CHAPTER ONE

INFERENCE AND MEANING

I

Twenty or so years ago it was received dogma among the great majority of empirically-minded philosophers that the inference which finds its expression in "It is raining, therefore the streets will be wet" is an enthymeme. Explicitly formulated, it was claimed, the argument thus presented would read, "Whenever it rains the streets will be wet, it is raining; therefore the streets will be wet". As the validity of this reasoning rests on purely formal principles, it was concluded that the same is true of the briefer argument above, it being in all respects save formulation, identically the same. Thus, when Metaphysicus rehearsed for their benefit the argument "I am releasing a piece of chalk, therefore *of necessity* it will fall", adding by way of commentary, "Surely that was a reasonable argument. It is not, however, formally valid, so the necessity in question cannot be logical necessity. Must you not, therefore, admit that the inference is based on an appeal to a non-logical or material necessity?" our empiricists replied with the above analysis, and dismissed the subject with the remark, "It is now obvious that the only necessity involved is the logical necessity with which 'This chalk will fall' follows from 'All released pieces of chalk fall' and 'This piece of chalk is being released'."

One need not be persuaded by this retort to feel its force. After all, are there not such things as enthymemes? And is not the rephrased argument valid on purely logical grounds? Convincing though the retort may be, however, it scarcely amounts to a disproof of the idea that there are *material* as well as *formal* principles of inference, so that instead of merely being abridged edition of a formally valid argument, "It is raining, therefore the streets will be wet"

might well be as it stands a valid argument, though warranted by a material principle of inference. On what grounds would our empirically minded philosophers have rejected this idea? At least a partial answer lies close at hand. A scrutiny of the above clash with Metaphysicus suggests that tacit use is being made of Ockham's razor. The claim seems to be that even if it made sense to speak of non-logical principles of inference, there would be no need for them. For do not logical principles enable us to do all the arguing and inferring which these supposed material principles could warrant, provided we use the generalizations which correspond to these material principles as *premises* in our arguments? Thus, if we suppose "*x is an acid* may be inferred from *x turns litmus paper red*" to be a material principle of inference, the corresponding generalization would be "(x) x turns litmus paper red ⊃ x is an acid". The material rule would certify the argument, "This turns litmus paper red, therefore it is an acid", while if we use the generalization corresponding to the rule as a premise, we get the logically valid argument, "(x) x turns litmus paper red ⊃ x is an acid; this turns litmus paper red; therefore this is an acid".

I think it is clear, however, that our empirically-minded friends would have gone much farther than this. They would have attacked the very notion of a material principle of inference. At the very least they would have claimed that if any principles do correspond to this description, they have a thoroughly second rate and/or derivative status as compared with purely formal principles. We can imagine that something like the following considerations would have governed their thinking on this matter.

'Formal rules of inference are essential to the very possibility of language; indeed, of thought. Kant was on the right track when be insisted that just as concepts are essentially (and not accidentally) items which can occur in judgments, so judgments (and, therefore, indirectly concepts) are essentially (and not accidentally) items which can occur in reasonings or

arguments. Without formal rules of inference there would be no terms, no concepts, no language, no thought. In this sense, our empiricists continue, one could say that logical rules of inference specify, at least partially, the very form of a term or concept. Were it not for these rules, we could not even conceive of the releasing or the falling of a piece of chalk, not to mention the piece of chalk itself. On the other band, given these rules and given the course of our sense-experience, no other rules of inference (that is, no non-formal or material rules) are necessary conditions of concepts—though rules of inductive inference may be necessary to establish synthetic truths involving them.'

To bolster up this line of thought, they would appeal to the empiricist account of concept formation in one or other of the various forms in which it has been held, since Locke made it the cornerstone of his philosophy, and continue:

'The *form* of our concepts may depend on rules of inference, but their material *content* does not. Even if we were to acknowledge a material rule of inference whereby "This piece of chalk will fall" can legitimately be inferred from "This piece of chalk is being released", the rule could have nothing to do with our ability to conceive of either *chalk*, the *releasing of chalk*, or the *falling of chalk*. This fact alone would force us to put material principles of inference, should we acknowledge their existence, on a decidedly inferior plane.'

