of exception or rebuttal (R) are distinct both from data and from warrants, and need to be given separate places in our layout. Just as a warrant (W) is itself neither a datum (D) nor a claim (C), since it implies in itself

something about both D and C—namely, that the step from the one to the other is legitimate; so, in turn, Q and R are themselves distinct from W, since they comment implicitly on the bearing of W on this step— qualifiers (Q) indicating the strength conferred by the warrant on this step, conditions of rebuttal (R) indicating circumstances in which the general authority of the warrant would have to be set aside. To mark these further distinctions, we may write the qualifer (Q) immediately beside the conclusion which it qualifies (C), and the exceptional conditions which might be capable of defeating or rebutting the warranted conclusion (R) immediately below the qualifier.

To illustrate: our claim that Harry is a British subject may normally be defended by appeal to the information that he was born in Bermuda, for this datum lends support to our conclusion on account of the warrants implicit in the British Nationality Acts; but the argument is not by itself conclusive in the absence of assurances about his parentage and about his not having changed his nationality since birth. What our information does do is to establish that the conclusion holds good 'presumably', and subject to the appropriate provisos. The argument now assumes the form:

$$
\begin{array}{ccc}
\text{D} & \longrightarrow & \text{So, Q, C} \\
& | & | \\
& \text{Since} & \text{Unless} \\
& \text{W} & \text{R}
\end{array}
$$

i.e. Harry was born }————→ So, presumably,—{ Harry is a
      in Bermuda }   British subject
              | |
           Since   Unless
              | |
      A man born in   Both his parents were
      Bermuda will   aliens/he has become
      generally be a a naturalised American/ …
      British subject
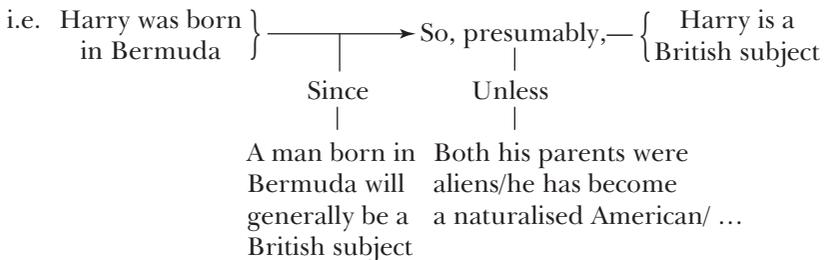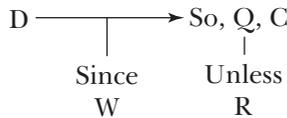
We must remark, in addition, on two further distinctions. The first is that between a statement of a warrant, and statements about its applicability—between 'A man born in Bermuda will be British', and 'This presumption holds good provided his parents were not both aliens, etc.' The distinction is relevant not only to the law of the land, but also for an understanding of scientific laws or 'laws of nature': it is important,

indeed, in all cases where the application of a law may be subject to exceptions, or where a warrant can be supported by pointing to a general correlation only, and not to an absolutely invariable one. We can distinguish also two purposes which may be served by the production of additional facts: these can serve as further data, or they can be cited to confirm or rebut the applicability of a warrant. Thus, the fact that Harry was born in Bermuda and the fact that his parents were not aliens are both of them directly relevant to the question of his present nationality; but they are relevant in different ways. The one fact is a datum, which by itself establishes a presumption of British nationality; the other fact, by setting aside one possible rebuttal, tends to confirm the presumption thereby created.

One particular problem about applicability we shall have to discuss more fully later: when we set out a piece of applied mathematics, in which some system of mathematical relations is used to throw light on a question of (say) physics, the correctness of the calculations will be one thing, their appropriateness to the problem in hand may be quite another. So the question 'Is this calculation mathematically impeccable?' may be a very different one from the question 'Is this the relevant calculation?' Here too, the applicability of a particular warrant is one question: the result we shall get from applying the warrant is another matter, and in asking about the *correctness* of the result we may have to inquire into both these things independently.

The Pattern of an Argument: Backing Our Warrants

One last distinction, which we have already touched on in passing, must be discussed at some length. In addition to the question whether or on what conditions a warrant is applicable in a *particular* case, we may be asked why *in general* this warrant should be accepted as having authority. In defending a claim, that is, we may produce our data, our warrant, and the relevant qualifications and conditions, and yet find that we have still not satisfied our challenger; for he may be dubious not only about this particular argument but about the more general question whether the warrant (W) is acceptable at all. Presuming the general acceptability of this warrant (he may allow) our argument would no doubt be impeccable—if D-ish facts really do suffice as backing for C-ish claims, all well and good. But does not that warrant in its turn rest on something else? Challenging a particular claim may in this way lead on to challenging, more generally, the legitimacy of a whole range of arguments. 'You presume that a man

born in Bermuda can be taken to be a British subject,' he may say, 'but why do you think that?' Standing behind our warrants, as this example reminds us, there will normally be other assurances, without which the warrants themselves would posses neither authority nor currency—these other things we may refer to as the *backing* (B) of the warrants. This 'backing' of our warrants is something which we shall have to scrutinise very carefully: its precise relations to our data, claims, warrants and conditions of rebuttal deserve some clarification, for confusion at this point can lead to trouble later.

We shall have to notice particularly how the sort of backing called for by our warrants varies from one field of argument to another. The *form* of argument we employ in different fields

$$D \longrightarrow \text{So, Q, C}$$
$$\text{Since} \qquad \text{Unless}$$
$$W \qquad\qquad R$$
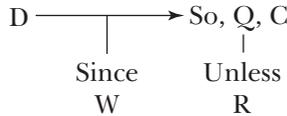
need not vary very much as between fields. 'A whale will be a mammal','A Bermudan will be a Briton','A Saudi Arabian will be a Muslim': here are three different warrants to which we might appeal in the course of a practical argument, each of which can justify the same sort of straightforward step from a datum to a conclusion. We might add for variety examples of even more diverse sorts, taken from moral, mathematical or psychological fields. But the moment we start asking about the *backing* which a warrant relies on in each field, great differences begin to appear: the kind of backing we must point to if we are to establish its authority will change greatly as we move from one field of argument to another. 'A whale will be (i.e. *is classifiable as*) a mammal','A Bermudan will be (*in the eyes of the law*) a Briton','A Saudi Arabian will be (*found to be*) a Muslim'—the words in parentheses indicate what these differences are. One warrant is defended by relating it to a system of taxonomical classification, another by appealing to the statutes governing the nationality of people born in the British colonies, the third by referring to the statistics which record how religious beliefs are distributed among people of different nationalities. We can for the moment leave open the more contentious question, how we establish our warrants in the fields of morals, mathematics and psychology: for the moment all we are trying to show is the *variablity* or *field-dependence* of the backing needed to establish our warrants.

We can make room for this additional element in our argument-pattern by writing it below the bare statement of the warrant for which it serves as backing (B):

$$
\begin{array}{ccc}
\text{D} \longrightarrow & \text{So, Q, C} \\
\big| & \big| \\
\text{Since} & \text{Unless} \\
\text{W} & \text{R} \\
\big| \\
\text{On account of} \\
\text{B}
\end{array}
$$
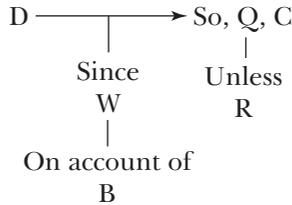
This form may not be final, but it will be complex enough for the purpose of our present discussions. To take a particular example: in support of the claim (C) that Harry is a British subject, we appeal to the datum (D) that he was born in Bermuda, and the warrant can then be stated in the form, 'A man born in Bermuda may be taken to be a British subject': since, however, questions of nationality are always subject to qualifications and conditions, we shall have to insert a qualifying 'presumably' (Q) in front of the conclusion, and note the possiblity that our conclusion may be rebutted in case (R) it turns out that both his parents were aliens or he has since become a naturalised American. Finally, in case the warrant itself is challenged, its backing can be put in: this will record the terms and the dates of enactment of the Acts of Parliament and other legal provisions governing the nationality of persons born in the British colonies. The result will be an argument set out as follows:

$$
\begin{array}{lll}
\left.\begin{array}{l}\text{Harry was born} \\ \text{in Bermuda}\end{array}\right\} \longrightarrow & \text{So, presumably,} & \left\{\begin{array}{l}\text{Harry is a} \\ \text{British subject}\end{array}\right. \\
\qquad\big| & \qquad\big| \\
\text{Since} & \text{Unless} \\
\big| & \big| \\
\text{A man born in} & \text{Both his parents were} \\
\text{Bermuda will} & \text{aliens/he has become a} \\
\text{generally be a} & \text{naturalised American/ …} \\
\text{British subject} \\
\big| \\
\text{On account of} \\
\big| \\
\text{The following statutes} \\
\text{and other legal provisions:}
\end{array}
$$
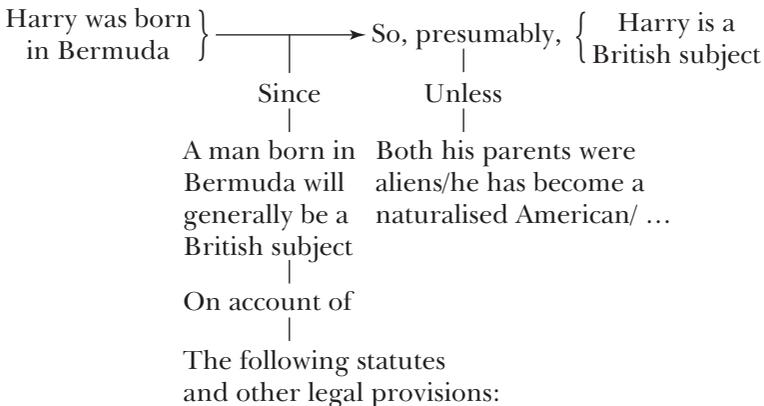
In what ways does the backing of warrants differ from the other elements in our arguments? To begin with the differences between B and W:

statements of warrants, we saw, are hypothetical, bridgelike statements, but the backing for warrants can be expressed in the form of categorical statements of fact quite as well as can the data appealed to in direct support of our conclusions. So long as our statements reflect these functional differences explicitly, there is no danger of confusing the backing (B) for a warrant with the warrant itself (W): such confusions arise only when these differences are disguised by our forms of expression. In our present example, at any rate, there need be no difficulty. The fact that the relevant statutes have been validly passed into law, and contain the provisions they do, can be ascertained simply by going to the records of the parliamentary proceedings concerned and to the relevant volumes in the books of statute law: the resulting discovery, that such-and-such a statute enacted on such-and-such a date contains a provision specifying that people born in the British colonies of suitable parentage shall be entitled to British citizenship, is a straightforward statement of fact. On the other hand, the warrant which we apply *in virtue of* the statute containing this provision is logically of a very different character—'*If* a man was born in a British colony, he *may be presumed to be* British.' Though the facts about the statute may provide all the backing required by this warrant, the explicit statement of the warrant itself is more than a repetition of these facts: it is a general *moral* of a practical character, about the ways in which we can safely argue in view of these facts.

We can also distinguish backing (B) from data (D). Though the data we appeal to in an argument and the backing lending authority to our warrants may alike be stated as straightforward matters-of-fact, the roles which these statements play in our argument are decidedly different. Data of some kind must be produced, if there is to be an argument there at all: a bare conclusion, without any data produced in its support, is no argument. But the backing of the warrants we invoke need not be made explicit—at any rate to begin with: the warrants may be conceded without challenge, and their backing left understood. Indeed, if we demanded the credentials of all warrants at sight and never let one pass unchallenged, argument could scarcely begin. Jones puts forward an argument invoking warrant W_1, and Smith challenges that warrant; Jones is obliged, as a lemma, to produce another argument in the hope of establishing the acceptability of the first warrant, but in the course of this lemma employs a second warrant W_2; Smith challenges the credentials of this second warrant in turn; and so the game goes on. Some warrants must be accepted provisionally without further challenge, if argument is to open to us in the field in question: we should not even know what sort of data were of

the slightest relevance to a conclusion, if we had not at least a provisional idea of the warrants acceptable in the situation confronting us. The existence of considerations such as would establish the acceptability of the most reliable warrants is something we are entitled to take for granted.