Can one, however, go this far in cutting material rules of inference down to size, without taking the more drastic step of denying that anything is really described by the phrase "material rule of inference"? Those who take this line claim that "It is raining, therefore the streets will be wet", when it isn't an enthymematic abridgment of a formally valid argument, is merely the manifestation of a *tendency to expect* to see wet streets when one finds it raining, a tendency which has been hammered into the speaker by past experience. In this latter case it is the

manifestation of a process which at best can only *simulate* inference, since it is a habitual transition of the imagination, and as such is not governed by a principle or rule by reference to which it can be characterized as valid or invalid. That Hume dignified the activation of an association with the phrase "causal *inference*" is but a minor flaw, they continue, in an. otherwise brilliant analysis. It should, however, be immediately pointed out that before one has a right to say that what Hume calls "causal inference" really isn't inference at all, but a mere habitual transition from one thought to another, one must pay the price of showing just how *logical* inference is something more than a mere habitual transition of the imagination. Empiricists in the Humean tradition have rarely paid this price, a fact which has proved most unfortunate for the following reason. An examination of the history of the subject shows that those who have held that "causal inference" only simulates inference proper have been led to do so as a result of the conviction that *if it were genuine inference, the laws of nature would be discovered to us by pure reason*. But an adequate account of *logical* inference might make it clear that even "causal inference" can be genuine inference, as it seems to be, without this unwelcome consequence.

A somewhat less drastic approach to material rules of inference differs from the above in admitting that there are such rules, and that they are indeed rules of *inference*, but insists that not only do they have second-class status in that, unlike formal rules, they are not necessary conditions of the very existence of terms or concepts, but also that their authority as rules is purely *derivative*. It claims that recognition of a material rule to the effect that "x is B" may be inferred from "x is A" presupposes prior acceptance of what we have called the corresponding generalization, in this case "All A is B", and owes its authority to the fact that "x is B" is logically derivable from "x is A" together with "All A is B". Those who adopt this alternative concede to Metaphysicus that the inference from "It is raining" to "The streets will be wet" is

immediately grounded in a material rather than formal rule of inference, but insist that as the authority of material principles is purely derivative, this admission entails none of the rationalistic consequences which he desiderates. While they might agree with proponents of a more drastic approach that in some cases utterances and inscriptions of "It is raining, therefore the streets will be wet" are functioning merely as abbreviated expressions of inferences governed by a formal rule of inference, they are more likely to insist (and I believe correctly) that in most cases, at least, these supposed abridgments of formally valid arguments are actually complete arguments as they stand which are validated by material rules of inference. They would add that it might not be inappropriate to say that these arguments are "abridgments" or "enthymemes" provided that these terms are taken to imply not that there are no material rules of inference, but rather that their status is purely derivative, and their contribution to thought a matter of convenience.

If neither of these two more drastic lines is taken, it would seem possible (at least at this early stage of our discussion) to take a different tack and combine the ascription of an inferior status to material rules of inference, as not being necessary conditions of the existence of terms or concepts, with the claim that their authority as rules is nevertheless original. This view in turn, would seem to admit of two variants. According to the first, material principles of inference, though not essential to meaning, are as indispensable as formal rules to thought about empirical matters. The second variant denies this, claiming that although the authority of material rules is not inherited from formal rules, but is equally original, they are nevertheless dispensable modes of thought, making no contribution to its penetration or scope which could not be duplicated by a combination of formal rules and factual premises.

Now, all the above possibilities in the way of empirically minded interpretations of

material rules of inference have in common the idea that whereas formal rules are necessary conditions of the existence of concepts or the possession of meaning by terms, and, in this sense, are generic conditions of meaning—the specific content of a concept, or meaning of a term, is derived from experience, and is prior to any material rules of inference in which this concept or term may come to play a role. But might it not be possible for an empiricist to hold that material rules of inference are as essential to meaning as formal rules? That the specific nature of a factual concept is determined by the material rules of inference governing it, as its generic nature is determined by formal rules of inference? That the meaning of a term lies in the materially and formally valid inferences it makes possible? In spite of the fact that a position of this kind is incompatible with the so-called "empiricist" theory of concept formation, and is universally relegated to the absolute idealisms and rationalisms of a bygone age, I mention it for the sake of completeness.

In effect, then, we have been led to distinguish the following six conceptions of the status of material rules of inference:

(1) Material rules are as *essential to meaning* (and hence to language and thought) as formal rules, contributing the architectural detail of its structure within the flying buttresses of logical form.

(2) While not essential to meaning, material rules of inference have an *original authority* not derived from formal rules, and play an *indispensable* role in our thinking on matters of fact.

(3) Same as (2) save that the acknowledgment of material rules of inference is held to be a *dispensable* feature of thought, at best a matter of convenience.