Finally, a word about the ways in which B differs from Q and R: these are too obvious to need expanding upon, since the grounds for regarding a warrant as generally acceptable are clearly one thing, the force which the warrant lends to a conclusion another, and the sorts of exceptional circumstance which may in particular cases rebut the presumptions the warrant creates a third. They correspond, in our example, to the three statements, (i) that the statues about British nationality *have in fact* been validly passed into law, and say this: . . . , (ii) that Harry *may be presumed* to be a British subject, and (iii) that Harry, having recently become a naturalised American, *is no longer covered* by these statutes.

One incidental point should be made, about the interpretation to be put upon the symbols in our pattern of argument: this may throw light on a slightly puzzling example which we came across when discussing Kneale's views on probability. Consider the arrow joining D and C. It may seem natural to suggest at first that this arrow should be read as 'so' in one direction and as 'because' in the other. Other interpretations are however possible. As we saw earlier, the step from the information that Jones has Bright's Disease to the conclusion that he cannot be expected to live to eighty does not reverse perfectly: we find it natural enough to say, 'Jones cannot be expected to live to eightly, *because* he has Bright's Disease', but the fuller statement, 'Jones cannot be expected to live to eighty, *because* the probability of his living that long is low, *because* he has Bright's Disease', strikes us as cumbrous and artificial, for it puts in an extra step which is trivial and unnecessary. On the other hand, we do not mind saying, 'Jones has Bright's Disease, *so* the chances of his living to eighty are slight, *so* he cannot be expected to live that long', for the last clause is (so to speak) an *inter alia* clause—it states one of the many particular morals one can draw from the middle clause, which tells us his general expectation of life.

So also in our present case: reading along the arrow from right to left or from left to right we can normally say both 'C, because D' and 'D, so C'. But it may sometimes happen that some more general conclusion than C may be warranted, given D: where this is so, we shall often find it natural to write, not only 'D, so C', but also 'D, so C′, so C', C′ being the more general conclusion warranted in view of data D, from which in turn we infer *inter alia* that C. Where this is the case, our 'so' and 'because' are no longer

reversible: if we now read the argument backwards the statement we get—'C, because C′, because D'—is again more cumbrous than the situation really requires.

Ambiguities in the Syllogism

The time has come to compare the distinctions we have found of practical importance in the layout and criticism of arguments with those which have traditionally been made in books on the theory of logic: let us start by seeing how our present distinctions apply to the syllogism or syllogistic argument. For the purposes of our present argument we can confine our attention to one of the many forms of syllogism—that represented by the time-honoured example:

> Socrates is a man;
> All men are mortal;
> So Socrates is mortal.

This type of syllogism has certain special features. The first premiss is 'singular' and refers to a particular individual, while the second premiss alone is 'universal'. Aristotle himself was, of course, much concerned with syllogisms in which both the premisses were universal, since to his mind many of the arguments within scientific theory must be expected to be of this sort. But we are interested primarily in arguments by which general propositions are applied to justify particular conclusions about individuals; so this initial limitation will be convenient. Many of the conclusions we reach will, in any case, have an obvious application—*mutatis mutandis*—to syllogisms of other types. We can begin by asking the question 'What corresponds in the syllogism to our distinction between data, warrant, and backing?' If we press this question, we shall find that the apparently innocent forms used in syllogistic arguments turn out to have a hidden complexity. This internal complexity is comparable with that we observed in the case of modally-qualified conclusions: here, as before, we shall be obliged to disentangle two distinct things—the force of universal premisses, when regarded as warrants, and the backing on which they depend for their authority.

In order to bring these points clearly to light, let us keep in view not only the two universal premisses on which logicians normally concentrate—'All A's are B's' and 'No A's are B's'—but also two other forms of statement which we probably have just as much occasion to use

in practice—'Almost all A's are B's' and 'Scarcely any A's are B's'. The internal complexity of such statments can be illustrated first, and most clearly, in the latter cases.

Consider, for instance, the statement, 'Scarcely any Swedes are Roman Catholics.' This statement can have two distinct aspects: both of them are liable to be operative at once when the statement figures in an argument, but they can nevertheless be distinguished. To begin with, it may serve as a simple statistical report: in that case, it can equally well be written in the fuller form, 'The proportion of Swedes who are Roman Catholics is less than (say) 2%'—to which we may add a parenthetical reference to the source of our information, '(According to the tables in *Whittaker's Almanac*)'. Alternatively, the same statement may serve as a genuine inference-warrant: in that case, it will be natural to expand it rather differently, so as to obtain the more candid statement, 'A Swede can be taken almost certainly not to be a Roman Catholic.'

So long as we look at the single sentence 'Scarcely any Swedes are Roman Catholics' by itself, this distinction may appear trifling enough: but if we apply it to the analysis of an argument in which this appears as one premiss, we obtain results of some significance. So let us construct an argument of quasi-syllogistic form, in which this statement figures in the position of a 'major premiss'. This argument could be, for instance, the following:

> Petersen is a Swede;
> Scarcely any Swedes are Roman Catholics;
> So, almost certainly, Petersen is not a Roman Catholic.

The conclusion of this argument is only tentative, but in other respects the argument is exactly like a syllogism.

As we have seen, the second of these statements can be expanded in each of two ways, so that it becomes either, 'The proportion of Swedes who are Roman Catholics is less than 2%', or else, 'A Swede can be taken almost certainly not to be a Roman Catholic.' Let us now see what happens if we substitute each of these two expanded versions in turn for the second of our three original statements. In one case we obtain the argument:

> Petersen is a Swede;
> A Swede can be taken almost certainly not to be a Roman Catholic;
> So, almost certainly, Petersen is not a Roman Catholic.

Here the successive lines correspond in our terminology to the statement of a datum (D), a warrant (W), and a conclusion (C). On the other

hand, if we make the alternative substitution, we obtain:

> Petersen is a Swede;
> The proportion of Roman Catholic Swedes is less than 2%;
> So, almost certainly, Petersen is not a Roman Catholic.

In this case we again have the same datum and conclusion, but the second line now states the backing (B) for the warrant (W), which is itself left unstated.

For tidiness' sake, we may now be tempted to abbreviate these two expanded versions. If we do so, we can obtain respectively the two arguments:

> (D) Petersen is a Swede;
> (W) A Swede is almost certainly not a Roman Catholic;
> So, (C) Petersen is almost certainly not a Roman Catholic:

and,   (D) Petersen is a Swede;
>   (B) The proportion of Roman Catholic Swedes is minute;
>   So, (C) Petersen is almost certainly not a Roman Catholic.

The relevance of our distinction to the traditional conception of 'formal validity' should already be becoming apparent, and we shall return to the subject shortly.

Turning to the form 'No A's are B's' (e.g. 'No Swedes are Roman Catholics'), we can make a similar distinction. This form of statement also can be employed in two alternative ways, either as a statistical report, or as an inference-warrant. It can serve simply to report a statistician's discovery—say, that the proportion of Roman Catholic Swedes is in fact zero; or alternatively it can serve to justify the drawing of conclusions in argument, becoming equivalent to the explicit statement, 'A Swede can be taken certainly not to be a Roman Catholic.' Corresponding interpretations are again open to us if we look at an argument which includes our sample statement as the universal premiss. Consider the argument:

> Petersen is a Swede;
> No Swedes are Roman Catholics;
> So, certainly, Petersen is not a Roman Catholic.

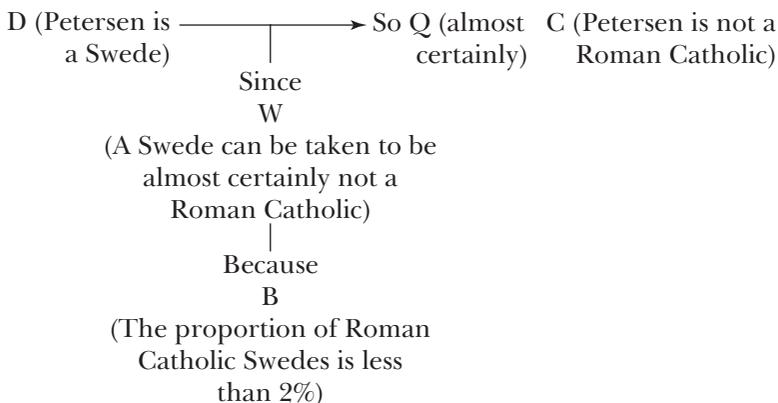This can be understood in two ways: we may write it in the form:

> Petersen is a Swede;
> The proportion of Roman Catholic Swedes is zero;
> So, certainly, Petersen is not a Roman Catholic,

or alternatively in the form:

> Petersen is a Swede;
> A Swede is certainly not a Roman Catholic;
> So, certainly, Petersen is not a Roman Catholic.

Here again the first formulation amounts, in our terminology, to putting the argument in the form 'D, B, so C'; while the second formulation is equivalent to putting it in the form 'D, W, so C'. So, whether we are concerned with a 'scarcely any . . .' argument or a 'no . . .' argument, the customary form of expression will tend in either case to conceal from us the distinction between an inference-warrant and its backing. The same will be true in the case of 'all' and 'nearly all': there, too, the distinction between saying 'Every, or nearly every single A *has been found* to be a B' and saying 'An A *can be taken*, certainly or almost certainly, to be a B' is concealed by the over-simple form of words 'All A's are B's.' A crucial difference in practical function can in this way pass unmarked and unnoticed.

Our own more complex pattern of analysis, by contrast, avoids this defect. It leaves no room for ambiguity: entirely separate places are left in the pattern for a warrant and for the backing upon which its authority depends. For instance, our 'scarcely any . . .' argument will have to be set out in the following way:

D (Petersen is ————————→ So Q (almost   C (Petersen is not a
    a Swede) | certainly)   Roman Catholic)
                   Since
                     W
        (A Swede can be taken to be
             almost certainly not a
                Roman Catholic)
                     |
                  Because
                     B
          (The proportion of Roman
            Catholic Swedes is less
                 than 2%)

Corresponding transcriptions will be needed for arguments of the other three types.

When we are theorising about the syllogism, in which a central part is played by propositions of the forms 'All A's are B's' and 'No A's are B's', it will accordingly be as well to bear this distinction in mind. The form of statement 'All A's are B's' is as it stands deceptively simple: it may have

in use both the force of a warrant and the factual content of its backing, two aspects which we can bring out by expanding it in different ways. Sometimes it may be used, standing alone, in only one of these two ways at once; but often enough, especially in arguments, we make the single statement do both jobs at once and gloss over, for brevity's sake, the transition from backing to warrant—from the factual information we are presupposing to the inference-licence which that information justifies us in employing. The practical economy of this habit may be obvious; but for philosophical purposes it leaves the effective structure of our arguments insufficiently candid.

There is a clear parallel between the complexity of 'all . . .' statements and that of modal statements. As before, the *force* of the statements is invariant for all fields of argument. When we consider this aspect of the statements, the form 'All A's are B's' may always be replaced by the form 'An A can certainly be taken to be a B': this will be true regardless of the field, holding good equally of 'All Swedes are Roman Catholics', 'All those born in British colonies are entitled to British citizenship', 'All whales are mammals', and 'All lying is reprehensible'—in each case, the general statement will serve as a warrant authorising an argument of precisely the same form, D→C, whether the step goes from 'Harry was born in Bermuda' to 'Harry is a British citizen' or from 'Wilkinson told a lie' to 'Wilkinson acted reprehensibly.' Nor should there be any mystery about the nature of the step from D to C, since the whole *force* of the general statement 'All A's are B's', as so understood, is to authorise just this sort of step.

By contrast, the kind of *grounds* or *backing* supporting a warrant of this form will depend on the field of argument: here the parallel with modal statements is maintained. From this point of view, the important thing is the factual content, not the force of 'all . . .' statements. Though a warrant of the form 'An A can certainly be taken to be a B' must hold good in any field in virtue of *some* facts, the actual sort of facts in virtue of which any warrant will have currency and authority will vary according to the field of argument within which that warrant operates; so, when we expand the simple form 'All A's are B's' in order to make explicit the nature of the backing it is used to express, the expansion we must make will also depend upon the field with which we are concerned. In one case, the statement will become 'The proportion of A's found to be B's is 100%'; in another, 'A's are ruled by statute to count unconditionally as B's'; in a third, 'The class of B's includes taxonomically the entire class of A's'; and

in a fourth, 'The practice of doing A leads to the following intolerable consequences, etc.' Yet, despite the striking differences between them, all these elaborate propositions are expressed on occasion in the compact and simple form 'All A's are B's.'

Similar distinctions can be made in the case of the forms, 'Nearly all A's are B's', 'Scarcely any A's are B's', and 'No A's are B's.' Used to express warrants, these differ from 'All A's are B's' in only one respect, that where before we wrote 'certainly' we must now write 'almost certainly', 'almost cetainly not' or 'certainly not'. Likewise, when we are using them to state not warrants but backing: in a statistical case we shall simply have to replace '100%' by (say) 'at least 95%', 'less than 5%' or 'zero'; in the case of a statute replace 'unconditionally' by 'unless exceptional conditions hold', 'only in exceptional circumstances' or 'in no circumstances whatever'; and in a taxonomical case replace 'the entirety of the class of A's' by 'all but a small sub-class . . .', 'only a small sub-class . . .' or 'no part of . . .'. Once we have filled out the skeletal forms 'all . . .' and 'no . . .' in this way, the field-dependence of the backing for our warrants is as clear as it could be.

The Notion of 'Universal Premisses'

The full implications of the distinction between force and backing, as applied to propositions of the form 'All A's are B's', will become clear only after one further distinction has been introduced—that between 'analytic' and 'substantial' arguments. This cannot be done immediately, so for the moment all we can do is to hint at ways in which the traditional way of setting out arguments—in the form of two premisses followed by a conclusion—may be misleading.

Most obviously, this pattern of analysis is liable to create an exaggerated appearance of uniformity as between arguments in different fields, but what is probably as important is its power of disguising also the great differences between the things traditionally classed together as 'premisses'. Consider again examples of our standard type, in which a particular conclusion is justified by appeal to a particular datum about an individual—the singular, minor premiss—taken together with a general piece of information serving as warrant and/or backing—the universal, major premiss. So long as we interpret universal premisses as expressing not warrants but their backing, both major and minor premisses are at any rate categorical and factual: in this respect, the information that not a single Swede

is recorded as being a Roman Catholic is on a par with the information that Karl Henrik Petersen is a Swede. Even so, the different roles played in practical argument by one's data and by the backing for one's warrants make it rather unfortunate to label them alike 'premisses'. But supposing we adopt the alternative interpretation of our major premisses, treating them instead as warrants, the differences between major and minor premisses are even more striking. A 'singular premiss' expresses a piece of information *from* which we are drawing a conclusion, a 'universal premiss' now expresses, not a piece of information at all, but a guarantee *in accordance with* which we can safely take the step from our datum to our conclusion. Such a guarantee, for all its backing, will be neither factual nor categorical but rather hypothetical and permissive. Once again, the two-fold distinction between 'premisses' and 'conclusion' appears insufficiently complex and, to do justice to the situation, one needs to adopt in its place at least the fourfold distinction between 'datum', 'conclusion', 'warrant' and 'backing'.

One way in which the distinction between the various possible interpretations of the 'universal premiss' may prove important to logicians can be illustrated by referring to an old logical puzzle. The question has often been debated, whether the form of statement 'All A's are B's' has or has not any existential implications: whether, that is, its use commits one to the belief that some A's do exist. Statements of the form 'Some A's are B's' have given rise to no such difficulty, for the use of this latter form always implies the existence of some A's, but the form 'All A's are B's' seems to be more ambiguous. It has been argued, for instance, that such a statement as 'All club-footed men have difficulty in walking' need not be taken as implying the existence of any club-footed men: this is a general truth, it is said, which would remain equally true even though, for once in a while, there were no living men having club feet, and it would not suddenly cease to be true that club-footedness made walking difficult just because the last club-footed man had been freed of his deformity by a skilful surgeon. Yet this leaves us uncomfortable: has our assertion then no existential force? Surely, we feel, club-footed men must at any rate *have* existed if we are to be able to make this assertion at all?

This conundrum illustrates very well the weaknesses of the term 'universal premiss'. Suppose that we rely on the traditional mode of analysis of arguments:

> Jack is club-footed;
> All club-footed men have difficulty in walking;
> So, Jack has difficulty in walking.

For so long as we do, the present difficulty will be liable to recur, since this pattern of analysis leaves it unclear whether the general statement 'All . . .' is to be construed as a premissive inference-warrant or as a factual report of our observations. Is it to be construed as meaning 'A club-footed man will (i.e. may be expected to) have difficulty in walking', or as meaning 'Every club-footed man of whom we have records had (i.e. was found to have) difficulty in walking'? We are not bound, except by long habit, to employ the form 'All A's are B's', with all the ambiguities it involves. We are at liberty to scrap it in favour of forms of expression which are more explicit, even if more cumbersome; and if we make this change, the problem about existential implications will simply no longer trouble us. The statement 'Every club-footed man of whom we hve records . . .' implies, of course, that there have been at any rate *some* club-footed men, since otherwise we should have no records to refer to; while the warrant 'A club-footed man will have difficulty in walking', equally of course, leaves the existential question open. We can truthfully say that club-footedness would be a handicap to any pedestrian, even if we knew that at this moment everyone was lying on his back and nobody was so deformed. We are therefore not compelled to answer as it stands the question whether 'All A's are B's' has existential implications: certainly we can refuse a clear Yes or No. Some of the statements which logicians represent in this rather crude form do have such implications; others do not. No entirely general answer can be given to the question, for what determines whether there are or are not existential implications in any particular case is not the form of statement itself, but rather the practical use to which this form is put on that occasion.

Can we say then that the form 'All A's are B's' has existential implications when used to express the backing of a warrant, but not when used to express the warrant itself? Even this way of putting the point turns out to be too neat. For the other thing which excessive reliance on the form 'All A's are B's' tends to conceal from us is the different sorts of backing which our general beliefs may require, and these differences are relevant here. No doubt the statement that every club-footed man of whom we have any record found his deformity a handicap in walking, which we have here cited as backing, implies that there been some such people; but we can back the same warrant by appeal to considerations of other kinds as well, e.g. by arguments explaining from anatomical principles in what way club-footedness may be expected to lead to disability—just how this shape of foot will prove a handicap. In these theoretical terms we could discuss the disabilities which would result from any kind of deformity

we cared to imagine, including ones which nobody is known ever to have had: this sort of backing accordingly leaves the existential question open.

Again, if we consider warrants of other types, we find plenty of cases in which the backing for a warrant has, as it stands, no existential implication. This may be true, for instance, in the case of warrants backed by statutory provisions: legislation may refer to persons or situations which have yet to be—for instance, to all married women who will reach the age of 70 after 1 January 1984—or alternatively to classes of persons none of whom may ever exist, such as men found guilty on separate occasions of ten different murders. Statutes referring to people of these types can provide backing for inference-warrants entitling us to take all kinds of steps in argument, without either the warrants or their backing implying anything about the existence of such people at all. To sum up: if we pay closer attention to the differences between warrants and backing, and between different sorts of backing for one and the same warrant, and between the backing for warrants of different sorts, and if we refuse to focus our attention hypnotically on the traditional form 'All A's are B's', we can not only come to see *that* sometimes 'All A's are B's' does have existential implications and sometimes not, but furthermore begin to understand *why* this should be so.

Once one has become accustomed to expanding statements of the form 'All A's are B's' and replacing them, as occasion requires, by explicit warrant or explicit statements of backing, one will find it a puzzle that logicians have been wedded to this form of statement for so long. The reasons for this will concern us in a later essay: for the moment, we may remark that they have done so only at the expense of impoverishing our languages and disregarding a large number of clues to the proper solutions of their conundrums. For the form 'All A's are B's' occurs in practical argument much less than one would suppose from logic text-books: indeed, a great deal of effort has to be expended in order to train students in ways of rephrasing in this special form the idiomatic statements to which they are already accustomed, thereby making these idiomatic utterances apparently amenable to traditional syllogistic analysis. There is no need, in complaining of this, to argue that idiom is sacrosanct, or provides by itself understanding of a kind we could not have had before. Nevertheless, in our normal ways of expressing ourselves, one will find many points of idiom which can serve as very definite clues, and are capable in this case of leading us in the right direction.

Where the logician has in the past cramped all general statements into his predetermined form, practical speech has habitually employed a dozen different forms—'Every single A is a B', 'Each A is a B', 'An A will be a B', 'A's are generally B's' and 'The A is a B' being only a selection. By contrasting these idioms, instead of ignoring them or insisting that they all fall into line, logicians would long ago have been led on to the distinctions we have found crucial. The contrast between 'Every A' and 'Not a single A', on the one hand, and 'Any A' or 'An A', on the other, points one immediately towards the distinction between statistical reports and the warrants for which they can be the backing. The differences between warrants in different fields are also reflected in idiom. A biologist would hardly ever utter the words 'All whales are mammals'; though sentences such as 'Whales are mammals' or 'The whale is a mammal' might quite naturally come from his lips or his pen. Warrants are one thing, backing another; backing by enumerative observation is one thing, backing by taxonomic classification another; and our choices of idiom, though perhaps subtle, reflect these differences fairly exactly.

Even in so remote a field as philosophical ethics, some hoary problems have been generated in just this way. Practice forces us to recognise that general ethical truths can aspire at best to hold good in the absence of effective counter-claims: conflicts of duty are an inescapable feature of the moral life. Where logic demands the form '*All* lying is reprehensible' or '*All* promise-keeping is right', idiom therefore replies 'Lying is reprehensible' and 'Promise-keeping is right.' The logician's 'all' imports unfortunate expectations, which in practice are bound on occasion to be disappointed. Even the most general warrants in ethical arguments are yet liable in unusual situations to suffer exceptions, and so at strongest can authorise only presumptive conclusions. If we insist on the 'all', conflicts of duties land us in paradox, and much of moral theory is concerned with getting us out of this morass. Few people insist on trying to put into practice the consequences of insisting on the extra 'all', for to do so one must resort to desperate measures: it can be done only by adopting an eccentric moral position, such as absolute pacifism, in which one principle and one alone is admitted to be genuinely universal, and this principle is defended through thick and thin, in the face of all the conflicts and counter-claims which would normally qualify its application. The road from nice points about logic and idiom to the most difficult problems of conduct is not, after all, such a long one.

The Notion of Formal Validity

The chief morals of this study of practical argument will be our concern in the final pair of essays. But there is one topic—the one from which this present essay began—about which we are already in a position to say something: namely, the idea of 'logical form', and the doctrines which attempt to explain the validity of arguments in terms of this notion of form. It is sometimes argued, for instance, that the validity of syllogistic arguments is a consequence of the fact that the conclusions of these arguments are simply 'formal transformations' of their premises. If the information we start from, as expressed in the major and minor premises, leads to the conclusion it does by a valid inference, that (it is said) is because the conclusion results simply from shuffling the parts of the premises and rearranging them in a new pattern. In drawing the inference, we re-order the given elements, and the formal relations between these elements as they appear, first in the premises and then in the conclusion, somehow or other assure for us the validity of the inference which we make.

   How does this doctrine look, if we now make our central distinction between the two aspects of the statement-form 'All A's are B's'? Consider an argument of the form

> X is an A;
> All A's are B's;
> So X is a B.

If we expand the universal premiss of this argument as a warrant, it becomes 'Any A can certainly be taken to be a B' or, more briefly, 'An A is certainly a B.' Substituting this in the argument, we obtain:

> X is an A;
> An A is certainly a B;
> So X is certainly a B.

When the argument is put in this way, the parts of the conclusion are manifestly the same as the parts of the premises, and the conclusion can be obtained simply by shuffling the parts of the premises and rearranging them. If that is what is meant by saying that the argument has the appropriate 'logical form', and that it is valid on account of that fact, then this may be said to be a 'formally valid' argument. Yet one thing must be noticed straight away: provided that the correct warrant is employed, any argument can be expressed in the form 'Data; warrant; so conclusion' and so become formally valid. By suitable choice of phrasing, that is, any such argument can be so expressed that its validity is apparent simply from its

form: this is true equally, whatever the field of the argument—it makes no difference if the universal premiss is 'All multiples of 2 are even', 'All lies are reprehensible' or 'All whales are mammals.' Any such premiss can be written as an unconditional warrant, 'An A is certainly a B', and used in formally valid inference; or, to put the point less misleadingly, can be used in an inference which is so set out that its validity becomes formally manifest.

On the other hand, if we substitute the backing for the warrant, i.e. interpret the universal premiss in the other way, there will no longer be any room for applying the idea of formal validity to our argument. An argument of the form 'Data; backing; so conclusion' may, for practical purposes, be entirely in order. We should accept without hesitation the argument:

> Petersen is a Swede;
> The recorded proportion of Roman Catholic Swedes is zero;
> So, certainly, Petersen is not a Roman Catholic.