(4) Material rules of inference have a *purely derivative authority*, though they are

genuinely rules of inference.

(5) The sentences which raise these puzzles about material rules of inference are *merely abridged formulations of logically valid inferences*. (Clearly the distinction between an inference and the formulation of an inference would have to be explored.)

(6) Trains of thought which are said to be governed by "material rules of inference" are actually not inferences at all, but rather activated associations which mimic inference, concealing their intellectual nudity with stolen "therefores".

II

In the above paragraphs we have been led to worry about the dispensability or indispensability of, and the relation to meaning of, material rules of inference. We have not yet, however, given an account of what a material rule of inference is, or pretends to be. We have relied on dangerously vague historical connotations of the terms "formal" and "logical", as well as on the use of examples. Fortunately, help lies close at hand. Professor Rudolf Carnap, in his *Logical Syntax of Language*, draws a systematic contrast between two types of syntactical rule which if his syntactical conception of logic is sound, are exactly the formal and material rules of inference with which we are concerned. It is to a brief exposition of his views on this matter that I now turn.

In Carnap's terminology, a rule of inference, conceived to be a syntactical rule, is called a "transformation rule". He emphasizes the central role played by the concept of a transformation rule in the definition of a language. Indeed (p. 168) he contends that once we know the circumstances under which one expression of a language, is the direct consequence of another, we have the key to the logical structure of the language. These circumstances are specified by the

transformation rules, which are formulated in the syntactical metalanguage of the language to which they apply. Whether stated as rules of inference, or as a definition of "direct consequence in S",

> … all that is necessary is that it be clear to what forms of expression the rules are in general applicable (which gives us the definition of "sentence") and under what conditions a transformation or inference is permitted (which gives us the definition of "direct consequence") (p. 170).

Transformation rules must carefully be distinguished from valid sentences in the object language. The latter are sentences which require nothing more than an appeal to the transformation rules of the language to justify their assertion. If an object-language sentence is valid, its contradictory is *contra-valid*. If either valid or contra-valid, it is said to be *determinate*, otherwise *indeterminate*. Carnap finds it to be a distinguishing feature of logical symbols and expressions that each sentence constructed solely from them is determinate (p. 177). On page 175 he defines the *content* of a sentence as the class of non-valid sentences which are its consequences (i.e. can be inferred from it).

We next note that Carnap draws a distinction between *logical* and *extra-logical* transformation rules. The essential difference, to put the matter in a way which is adequate for our purposes, is that whereas *logically* valid inferences do not, *extra-logically* valid inferences do depend for their validity on the fact that they contain a certain set of descriptive terms. The syllogism so fatal to Socrates remains valid if any three descriptive terms of appropriate category are systematically substituted for "men", "mortal" and "Socrates". In Quine's useful terminology, descriptive terms occur *vacuously* in logically valid arguments; *essentially* in extra-logically valid arguments. Now, the most obvious candidates for the position of extra-logical rule

of inference are rules authorizing inferences which, to be *logically* valid would have to have as an additional premise a sentence formulating a law of nature. Carnap calls rules of this kind "P-rules" (Where the "P" is short for "physical" in a suitably broad sense), as contrasted with L-rules (logical rules). In his terminology, therefore, he distinguished between L-valid and P-valid inferences. To illustrate: If we suppose "(x) ϕx implies ψx" to state a law of nature,

I. (x) $\phi x \supset \psi x$, but ϕa, therefore ψa

would be an L-valid inference.

II. ϕa, therefore ψa

would be a P-valid inference. The P-rule authorizing it, whatever its most satisfactory formulation might turn out to be, would be to the effect that "A sentence consisting of 'ψ' followed by an individual constant is validly inferred from a sentence consisting of 'ϕ' followed by that same individual constant". (That we cannot rest in this formulation is shown by the fact that when the phrase "may be inferred from" is correctly used in ordinary speech, it is preceded and followed not by the names of sentences, but by the sentences themselves—e.g. that it will rain can be inferred from the darkness of the clouds.)

Corresponding to this distinction between L-valid and P-valid *inferences*, we have the distinction between L-valid and P-valid *sentences*. Thus,

III. (x) $\phi x \supset \psi x \,.\, \& \,.\, \phi a : \supset \,.\, \psi a$

would be an L-valid sentence. On the other hand, given the above P-rule,

IV. $\phi a \supset \psi a$

would be a P-valid sentence, while

V. $\phi a \,\&\, - \psi a$

would be P-contravalid.