But there can no longer be any pretence that the soundness of this argument is a consequence of any formal properties of its constituent expressions. Apart from anything else, the elements of the conclusion and premisses are not the same: the step therefore involves more than shuffling and re-ordering. For that matter, of course, the validity of the (D; W; so C) argument was not really a *consequence* of its formal properties either, but at any rate in that case one could state the argument in a particularly tidy form. Now this can no longer be done: a (D; B; so C) argument will not be formally valid. Once we bring into the open the backing on which (in the last resort) the soundness of our arguments depends, the suggestion that validity is to be explained in terms of 'formal properties', in any geometrical sense, loses its plausibility.

This discussion of formal validity can throw some light on another point of idiom: one in which the customary usage of arguers again parts company with logical tradition. The point arises in the following way. Suppose we contrast what may be called 'warrant-using' arguments with 'warrant-establishing' ones. The first class will include, among others, all those in which a single datum is relied on to establish a conclusion by appeal to some warrant whose acceptability is being taken for granted— examples are 'Harry was born in Bermuda, so presumably (people born in the colonies being entitled to British citizenship) Harry is a British citizen', 'Jack told a lie, so presumably (lying being generally reprehensible) Jack behaved in a reprehensible way', and 'Petersen is a Swede,

so presumably (scarcely any Swedes being Roman Catholics) Petersen is not a Roman Catholic.' Warrant-establishing arguments will be, by contrast, such arguments as one might find in a scientific paper, in which the acceptability of a novel warrant is made clear by applying it successively in a number of cases in which both 'data' and 'conclusion' have been independently verified. In this type of argument the warrant, not the conclusion, is novel, and so on trial.

Professor Gilbert Ryle has compared the steps involved in these two types of argument with, respectively, the taking of a journey along a railway already built and the building of a fresh railway: he has argued persuasively that only the first class of arguments should be referred to as 'inferences', on the ground that the essential element of innovation in the later class cannot be made the subject of rules and that the notion of inference essentially involves the possibility of 'rules of inference'.

The point of idiom to be noticed here is this: that the distinction we have marked by the unwieldy terms 'warrant-using' and 'warrant-establishing' is commonly indicated in practice by the word 'deductive', its affiliates and their opposites. Outside the study the family of words, 'deduce', 'deductive' and 'deduction', is applied to arguments from many fields; all that is required is that these arguments shall be warrant-using ones, applying established warrants to fresh data to derive new conclusions. It makes no difference to the propriety of these terms that the step from D to C will in some cases involve a transition of logical type—that it is, for instance, a step from information about the past to a prediction about the future.

Sherlock Holmes, at any rate, never hesitated to say that he had *deduced*, e.g., that a man was recently in East Sussex from the colour and texture of the fragments of soil he left upon the study carpet; and in this he spoke like a character from real life. An astronomer would say, equally readily, that he had *deduced* when a future eclipse would occur from the present and past positions and motions of the heavenly bodies involved. As Ryle implies, the meaning of the word 'deduce' is effectively the same as that of 'infer'; so that, wherever there are established warrants or set procedures of computation by which to pass from data to a conclusion, there we may properly speak of 'deductions'. A regular prediction, made in accordance with the standard equations of stellar dynamics, is in this sense an unquestionable deduction; and so long as Sherlock Holmes also is capable of producing sound, well-backed warrants to justify his steps, we can allow that he too has been making deductions—unless one has just been reading a textbook of formal logic. The protestations of

another sleuth that Sherlock Holmes was in error, in taking for deductions arguments which were really inductive, will strike one as hollow and mistaken.

The other side of this coin is also worth a glance: namely, the way in which the word 'induction' can be used to refer to warrant-establishing arguments. Sir Isaac Newton, for instance, regularly speaks of 'rendering a proposition general by induction': by this he turns out to mean 'using our observations of regularities and correlations as the backing for a novel warrant'. We begin, he explains, by establishing that a particular relation holds in a certain number of cases, and then, 'rendering it general by induction', we continue to apply it to fresh examples for so long as we can successfully do so: if we get into trouble as a result, he says, we are to find ways of rendering the general statement 'liable to exceptions', i.e. to discover the special circumstances in which the presumptions established by the warrant are liable to rebuttal. A general statement in physical theory, as Newton reminds us, must be construed not as a statistical report about the behaviour of a very large number of objects, but rather as an open warrant or principle of computation: it is established by testing it in sample situations where both data and conclusion are independently known, then rendered general by induction, and finally applied as a rule of deduction in fresh situations to derive novel conclusions from our data.

In many treatises on formal logic, on the other hand, the term deduction is reserved for arguments in which the data and backing positively entail the conclusion—in which, that is to say, to state all the data and backing and yet to deny the conclusion would land one in a positive inconsistency or contradiction. This is, of course, an ideal of deduction which no astronomer's prediction could hope to approach; and if that is what formal logicians are going to demand of any 'deduction', it is no wonder they are unwilling to call such computations by that name. Yet the astronomers are unwilling to change their habits: they have been calling their elaborate mathematical demonstrations 'deductions' for a very long time, and they use the term to mark a perfectly genuine and consistent distinction.

What are we to make of this conflict of usage? Ought we to allow any argument to count as a deduction which applies an established warrant, or must we demand in addition that it should be backed by a positive entailment? This question we are not yet ready to determine. All we can do at the moment is register the fact that at this point customary idiom outside the study tends to deviate from the professional usage of logicians.

As we shall see, this particular deviation is only one aspect of a larger one, which will concern us throughout a large part of our fourth essay and whose nature will become clearer when we have studied one final distinction. To that distincion, between 'analytic' and 'substantial' arguments, we must now turn.

Analytic and Substantial Arguments

This distinction is best approached by way of a preamble. We remarked some way back that an argument expressed in the form 'Datum; warrant; so conclusion' can be set out in a formally valid manner, regardless of the field to which it belongs; but this could never be done, it appeared, for arguments of the form 'Datum; backing for warrant; so conclusion'. To return to our stock example: if we are given information about Harry's birthplace, we may be able to draw a conclusion about his nationality, and defend it with a formally valid argument of the form (D; W; so C). But the warrant we apply in this formally valid argument rests in turn for its authority on facts about the enactment and provisions of certain statutes, and we can therefore write out the argument in the alternative form (D; B; so C), i.e.:

> Harry was born in Bermuda;
> The relevant statutes ($W_1 \ldots$) provide that people born in the colonies
>   of British parents are entitled to British citizenship;
> So, presumably, Harry is a British citizen.

When we choose this form, there is no question of claiming that the validity of the argument is evident simply from the formal relations between the three statements in it. Stating the backing for our warrant in such a case inevitably involves mentioning Acts of Parliament and the like, and these references destroy the formal elegance of the argument. In other fields, too, explicitly mentioning the backing for our warrant— whether this takes the form of statistical reports, appeals to the results of experiments, or references to taxonomical systems—will prevent us from writing the argument so that its validity shall be manifest from its formal properties alone.

   As a general rule, therefore, we can set out in a formally valid manner arguments of the form 'D; W; so C' alone: arguments of the form 'D; B; so C' cannot be so expressed. There is, however, one rather special class of arguments which appears at first sight to break this general rule, and these we shall in due course christen *analytic* arguments. As an illustration

we may take the following:

> Anne is one of Jack's sisters;
> All Jack's sisters have red hair;
> So, Anne has red hair.

Arguments of this type have had a special place in the history of logic, and we shall have to pay close attention to them: it has not always been recognised how rare, in practice, arguments having their special characteristics are.

As a first move, let us expand this argument as we have already done those of other types. Writing the major premiss as a statement of backing, we obtain:

> Anne is one of Jack's sisters;
> Each one of Jack's sisters has (been checked individually to have) red hair;
> So, Anne has red hair.

Alternatively, writing warrant in place of backing, we have:

> Anne is one of Jack's sisters;
> Any sister of Jack's will (i.e. may be taken to) have red hair;
> So, Anne has red hair.

This argument is exceptional in the following respect. If each one of the girls has been checked individually to have red hair, then Anne's hair-colour has been specifically checked in the process. In this case, accordingly, the backing of our warrant includes explicitly the information which we are presenting as our conclusion: indeed, one might very well replace the word 'so' before the conclusion by the phrase 'in other words', or 'that is to say'. In such a case, to accept the datum and the backing is *thereby* to accept implicitly the conclusion also; if we string datum, backing and conclusion together to form a single sentence, we end up with an actual tautology—'Anne is one of Jack's sisters and each one of Jack's sisters has red hair *and also* Anne has red hair.' So, for once, not only the (D; W; so C) argument but also the (D; B; so C) argument can—it appears—be stated in a formally valid manner.

Most of the arguments we have practical occasion to make use of are, one need hardly say, not of this type. We make claims about the future, and back them by reference to our experience of how things have gone in the past; we make assertions about a man's feelings, or about his legal status, and back them by references to his utterances and gestures, or to his place of birth and to the statutes about nationality; we

adopt moral positions, and pass aesthetic judgements, and declare support for scientific theories or political causes, in each case producing as grounds for our conclusion statements of quite other logical types than the conclusion itself. Whenever we do any of these things, there can be no question of the conclusion's being regarded as a mere restatement in other words of something already stated implicitly in the datum and the backing: though the argument may be formally valid when expressed in the form 'Datum; warrant; so conclusion', the step we take in passing to the conclusion from the information we have to rely on—datum and backing together—is a substantial one. In most of our arguments, therefore, the statement obtained by writing 'Datum; backing; *and also* conclusion' will be far from a tautology—obvious it may be, where the legitimacy of the step involved is transparent, but tautological it will not.

In what follows, I shall call arguments of these two types respectively *substantial* and *analytic.* An argument from D to C will be called analytic if and only if the backing for the warrant authorising it includes, explicitly or implicitly, the information conveyed in the conclusion itself. Where this is so, the statement 'D, B, and also C' will, as a rule, be tautological. (This rule is, however, subject to some exceptions which we shall study shortly.) Where the backing for the warrant does not contain the information conveyed in the conclusion, the statement 'D, B, and also C' will never be a tautology, and the argument will be a substantial one.

The need for some distinction of this general sort is obvious enough, and certain aspects of it have forced themselves on the attention of logicians, yet its implications have never been consistently worked out. This task has been neglected for at least two reasons. To begin with, the internal complexity of statements of the form 'All A's are B's' helps to conceal the full difference between analytic and substantial arguments. Unless we go to the trouble of expanding these statements, so that it becomes manifest whether they are to be understood as stating warrants or the backing for warrants, we overlook the great variety of arguments susceptible of presentation in the traditional syllogistic form: we have to bring out the distinction between backing and warrant explicitly in any particular case if we are to be certain what sort of argument we are concerned with on that occasion. In the second place, it has not been recognised how exceptional genuinely analytic arguments are, and how difficult it is to produce an argument which will be analytic past all question: if logicians had recognised these facts, they might have been less ready to treat

analytic arguments as a model which other types of argument were to emulate.

　　Even our chosen example, about the colour of Anne's hair, may easily slip out of the analytic into the substantial class. If the backing for our step from datum, 'Anne is Jack's sister', to conclusion, 'Anne has red hair', is just the information that each of Jack's sisters has *in the past* been observed to have red hair, then—one might argue—the argument is a substantial one even as it stands. After all, dyeing is not unknown. So ought we not to rewrite the argument in such a way as to bring out its substantial character openly? On this interpretation the argument will become:

> Datum—Anne is one of Jack's sisters;
> Backing—All Jack's sisters have previously been observed to have red hair;
> Conclusion—So, presumably, Anne now has red hair.

The warrant relied on, for which the backing is here stated, will be of the form, 'Any sister of Jack's may be taken to have red hair': for the reasons given, this warrant can be regarded as establishing no more than a presumption:

It seems, then, that I can defend my conclusion about Anne's hair with an unquestionably analytic argument only if at this very moment I have all of Jack's sisters in sight, and so can back my warrant with the assurance that every one of Jack's sisters has red hair at this moment. But, in such a situation, what need is there of an *argument* to establish the colour of Anne's hair? And of what relevance is the other sisters' hair-colour? The thing to do now is use one's eyes, not hunt up a chain of reasoning. If the purpose of an argument is to establish conclusions about which we are not entirely confident by relating them back to other information about which we have greater assurance, it begins to be a little doubtful whether any genuine, practical argument could *ever* be properly analytic.

Mathematical arguments alone seem entirely safe: given the assurance that every sequence of six or more integers between 1 and 100 contains at least one prime number, and also the information that none of the numbers from 62 up to 66 is a prime, I can thankfully conclude that the number 67 is a prime; and that is an argument whose validity neither time nor the flux of change can call in question. This unique character of mathematical arguments is significant. Pure mathematics is possibly the only intellectual activity whose problems and solutions are 'above time'. A mathematical problem is not a quandary; its solution has no time-limit; it involves no steps of substance. As a model argument for formal logicians to analyse, it may be seducingly elegant, but it could hardly be less representative.

The Peculiarities of Analytic Arguments

For the rest of this essay, two chief tasks remain. First, we must clarify a little further the special characterstics of analytic arguments: after that, we must contrast the distinction between analytic and substantial arguments with three other distinctions whose importance we have already seen:

   (i) that between formally valid arguments and those which are not formally valid,
  (ii) that between warrant-using and warrant-establishing arguments,
 (iii) that between arguments leading to necessary conclusions and those leading only to probable conclusions.

As to the nature of analytic arguments themselves, two things need to be discussed. To begin with we must ask upon what foundation arguments of this type ultimately depend for their validity: after that, we must go on to reconsider the criteria provisionally suggested for distinguishing analytic arguments from others—for the 'tautology test' turns out, after all, to involve unsuspected difficulties.

To see how the first question arises, one should first recall how much less sharply than usual, in the case of analytic arguments, we can distin-guish between data and warrant-backing—between the information we argue *from*, and the information which lends authority to the warrants we argue *in accordance with*: so far as it concerns the conclusion that Anne has red hair, the information that Anne is Jack's sister has, at first sight, the same sort of bearing as the information that every one of Jack's sisters has red hair. This similarity may lead us to construe both pieces of infor-mation as data, and if we do so the question may be raised, 'What warrant

authorises us to pass from these two premisses jointly to the required conclusion?' Surely we cannot get from *any* set of data to a conclusion without *some* warrant; so what warrant can we produce to justify our inference in this case? This is the problem, and we can tackle it in only two ways: either we must accept the question, and produce a warrant, or alternatively we must reject the question in the form in which it stands, and insist on sending it back for rephrasing. (It is arguable, for instance, that we have a perfectly good warrant for passing from the *first* datum to the conclusion, and that the second piece of information is the backing for that warrant.) For the moment, however, let us consider this problem in the form in which it arises here.

The first thing to notice about this problem is the fact that it is completely general. So long as one is arguing only from Anne's being Jack's sister to her having red hair, the question what warrant authorises our inference is a *particular* question, relevant only to this argument and a few others; but if one asks, what warrant authorises us to pass from the information *both* that Anne is Jack's sister *and* that every single one of Jack's sisters has red hair to the conclusion that Anne has red hair, that question is nowhere near so restricted a question, since it can arise in exactly the same form for all arguments of this type, whatever their explicit subject-matter. The answer to be given must therefore be equally general, and stated in such a way as to apply equally to all such arguments. What warrant, then, are we to say does authorise this particular step? The attempts to answer this question satisfactorily have been prolonged and inconclusive, and we cannot follow them through here: several different principles of a wholly general character have been put forward as the implied warrant for steps of this kind—the 'Principle of the Syllogism', the 'Dictum de Omni et Nullo', and others. But, quite apart from the respective merits of their rival answers, philosophers have not even been agreed about *how* such general principles really authorise us to argue as we do. What sort of a statement is (say) the Principle of the Syllogism?—that is the first question needing attention.

There is a temptation to say that any principle validating all syllogisms alike must be understood as a statement about the meanings of our words—an implicit analysis of such pre-eminently logical words as 'all' and 'some'. One consequence of this view, which we shall scrutinise in the next essay, has been the growth of a rather limited doctrine about the nature and scope of logic. If the only principles of inference properly so-called are statements about the meanings of our words, then (some have argued) it is misleading to apply the title of inferring-rules to

other sorts of general statement also, which are concerned with matters of substance and not simply with the meanings of our words: as a result, the whole notion of inference-warrants, as set out in this essay, has been pushed aside as confused.

Now we may agree that there is not an exact parallel between the Principle of the Syllogism and those other sorts of argument-governing rules we have given the name of 'warrant', and yet feel that this conclusion goes too far. Without questioning at the moment the need for some Principle of the Syllogism, we may yet object to its being called a statement *about* the meanings of our words: why should we not see in it, rather, a warrant of a kind that holds good *in virtue of* the meanings of our words? This is an improvement on the previous formulation in at least one respect, for it leaves us free to say that other warrants—those we argue in accordance with outside the analytic field—hold good in virtue of other sorts of consideration. Legal principles hold good in virtue of statutory enactments and judicial precedents, the scientist's laws of nature in virtue of the experiments and observations by which they were established, and so on. In all fields, the force of our warrants is to authorise the step from certain types of data to certain types of conclusions, but, after all we have seen about the field-dependence of the criteria we employ in the practical business of argument, it is only natural to expect that inference-warrants in different fields should need establishing by quite different sorts of procedure.

Accordingly, there seems room for an accommodation—for us to accept the Principle of the Syllogism as the warrant of all analytic syllogisms, while retaining other kinds of general statement as warrants for arguments of other types. Yet there remains something paradoxical about admitting the need for a Principle of the Syllogism at all. With arguments of all other kinds, a man who is given the data and the conclusion and who understands perfectly well what he is told may yet need to have explained to him the authority for the step from one to the other. 'I understand what your evidence is, and I understand what conclusion you draw from it,' he may say, 'but I don't see *how* you get there.' The task of the warrant is to meet his need: in order to satisfy him we have to explain what is our warrant, and if necessary show on what backing it depends, and until we have done this it is still open to him to challenge our argument. With analytic arguments, on the other hand, this sort of situation is hardly conceivable: one is tempted to say of analytic arguments (as of analytic statements) that anyone who understands them must acknowledge their legitimacy. If a man does not see the legitimacy of an analytic step in any particular case, we shall not help him

much by proffering him any principle so general as the Principle of the Syllogism.

The suggestion that this principle really does a job for us, by serving as the warrant for all syllogistic arguments, is therefore implausible. Certainly, if it *is* to be regarded as a warrant, it is a warrant which requires no backing: this much is conceded by Aristotle in the fourth book of the *Metaphysics*, where he goes out of his way to reject any demand that the law of non-contradiction should be *proved*—he recognises that no backing we could produce would add anything to the strength of the principle, and that all we need do in its defence is to challenge a critic to produce a meaningful objection to it.

Let us therefore try following the alternative course: let us reject the request for a warrant to lend authority to all analytic syllogisms, insisting instead that one premiss of every such syllogism provides all the warrant we need. The information that *every* one of Jack's sisters has red hair, we may say, serves as backing for the warrant that *any* of his sisters may be taken to have hair of that colour, and it is this limited warrant which takes us from our initial information about Anne's being Jack's sister to the conclusion about her hair-colour: 'that's just analytic!' Our task is now to define more carefully what exactly here is 'just analytic', and to work out clearer tests than we have stated so far for recognising whether an argument is an analytic or a substantial one.

Three different tests suggest themselves, and their merits we must now consider. First, there is the *tautology* test: in an analytic syllogism with an 'all' in the major premiss, the data and backing positively entail the conclusion, so that we can write 'D, B, or *in other words* C', confident that in stating the conclusion we shall simply be repeating something already stated in the backing. The question is whether this is true of *all* analytic arguments: I shall argue that it is not. Secondly, there is the *verification* test: must verifying the backing implicitly relied on in an argument *ipso facto* involve checking the truth of the conclusion? This does not universally lead to the same result as the first test, and will prove to be a more satisfactory criterion. Finally, there is the test of *self-evidence*: once a man has had data, backing and conclusion explained to him, can he still raise genuine questions about the validity of the argument? This might at first seem to amount to the same as the first test but, as we shall see, it corresponds in practice more nearly to the second.

One type of example can be mentioned straight away in which the tautology criterion leads to difficulties. This is the 'quasi-syllogism', discussed earlier, in which the universal quantifiers 'all' and 'no' are replaced by

the more restrictive ones 'nearly all' and 'scarcely any'. As an instance, we may take the argument:

> Petersen is a Swede;
> Scarcely any Swedes are Roman Catholics;
> So, almost certainly, Petersen is not a Roman Catholic.

This argument differs from the corresponding 'no' argument—

> Petersen is a Swede;
> No Swedes are Roman Catholics;
> So, certainly, Petersen is not a Roman Catholic—

only in relying on a weaker warrant and so ending in a more tentative conclusion. (Written explicitly as warrants the universal premisses are, respectively, 'A Swede can almost certainly be taken not to be a Roman Catholic' and 'A Swede can certainly be taken not to be a Roman Catholic'.)

The validity of the argument is in each case manifest, and by the test of self-evidence both should be classed as analytic arguments. If we imagine a man to challenge the 'scarcely any' argument, and to demand further backing to show its validity, his request will be no more intelligible than it would be in the case of the 'no' argument: he might ask in the first case to have the *conclusion* more firmly grounded, seeing that so long as we know only that scarcely any Swedes are Roman Catholics the possibility of any particular Swede's being of that persuasion is not ruled out past all question, but the *validity* of both arguments is surely not open to doubt. If he fails to see the force of either argument, there is little more we can do for him; and if he presents the same data and warrant-backing in support of the negated conclusion, the result will in either case be not just implausible but incomprehensible:

> Petersen is a Swede;
> The proportion of Roman Catholic Swedes is less than 5%/zero;
> So, almost certainly/certainly, Petersen *is* a Roman Catholic.

By the test of self-evidence, then, the 'scarcely any' and 'nearly all' arguments have as much right to be classed as analytic as have the 'all' and 'no' arguments.

But if we allow this parallel, how far do our other tests for recognising analytic arguments fit? In checking the backing for our warrant, we asked, would we *ipso facto* check the conclusion of our arguments? (This we called the verification test.) Alternatively, if we wrote down our data and backing, and added the words 'and also C'—C being our conclusion—would the

result be a tautology? Traditional syllogisms satisfy all our criteria equally well. Checking exhaustively that the proportion of Roman Catholic Swedes is zero of course involves checking what Petersen's religion is; while in addition the statement, 'Petersen is a Swede, and the proportion of Roman Catholic Swedes is zero, and also Petersen is not a Roman Catholic', can reasonably be called tautological. But when we look at quasi-syllogisms, we find the tautology test no longer applicable.

The verification test still fits the new cases, though it applies in a slightly Pickwickian manner: in checking exhaustively that the proportion of Roman Catholic Swedes was (say) less than 5%, we should *ipso facto* check what Petersen's religion was—whether it was actually Roman Catholicism or not. On the other hand, the statement, 'Petersen is a Swede and the proportion of Roman Catholic Swedes is less than 5%, and also Petersen is not a Roman Catholic', is no longer tautological: it is, rather, genuinely informative, since the conclusion locates Petersen definitely in the 95% majority. Even if we insert the modal qualifier 'almost certainly' in the conclusion, the resulting statement is not tautological either— 'Petersen is a Swede, the proportion of Roman Catholic Swedes is less than 5%, and also, almost certainly, Petersen is not a Roman Catholic.'

As a result, when we look for a general criterion to mark off analytic arguments from others, the verification test will enable us to classify quasi-syllogisms along with traditional syllogisms in a way the tautology test will not. We shall therefore class an argument as analytic if, and only if, it satisfies that criterion—if, that is, checking the backing of the warrant involves *ipso facto* checking the truth or falsity of the conclusion—and we shall do this whether a knowledge of the full backing would in fact verify the conclusion or falsify it.

At this point, two comments are needed about Petersen's case. Once we do have access to the complete backing, we shall of course no longer be entitled to rely simply on the bare percentage of the statistician's tables and our original argument will no longer be in place. We must base our argument about the likelihood of Petersen's being a Roman Catholic on *all* the relevant information we can get: if we in fact possess the detailed census returns, the only proper procedure is to look Petersen up by name, and find out the answer for certain. Secondly, the statement, 'Petersen is a Swede and the proportion of Roman Catholic Swedes is very low, and Petersen is almost certainly not a Roman Catholic', *would* be entirely tautological if one could properly *define* 'certainty' and 'probability' directly in terms of proportions and frequency. But to do this, as we saw, would mean ignoring the practical function of the term 'probability' and

its cognates as modal qualifiers. It would also lead to paradox: as things stand, a man can say with perfect propriety, 'Petersen is a Swede and the proportion of Roman Catholic Swedes is very low, and yet Petersen is almost certainly a Roman Catholic'—he will be entitled to say this, for instance, if he knows something further about Petersen which places him very probably in the Roman Catholic minority—whereas, if the original statement were a tautology, this new statement would be bound to be a self-contradiction.

One cannot, then, characterise analytic arguments as arguments in which the statement 'D, B and also C' is a tautology: in some cases at least, this criterion fails to serve our purposes. This helps to explain one further philosophical doctrine—that even analytic syllogisms are not valid in virtue of the meanings of words alone, and that failure to understand such an argument is a sign, not of linguistic incompetence, but rather of a 'defect of reason'. Suppose we tell a man that Petersen is a Swede, and that the proportion of Roman Catholic Swedes is either zero or very low; 'so', we conclude, 'Petersen is certainly—or almost certainly—not a Roman Catholic'. He fails to follow us: what then are we to say about him? If the tautology test were adequate, this would show that he did not really understand the meanings of all the words we had employed: if we give up the tautology view, this explanation is no longer open to us. Now we must say, rather, that he is blind to, i.e. fails to see the force of, the argument. Indeed what else can we say? This is not an explanation: it is a bare statement of the fact. He just does not follow the step, and the ability to follow such arguments is, surely, one of the *basic* rational competences.

This observation can throw some light on the true status of the Principle of the Syllogism. That principle, I suggested, enters logic when the second premiss of an analytic syllogism is misinterpreted as stating a datum instead of a warrant or its backing, and the argument is thereupon (apparently) left without any authorising warrant. The Principle of the Syllogism is then held out to us as somehow showing the *ultimate* foundation for the validity of *all* syllogistic arguments.

When considering arguments in other fields, we may again find ourselves going through this same sequence of steps. Suppose we begin by mistaking the backing of our warrant for an additional set of data; having done this, we shall appear to be arguing straight from data to conclusion, without our step's having any authority; and this lack will be found to affect, not just one, but every argument in the field concerned. To fill these fresh gaps, further completely general principles will now need to be invoked: one basic principle to lie behind all scientific predictions,

another to lie behind all properly grounded moral judgements, and so on. (This is a topic which we need mention here only in passing, since we shall have to return to it in the last of these essays.) Now, if the ability to follow valid syllogisms and quasi-syllogisms can best be described as a basic rational competence, and is not really explained in terms of linguistic ability or incompetence, perhaps there will be nothing more to be said in other cases either. The ability to follow simple predictive arguments, whose warrants are backed by sufficiently wide and relevant experience, may just have to be recognised as another simple rational skill, which most men possess but which is lacking in some mental defectives; and for other fields, other basic skills. Could this be said for arguments in all fields whatever? Is the ability to follow, and see the force of simple moral arguments (say), also such a skill? Or simple aesthetic arguments? Or simple theological arguments?...At this point we come directly up against the fundamental philosophical issue: whether all fields of argument alike are open to rational discussion, and whether the Court of Reason is competent to adjudicate equally, whetever the type of problem under discussion.

Some Crucial Distinctions

One major task remains for us to perform in this essay: we have to distinguish the division of arguments into analytic and substantial from three or four other possible modes of division. The dangers resulting from confusing these distinctions, and still more from running them together, are serious and can be avoided only with care.

To begin with, the division into analytic and substantial arguments does not correspond at all exactly to the division into *formally valid* arguments and others. An argument in an field whatever *may* be expressed in a formally valid manner, provided that the warrant is formulated explicitly as a warrant and authorises precisely the sort of inference in question: this explains how mathematical computations can be formally valid, even when the data argued from are entirely past and present observations and the conclusion argued to is a prediction about the future. On the other hand, an argument may be analytic, and yet not be expressed in a formally valid way: this is the case, for instance, when an analytic argument is written out with the backing of the warrant cited in place of the warrant itself.

Nor does the distinction between analytic and substantial arguments correspond, either, to that between *warrant-using* and *warrant-establishing*

arguments. In a very few cases, warrant-establishing arguments can be stated in a form which is formally valid: thus the argument, 'Jack has three sisters; the first has red hair, the second has red hair, the third has red hair; so all Jack's sisters have red hair', might be said to be at once warrant-establishing, formally valid and analytic. But, by and large, these characteristics vary independently. There can be warrant-using and warrant-establishing arguments both in the analytic field, and in other, substantial fields of argument, and one cannot seriously hope to make the two distinctions cut along one and the same line.

   Again, it has sometimes been thought that one could mark off a specially 'logical' class of arguments by reference to the *sorts of words* appearing in them. In some arguments, for instance, the words 'all' and 'some' play a crucial part, and such arguments as these deserve separate consideration. But if we do mark them off from others, we must immediately observe that the division which results corresponds no more closely than the previous two to the division between analytic arguments and substantial ones. Not all arguments are analytic in which the word 'all' appears in the major premiss or warrant: this will be so only in cases where the process of establishing the warrant would involve *ipso facto* checking the truth of the conclusion now to be inferred with its aid, and we do not restrict our use of 'all' to such cases. The task of identifying analytic arguments cannot therefore be performed by looking for key words like 'all' and 'some': it can be done only by looking at the nature of the problem under investigation, and the manner in which we establish the warrants relevant to its solution.

   These three distinctions can be recognised easily enough. The fourth and last distinction is at once the most contentious and the most important. Dividing arguments into analytic and substantial is not the same, I shall argue, as dividing them into arguments whose conclusions can be inferred *necessarily* or *certainly* and those whose conclusions can be inferred only *possibly* or with *probability*. As we saw when discussing modal qualifiers, there are some arguments in which the warrant authorises the step from D to C unambiguously, and others in which the step is authorised only tentatively, conditionally or with qualifications. This division is marked in practice by the words 'necessary' or 'conclusive' on the one hand, and 'tentative', 'probable', 'provisional' or 'conditional' on the other, and it is quite independent of the division into analytic arguments and substantial ones. Yet often enough logical theorists have attempted to run these two distinctions together, identifying analytic arguments with necessary or conclusive ones, and substantial arguments with tentative, probable

or inconclusive ones. The crucial question is whether this conflation can be justified, or whether, rather, we do not have occasion in practice to classify some arguments as at once substantial *and* conclusive, or as both analytic *and* tentative.

If we pay attention to the manner in which these categories are employed in the practical business of arguing, we shall discover plenty of occasions for making use of these seeming cross-classifications. For instance, a great many of the warrants in accordance with which we argue in the explanatory sciences authorise us to draw a conclusion unambiguously and unequivocally. The arguments they figure in are, accordingly, both substantial and conclusive, and scientists who make use of such arguments do not hesitate to round them off with the words '. . . so necessarily C'. Arguments of this kind are commonly met with in applied mathematics, as when, using the methods of geometrical optics, one calculates from the height of a wall and the angle of elevation of the sun how deep a shadow the wall will cast on level ground when the sun is shining directly on to it—if told that the wall is 6 ft. high and the sun at an angle of 30 degrees, a physicist will happily say that the shadow *must* have a depth of ten and a half feet.

In his *Philosophical Essay on Probabilities,* Laplace draws explicit attention to this class of substantial-yet-conclusive arguments: 'In the applications of mathematical analysis to physics,' he says, 'the results have all the certainty of facts,'[1] and he contrasts them with those arguments in which statistics are relied on, and whose conclusions are no more than probable. It is significant that he draws his distinction in just the manner he does. By applying the Newtonian system of mechanics to a problem in stellar dynamics, he reminds us, we are normally led, not to a whole battery of possible predictions each with a greater or lesser expectation of eventual confirmation, but to one single, unambiguous and unequivocal solution. If we are prepared to acknowledge that Newtonian mechanics is sufficiently well established for the purpose of the problem in hand, then we must accept this particular conclusion as following necessarily from our original data.

The point can be put more strongly: given the present standing of the theory, we are entitled to dispute the necessity of the conclusion only if we are prepared to challenge the adequacy or relevance of Newtonian dynamics. This means, not just pointing out that arguments in planetary dynamics are substantial ones (so that their soundness can be questioned

[1] Ch. III, 'Third Principle'.

without contradiction), but showing that they are *in fact* unreliable; i.e. attacking Newtonian dynamics on its own ground. Unless we are prepared to carry through this challenge, with all that it involves, the astronomer is entitled to ignore our objections and to claim that, for his purposes, the theory provides a unique and uniquely reliable answer to his questions. An answer obtained by these methods certainly *must* be the answer, he will say, for it is the answer to which a correctly performed calculation in accordance with well-established procedures necessarily leads us.

Nor do we find these substantial-yet-conclusive arguments in the more elaborate and technical sciences alone. When Sherlock Holmes says to Watson, 'So you see, my dear Watson, it *could only* have been Joseph Harrison who stole the Naval Treaty', or 'I concluded that the thief *must* be somebody living in the house', he does not mean that he can produce an analytic argument to establish his conclusion: he means rather that, by other-than-analytic standards and by appeal to other-that-analytic warrants, the evidence admits of this conclusion alone.

How widely this point of view deviates from that of many formal logicians, we shall see in the next essay. For them it is a commonplace that no argument can be both substantial and conclusive: only the conclusions of analytic arguments, they claim, can properly be classified as necessary, and the conclusions of substantial arguments—however well established and securely based the warrants relied on in reaching them—can never be more than highly probable. Why do they embrace this conclusion? Well, they explain, one can always imagine circumstances in which we might be forced to reconsider any substantial warrant: however well established any theory may appear at the moment, it makes sense to talk of future experiences forcing us to revise it, and so long as that remains the case—as in the nature of things it always must do—it will be presumptuous of us to call any conclusion reached in this way a necessary one. We could escape from this quandary only if the idea of our having to reconsider our inference-warrant gave rise to a positive contradiction, and this could never happen except with an analytic argument, whose warrant was backed not by experience but by an entailment.

If we have occasion to recognise in practice a class of arguments which are at once substantial and conclusive, so also do we recognise a class of analytic arguments with tentative or qualified conclusions. Quasi-syllogisms once more provide a good example. As is clear from their very wording, these arguments are not absolutely conclusive: all they entitle us to infer is (say) that Petersen is *almost certainly*, or *probably*, *not* a Roman Catholic. At the same time, we must accept these arguments as analytic for two

reasons: they satisfy our primary criterion of analyticity—the backing for the warrant employed including an implicit reference to the fact we are interested in inferring, even though we ourselves do not possess all the detailed backing; and further, the validity of such arguments must be evident as they stand, or not at all—if a man asks about a quasi-syllogism, 'Does it really follow? Is this really a legitimate inference?', we shall be as much at a loss to understand him as we should had he queried a genuine syllogism. One thing alone seems at first to count against calling quasi-syllogistic arguments analytic: the fact that data and backing taken together are, by linguistic standards, consistent with the negation of the conclusion—there is, as we saw, no positive contradiction in the supposition of Petersen's being a Swede, scarcely any Swedes being Roman Catholic, and yet Petersen's being a Roman Catholic. But then, how could one expect any *positive* contradiction here? The whole point of the qualifier 'probably' is to avoid any positive commitments, and this is its understood effect, whether it appears in an isolated statement or in the conclusion of an argument, and whether that argument is substantial or analytic. So here we have a *prima facie* case of an argument which is analytic without being conclusive.

At this point one objection may be pressed, as follows: 'Granted that quasi-syllogistic arguments are analytic, they nevertheless do not provide the example you require. You claim that they are tentative, but you succeed in giving this impression only by suppressing some of the essential data. If you were to state explicitly all the information needed for such arguments as these to be valid, it would become clear that they are not really tentative at all, but are as conclusive as one could ask.' What sort of information might one say was being suppressed? And would it, if brought to light, remove all inconclusiveness from these arguments? Two suggestions must be considered. Quasi-syllogistic arguments, it might be said, are valid only if we can add the datum, (*a*), '. . . and we know nothing else relevant about Petersen'—given this extra datum, the argument turns into an analytic one, leading necessarily to the conclusion that the likelihood of Petersen's being a Roman Catholic is small. Or alternatively, it may be argued, we must insert the additional datum, (*b*), '. . . and Petersen is a random Swede'—making this additional datum explicit, we shall see that a quasi-syllogistic argument is really a conclusive argument in disguise.

We cannot meet this objection by a straight denial, but only by restating it in a way which removes its force. It must of course be conceded that quasi-syllogisms can properly be advanced only if the initial data from which we argue state all that we know of relevance to the question at

issue: if they represent no more than a part of our relevant knowledge, we shall be required to argue not categorically but hypothetically—'Given only the information that Petersen is a Swede, we might conclude that the chances of his being a Roman Catholic were slight . . .'. But does this mean that the statement, (*a*), was an essential item in our data, which we should never have omitted? Surely this statement is not so much a statement *of* a datum as a statement *about the nature of* our data: it would naturally appear, not as part of our answer to the question, 'What have you got to go on?', but rather as a comment which we might add subsequently, after having stated (say) the solitary fact about Petersen's nationality.

The objection that we have omitted the information, (*b*), that Petersen is a random Swede (or a Swede taken at random) can be turned in a similar way. The information that he was a red-haired Swede, or a dark-complexioned Swede, or a Finnish-speaking Swede, could be called an 'extra fact' about him, and might possibly affect, in one way or another, our expectations about his religious beliefs. But the information that he was a *random* Swede is not like this at all. It is not a further fact about him which might be relevant to our expectations; it is at most a second-order comment on our previous information, indicating that, for all we know, we are entitled to presume about Petersen anything which established generalities about Swedes would suggest. So, once again, the so-called additional datum, (*b*), turns out to be not so much a datum as a passing comment about the applicability to this particular man of a warrant based only on statistical generalities.

The division of arguments into analytic and substantial is, therefore, entirely distinct from that into conclusive (necessary) and tentative (probable) arguments. Analytic arguments can be conclusive or tentative, and conclusive ones analytic or substantial. At once, one terminological precaution becomes urgent: we must renounce the common habit of using the adverb 'necessarily' interchangeably with the adverb 'deductively'— where this is used to mean 'analytically'. For where a substantial argument leads to an unequivocal conclusion, we are entitled to use the form 'D, so necessarily C', despite the fact that the relation between data, backing and conclusion is not analytic; and where an analytic argument leads to a tentative conclusion, we cannot strictly say any longer that the conclusion follows 'necessarily'—only, that it follows analytically. Once we fall into the way of identifying 'analytically' and 'necessarily', we shall end up by having to conclude an argument with the paradoxical words, '. . . so Petersen is necessarily probably not a Roman Catholic', or even, '. . . so Petersen is necessarily not a Roman Catholic'. Perhaps, indeed, it would

be better to scrap the words 'deductively' and 'necessarily' entirely, and to replace them either by 'analytically' or by 'unequivocally' according to the needs of the example.

The Perils of Simplicity

This essay has been deliberately restricted to prosaic studies of the different sorts of criticism to which our micro-arguments are subject, and to building up a pattern of analysis sufficiently complex to do justice to the most obvious differences between these forms of criticism. Much of this distinction-making would be tedious if we were not looking ahead to a point where the distinctions would prove of philosophical importance. So, in this concluding section, we can afford not only to look back over the ground which we have covered, but also to glance ahead to see the sort of value which these distinctions will have, and which will give a point to these laborious preliminaries.

We began from a question about 'logical form'. This had two aspects: there was the question, what relevance the geometrical tidiness sought in traditional analyses of the syllogism could have for a man trying to tell sound arguments from unsound ones; and there was the further question whether, in any event, the traditional pattern for analysing micro-arguments—'Minor Premiss, Major Premiss, so Conclusion'—was complex enough to reflect all the distinctions forced upon us in the actual practice of argument-assessment. We tackled the latter question first, with an eye to the example of jurisprudence. Philosophers studying the logic of legal arguments have long since been forced to classify their propositions into many more than three types, and, keeping our eyes on the actual practice of argument, we found ourselves obliged to follow them along the same road. There are in practical argument a good half-dozen functions to be performed by different sorts of proposition: once this is recognised, it becomes necessary to distinguish, not just between premisses and conclusions, but between claims, data, warrants, modal qualifiers, conditions of rebuttal, statements about the applicability or inapplicability of warrants, and others.

These distinctions will not be particularly novel to those who have studied explicitly the logic of special types of practical argument: the topic of exceptions or conditions of rebuttal, for instance—which were labelled (R) in our pattern of analysis—has been discussed by Professor H. L. A. Hart under the title of 'defeasibility', and he has shown its relevance not only to the jurisprudential study of contract but also to philosophical

theories about free-will and responsibility. (It is probably no accident that he reached these results while working in the borderland between jurisprudence and philosophy.) Traces of the distinction can be discerned even in the writings of some who remain wedded to the traditions of formal logic. Sir David Ross, for example, has discussed the same topic of rebuttals, especially in the field of ethics. He recognises that in practice we are compelled to allow exceptions to all moral rules, if only because any man recognising more than one rule is liable on occasion to find two of his rules pointing in different directions; but, being committed to the traditional pattern of argument-analysis, he has no category of presumptive arguments, or of rebuttals (R), in terms of which to account for this necessity. He gets around this by continuing to construe moral rules of action as major premises, but criticising the manner in which they are normally phrased. If we are to be logical, he claims, all our moral rules should have the words *prima facie* added to them: in the absence of these words, he can see no strict possibility of admitting any exceptions.

We accordingly found it more natural to look for parallels between logic and jurisprudence than for parallels between logic and geometry: a clearly analysed argument is as much one in which the formalities of rational assessment are clearly set out and which is couched 'in proper form', as one which has been presented in a tidy geometrical shape. Granted, there is a large class of valid arguments which can be expressed in the neat form', 'Data; Warrant; so Conclusion', the warrant serving precisely as the bridge required to make the transition from data to conclusion; but to call such an argument formally valid is to say only something about the manner in which it has been phrased, and tells us nothing about the *reasons for* its validity. These reasons are to be understood only when we turn to consider the *backing* of the warrant invoked.

The traditional pattern of analysis, I suggested, has two serious defects. It is always liable to lead us, as it leads Sir David Ross, to pay too little attention to the differences between the different modes of criticism to which arguments are subject—to the differences, for instance, between warrants (W) and rebuttals (R). Particular premises commonly express our data; whereas universal premises may express either warrants or the backing for warrants, and when they are stated in the form 'All A's are B's' it will often be entirely obscure just which function they are to be understood as performing. The consequences of this obscurity can be grave, as we shall see later, particularly when we allow for the other defect of the traditional pattern—the effect it has of obscuring the differences

between different fields of argument, and the sorts of warrant and backing appropriate to these different fields.

One central distinction we studied at some length: that between the field of analytic arguments, which in practice are somewhat rare, and those other fields of argument which can be grouped together under the title of substantial arguments. As logicians discovered early on, the field of analytic arguments is particularly simple; certain complexities which inevitably afflict substantial arguments need never trouble one in the case of analytic ones; and when the warrant of an analytic argument is expressed in the form 'All A's are B's', the whole argument can be laid out in the traditional pattern without harm resulting—for once in a while, the distinction between our data and the backing of our warrant ceases to be of serious importance. This simplicity is very attractive, and the theory of analytic arguments with universal major premisses was therefore seized on and developed with enthusiasm by logicians of many generations.

Simplicity, however, has its perils. It is one thing to choose as one's first object of theoretical study the type of argument open to analysis in the simplest terms. But it would be quite another to treat this type of argument as a paradigm and to demand that arguments in other fields should conform to its standards regardless, or to build up from a study of the simplest forms of argument alone a set of categories intended for application to arguments of all sorts: one must at any rate begin by inquiring carefully how far the artificial simplicity of one's chosen modal results in these logical categories also being artificially simple. The sorts of risks one runs otherwise are obvious enough. Distinctions which all happen to cut along the same line for the simplest arguments may need to be handled quite separately in the general case; if we forget this, and our new-found logical categories yield paradoxical results when applied to more complex arguments, we may be tempted to put these results down to defects in the arguments instead of in our categories; and we may end up by thinking that, for some regrettable reason hidden deep in the nature of things, only our original, peculiarly simple arguments are capable of attaining to the ideal of validity.

At this point, these perils can be hinted at only in entirely general terms. In the last two essays in this book, I shall make it my business to show more precisely how they have affected the actual results obtained, first by formal logicians, and then by philosophers working in the field of epistemology. The development of logical theory, I shall argue, began historically with the study of a rather special class of arguments—namely, the class of unequivocal, analytic, formally valid arguments with a universal

statement as 'major premiss'. Arguments in this class are exceptional in four different ways, which together make them a bad example for general study. To begin with, the use of the form 'All A's are B's' in the major premiss conceals the distinction between an inference-warrant and the statement of its backing. Secondly, with this class of arguments alone, the distinction between our data and our warrant-backing ceases to be of serious importance. (These first two factors between them can lead one to overlook the functional differences between data, warrants, and the backing of warrants; and so to put them on a level and label them all alike as 'premisses'.) In the third place, arguments of this chosen type be-ing analytic, the procedure for verifying the backing in each case involves *ipso facto* verifying the conclusion; while since they are, in the fourth place, unequivocal also, it becomes impossible to accept the data and backing and yet deny the conclusion, without positively contradicting oneself. These special characteristics of their first chosen class of arguments have been interpreted by logicians as signs of special merit; other classes of ar-gument, they have felt, are deficient in so far as they fail to display all the characteristic merits of the paradigm class; and the distinctions which in this first case alone all cut along one and the same line are identified and treated as a single distinction. The divisions of arguments into analytic and substantial, into warrant-using and warrant-establishing, into conclu-sive and tentative, and into formally valid and not formally valid: these are regimented for purposes of theory into a single distinction, and the pair of terms 'deductive' and 'inductive', which in practice—as we saw—is used to mark only the second of the four distinctions, is attached equally to all four.

    This vast initial over-simplification marks the traditional beginning of much in logical theory. Many of the current problems in the logical tradi-tion spring from adopting the analytic paradigm-argument as a standard by comparison with which all other arguments can be criticised. But an-alyticity is one thing, formal validity is another; and neither of these is a universal criterion of necessity, still less of the soundness of our argu-ments. Analytic arguments are a special case, and we are laying up trouble for ourselves, both in logic and in epistemology, if we treat them as any-thing else. That, at any rate, is the claim I hope to make good in the two essays which follow.

Conclusion

The first, indispensable steps in any philosophical inquiry are liable to seem entirely negative, both in intention and in effect. Distinctions are made, objections are pressed, accepted doctrines are found wanting, and such appearance of order as there was in the field is destroyed; and what, asks a critic, can be the use of that?

In immediate effect, the philosopher's initial moves do certainly tend to break down rather than build up analogies and connections. But this is inevitable. The late Ludwig Wittgenstein used to compare the re-ordering of our ideas accomplished in philosophy with the re-ordering of the books on the shelves of a library. The first thing one must do is to separate books which, though at present adjacent, have no real connection, and put them on the floor in different places: so to begin with the appearance of chaos in and around the bookcase inevitably increases, and only after a time does the new and improved order of things begin to be manifest—though, by that time, replacing the books in their new and proper positions will have become a matter of comparative routine. Initially, therefore, the librarian's and the philosopher's activities alike are bound to appear negative, confusing, destructive: both men must rely on their critics exercising a little charity, and looking past the initial chaos to the longer-term intention.

In these present inquiries, for instance, we may seem to have been preoccupied entirely with negative questions: what form logical theory should not take, what problems in theory of knowledge are mare's nests, what is wrong with the traditional notion of deduction, and so on. But, if this has been so, it is not from any love of distinctions and objections for their own sakes. If all were well (and clearly well) in philosophical logic,

there would be no point in embarking on these investigations: our excuse lies in the conviction that a radical re-ordering of logical theory is needed in order to bring it more nearly into line with critical practice, and our justification will come only if the distinctions and objections insisted on here bring such a re-ordering nearer.

Still, something can usefully be said in conclusion to indicate what more positive steps are required, both in logic and in theory of knowledge, so as to follow up the critical inquiries which have been our chief concern here. Having thrown out the old 'logic' and 'epistemology' sections from the catalogue of our intellectual library, how are we to set about replacing the scattered volumes in a new and more practical arrangement? The full answer would be a very long affair; but some general remarks can be made here about the principles which will govern any re-ordering. Three things especially need remarking on:

   (i) the need for a *rapprochement* between logic and epistemology, which will become not two subjects but one only;
  (ii) the importance in logic of the comparative method—treating arguments in all fields as of equal interest and propriety, and so comparing and contrasting their structures without any suggestion that arguments in one field are 'superior' to those in another; and
 (iii) the reintroduction of historical, empirical and even—in a sense— anthropological considerations into the subject which philosophers had prided themselves on purifying, more than all other branches of philosophy, of any but *a priori* arguments.

(1) To begin with, then, it will be necessary to give up any sharp distinction between logic on the one hand, and theory of knowledge on the other. The psychological tone and flavour of epistemological questions is (as we saw) misleading. The question, 'How does our cognitive equipment (our understanding) function?', must be treated for philosophical purposes as equivalent to the question, 'What sorts of arguments could be produced for the things we claim to know?'—so leaving aside the associated psychological and physiological questions, which are irrelevant to the philosopher's inquiries—and this question is one for logic. Whether an argument is put forward in support of a bare assertion, or of a claim to knowledge, in either case its adequacy will be a logical question: the fact that in the second case the assertion is made under cover of a claim to authority and reliability ('I know that...') makes no serious difference to the standards for judging the argument in its support.

So long as epistemology was thought of as including both psychological questions about the innate abilities of the new-born and physiological questions about the development of cerebro-physiological structure, as well as questions of a logical kind, it seemed to be an entirely autonomous branch of 'mental philosophy': the human understanding, its genesis and development, was quite another subject from the syllogism and its formal characteristics. But, if our investigations have been at all properly directed, logic and epistemology have now to move towards one another. Epistemology can divorce itself from psychology and physiology, and logic can divorce itself from pure mathematics: the proper business of both is to study the structures of our arguments in different fields, and to see clearly the nature of the merits and defects characteristic of each type of argument.

In a few fields, where logical self-consciousness can be of practical value, the study of applied logic has already gone a good way—though sometimes under other names. Jurisprudence is one subject which has always embraced a part of logic within its scope, and what we called to begin with 'the jurisprudential analogy' can be seen in retrospect to amount to something more than a mere analogy. If the same as has long been done for legal arguments were done for arguments of other types, logic would make great strides forward.

(2) This joint study—call it 'applied logic' or what you will—must inevitably be a comparative affair. The major distorting factor (we saw) in the development of logical theory hitherto has been the practice of treating arguments in one field as providing a universal standard of merit and validity. Philosophers have set up ideals of 'logical' necessity, 'logical' validity, and 'logical' possibility which can be applied to arguments outside the narrow, analytic field only at the preliminary, consistency-checking stage—or else by an illogical extension. Substantial arguments in natural science, ethics and elsewhere have been severely handled and judged by philosophers, solely on the grounds of not being (what they never pretended to be) analytic; and their quite genuine merits have been accounted negligible as compared with that initial and inevitable sin.

What has to be recognised first is that validity is an intra-field, not an inter-field notion. Arguments within any field can be judged by standards appropriate within that field, and some will fall short; but it must be expected that the standards will be field-dependent, and that the merits to be demanded of an argument in one field will be found to be absent (in the nature of things) from entirely meritorious arguments in another.

We must learn to tolerate in comparative logic a state of affairs long taken for granted in comparative anatomy. A man, a monkey, a pig

or a porcupine—to say nothing of a frog, a herring, a thrush and a coelacanth—each will be found to have its own anatomical structure: limbs, bones, organs and tissues arranged in a pattern characteristic of its species. In each species, some individuals will be deformed, either lacking an organ needed for life and survival, or having a part which is prevented by its make-up from serving the creature's life in a fully effective way. Yet what in an individual of one species counts as deformation may represent normality in one of another. A man with a hand the shape of a monkey's would indeed be deformed, and handicapped in living a man's life; but the very features which handicapped the man might be indispensable to the ape—far from being deformities, they could be of positive advantage. In this sense, normality and deformity are 'intra-specific', not 'inter-specific' notions, and the same kind of situation holds for terms of logical assessment. If we ask about the validity, necessity, rigour or impossibility of arguments or conclusions, we must ask these questions within the limits of a given field, and avoid, as it were, condemning an ape for not being a man or a pig for not being a porcupine.

The patterns of argument in geometrical optics, for instance—diagrams in which light rays are traced in their passage from object to image—are distinct from the patterns to be found in other fields: e.g. in a piece of historical speculation, a proof in the infinitesimal calculus, or the case for the plaintiff in a civil suit alleging negligence. Broad similarities there may be between arguments in different fields, both in the major phases of the arguments (which we studied in Essay I) and in their micro-structure (to which we turned in Essay III): it is our business, however, not to insist on finding such resemblances at all costs, but to keep an eye open quite as much for possible differences. Thus, in some fields we should expect to find 'necessary' conclusions as the rule, in others mainly 'presumptive' ones: inferences warranted by 'laws' will have one structure, those depending rather on simple empirical correlations will be somewhat different. Where differences of these kinds are found, we should normally respect them; we are at liberty to try and think up new and better ways of arguing in some field which specially interests us; but we should beware of concluding that there is any field in which all arguments equally must be invalid. The temptation to draw this conclusion should be taken as a danger-sign: it indicates almost certainly that irrelevant canons of judgement have entered into our analysis, and that arguments in the field concerned are being condemned for failing to achieve something which it is no business of theirs to achieve.

(3) Logic conceived in this manner may have to become less of an *a priori* subject than it has recently been; so blurring the distinction between

logic itself and the subjects whose arguments the logician scrutinises. (Some philosophers may see in this a reason for confining logic even more determinedly to 'the conditions of intelligible discourse'—namely, consistency and respect for entailments; but we have seen how drastic would be the price of this programme, if carried out completely.) Accepting the need to begin by collecting for study the actual forms of argument current in any field, our starting-point will be confessedly empirical: we shall study ray-tracing techniques because they are used to make optical inferences, presumptive conclusions and 'defeasibility' as an essential feature of many legal arguments, axiomatic systems because they reflect the pattern of our arguments in geometry, dynamics and elsewhere. This will seem a matter for apology only if one is completely wedded to the ideal of logic as a purely formal, *a priori* science.

But not only will logic have to become more empirical; it will inevitably tend to be more historical. To think up new and better methods of arguing in any field is to make a major advance, not just in logic, but in the substantive field itself: great logical innovations are part and parcel of great scientific, moral, political or legal innovations. In the natural sciences, for instance, men such as Kepler, Newton, Lavoisier, Darwin and Freud have transformed not only our beliefs, but also our ways of arguing and our standards of relevance and proof: they have accordingly enriched the logic as well as the content of natural science. Grotius and Bentham, Euclid and Gauss, have performed the same double feat for us in other fields. We must study the ways of arguing which have established themselves in any sphere, accepting them as historical facts; knowing that they may be superseded, but only as the result of a revolutionary advance in our methods of thought. In some cases these methods will not be further justifiable—at any rate by argument: the fact that they have established themselves in practice may have to be enough for us. (In these cases the propriety of our intellectual methods will be what the late R. G. Collingwood called an 'absolute presupposition'.) Even where they can be further justified in terms of more comprehensive conceptions, as the methods of geometrical optics can be justified by being embraced in the wider system of physical optics, the step will not be a formal *a priori* one but a substantial advance at the level of theory; and the conceptions of the wider system itself will in their turn remain something ultimate, whose successful establishment we must for the moment accept as a matter of history. In this way a door is opened out of logic, not only into psychology and sociology, but also into the history of ideas; we can look with new sympathy on Collingwood's vision of philosophy as a study of the methods of argument which at any historical moment

have served as the ultimate Court of Appeal in different intellectual disciplines.

Certain ways of thinking about Matter or the State or Conduct exist: others have existed but have been superseded. An indefinitely large number can no doubt be thought up which will be formally self-consistent, but in applied logic we can hardly do anything except start from the point at which we find ourselves. The sciences—natural, moral and practical—are *there*: an applied logician or epistemologist will be kept busy even if he studies only the species of inquiry and argument which have historically existed; and to do this adequately will be a lifetime's work for many men.

The mathematically-minded may, if they please, work out further abstract formal schemata—patterns of possible arguments detached from the actual business of arguing in any known field. But they should beware of fathering the results on to any of the existing sciences unless they are also prepared to do what we have here seen must be done—scrutinise the logical history, structure and *modus operandi* of the sciences using the eye of a naturalist, without preconceptions or prejudices imported from outside. This will mean seeing and describing the arguments in each field as they are, recognising how they work; not setting oneself up to explain why, or to demonstrate that they necessarily must work. What is required, in a phrase, is not epistemological *theory* but epistemological *analysis.*

There is no explanation of the fact that one sort of argument works in physics, for instance, except a deeper argument also within physics. (Practical logic has no escape-route, no bolt-hole into the *a priori*.) To understand the logic of physics is all of a piece with understanding physics. This is not to say that only professional physicists familiar with the latest theories can discuss the principles of that logic, since most of these are the same in elementary as in sophisticated branches of the science, and can be illustrated as well by historical episodes as by present-day ones. But it is to say that here, as also in political philosophy, ethics, and even the philosophy of religion, more attention needs to be paid, both to the actual state of the substantive subject at the present time, and to the course of its historical development. Remembering how, in the logic and philosophy of the physical sciences, men such as Duhem, Poincaré and Meyerson were for so long engaged on just this type of inquiry, and pursued it under the very title of *épistémologie*, an Englishman will look back with nostalgia at William Whewell, whose studies of the logic and of the history of the inductive sciences used likewise to illuminate one another. And he may be tempted to murmur under his breath, in parting, the memorable words of Laurence Sterne, 'They order this matter better in France.'

References

The analysis of arguments here presented owes much to Professor Gilbert Ryle, who has thrown out stimulating suggestions about logic both in the course of his book *The Concept of Mind* (London, 1949) and in subsequent papers, such as 'If, So, and Because' (in *Philosophical Analysis*, ed. M. Black, Cornell, 1950) and 'Logic and Professor Anderson' (*Australasian Journal of Philosophy*, 1950, pp. 137 ff.). His ideas about 'inference-licences' were applied to the physical sciences in my own *Philosophy of Science* (London, 1953) where some of the points discussed here in Essay III were treated in greater detail, notably the distinction between statements of scientific law and statements about the range of application of such laws. On the corresponding topic in jurisprudence, see J. L. Montrose, 'Judicial Law Making and Law Applying', in *Butterworth's South African Law Review* (1956), pp. 187ff.

The discussion of assessment and evaluation in Essay I extends to logical criticism the ideas of J. O. Urmson's paper 'On Grading', which is included in A. G. N. Flew, *Logic and Language: 2nd Series* (Oxford, 1953), pp. 159ff. The same topic is discussed also in Part II of R. M. Hare's book *The Language of Morals* (Oxford, 1952), where an interesting twist is given to G. E. Moore's famous attack on 'the naturalistic fallacy': cf. *Principia Ethica* (Cambridge, 1903). Hare however makes uncritical use of the sharp distinction between 'descriptive' and 'emotive' utterances, which is criticised in K. E. M. Baier and S. E. Toulmin, 'On Describing', *Mind* (1952), pp. 13ff. For Essay II, see J. L. Austin's paper 'Other Minds', in *Logic and Language: 2nd Series*, pp. 123ff., and also J. N. Findlay on 'Probability without Nonsense', *Philosophical Quarterly* (1952), pp. 218ff. For Essay III, see Ryle's book and papers, and also J. O. Urmson, 'Some Questions Concerning Validity', *Revue Internationale de Philosophie* (1953), pp. 217ff. (reprinted in Flew, *Essays in Conceptual Analysis* (London, 1956), pp. 120ff.), D. G. Brown, 'Misconceptions of Inference', *Analysis* (1955), H. L. A. Hart, 'The Ascription of Responsibilities and Rights', in Flew, *Logic and Language: 1st Series* (1951), pp. 145ff. On the question of 'statement-logic' and 'proposition-logic' touched on in Essay IV, see A. N. Prior, *Time and Modality* (Oxford, 1957), Appendix A. Essay V again owes much to Austin, *loc. cit.*

In conclusion, it is only fair to give precise references to books here criticised, so that a reader can judge for himself how far my strictures are just and where I have misrepresented the views I reject. These include, besides R. M. Hare, *op. cit.*, Rudolf Carnap, *Logical Foundations of Probability* (Chicago & London, 1950), William Kneale, *Probability and Induction* (Oxford, 1949), A. N. Prior, *Logic and the Basis of Ethics* (Oxford, 1949) and P. F. Strawson, *Introduction to Logical Theory* (London, 1952). The reference to the work of Sir David Ross is to *The Right and the Good* (Oxford, 1930), and that to Professor G. H. von Wright is to his paper on 'Deontic Logic' in *Mind* (1951), pp. 1ff., and to *An Essay in Modal Logic* (Amsterdam, 1951).