Furthermore, in view of Carnap's definition of the content of a sentence as the class of the non-valid sentences which are consequences of it, 'ψa' would be part of the content of 'ϕa', though not of its L-content. Given a suitable definition of the content of expressions other than sentences, a corresponding distinction would have to be drawn between the content of an expression governed by P-rules, and its content in the narrower sense of L-content.

Let us now raise the question whether, granted that a language must have rules of inference, it must have both L-rules and P-rules. We might expect Carnap to say that whereas a language without descriptive terms need not, and, indeed, cannot have other than logical rules of inference, a language with descriptive (extra-logical) terms must have extra-logical rules. *Carnap, however, makes it clear that in his opinion a language containing descriptive terms need not be governed by extra-logical transformation rules*. Indeed, be commits himself (p. 180) to the view that for every language with P-rules, a language with L-rules only can be constructed in which everything sayable in the former can be said. If we now turn back to our list of six possible accounts of the status of material rules of inference (above, p. 317), we see at once that Carnap's account falls in neither the first nor the second category for according to these, P-rules would be indispensable. Furthermore, since he clearly holds that P-rules are as genuinely rules of inference as are L-rules, it does not belong in the fifth or sixth category. Assuming the adequacy of our classification, we are left with the third and fourth pigeon-holes in which to place his account.

To be sure, Carnap, in the above passage, is not discussing the syntax of natural languages, but rather the construction by logicians of artificial languages. Yet he is clearly conceiving of these artificial languages as candidates for adoption by language users. And presumably, an artificially constructed calculus with an appropriate syntactical structure, becomes a natural language by virtue of (1) the adoption of its syntactical rules by a language speaking community; (2) the association of certain of its descriptive terms with sensory cues. Thus, in saying that "whether in the construction of a language S, we formulate only L-rules, or include also P-rules … is a question of expedience", Carnap is implying that natural languages need have no P-rules, and that the presence or absence of P-rules in a natural language is a matter of some form of (presumably unconscious) social selection determined by convenience.

Notice that corresponding descriptive terms in two languages, one with and one without P-rules, though they have the same meaning in the sense that they enable the communication of the same information, need not have the same content, in Carnap's syntactical sense of the term. For the content of a term 'ϕ' is, roughly speaking, the totality of what is entailed *logically* or *physically* by the function "ϕx", and, clearly, a term governed by P-rules will have a greater content than one which is not.

Now, according to the fourth alternative, P-rules are not only dispensable, but have a purely derivative authority. Concretely this amounts to the suggestion that the authority of P-rules derives from the fact that the inferences they certify can be reformulated as logically valid inferences, if the generalizations which have been canonized into P-rules are brought down to earth as additional premises. The contribution made by P-rules would then be one of convenience only, and they would be of little interest to the philosopher. They would permit us to argue "ϕa therefore ψa" provided we accepted the generalization "$(x)\ \phi x \supset \psi x$" and could,

therefore, argue "(x) $\phi x \supset \psi x$ & ϕa, therefore ψa", a saving, perhaps, of some intellectual breath at the level of argument, but one which brings no basic enrichment to the language. Now, Carnap nowhere commits himself—at least in so many words—to this fourth conception of the status of P-rules. Might it not be the case that his views fall into the third category? Perhaps we can find him to hold that although dispensable, and adding nothing to the factual content that can be communicated by the language, P-rules enable a language to perform a function which could not be duplicated (even at the cost of great inconvenience) by a language with L-rules alone. If there were any evidence to this effect, we might attribute to him the view that at least part of the authority of P-rules, even though what it authorizes is dispensable, is not derivative from that of L-rules. However, when one turns to Carnap's book with these questions in mind, one is startled to find no account whatsoever of the grounds on which it might be expedient to adopt a language governed by P-rules as well as L-rules. What we do find is an emphasis on the disadvantage of adopting P-rules. He points out that to the extent that empirical generalizations are erected into P-rules, science is put into a strait-jacket. "If P-rules are stated, we may frequently be placed in the position of having to alter the language" (p. 180). Now, although the phrase "alter the language" is perhaps a bit drastic for the adding or subtracting of P-rules conceived as conveniences with purely derivative authority, there is nothing here which prohibits us from construing Carnap as holding that when the adoption of P-rules is expedient, it is merely because at that time and in those circumstances, the economy in the number of premises required for inferences which is obtained by building scientific generalizations into the very machinery of the language, more than compensates for the resulting tendency of this machinery to impede scientific progress. In any event, the passage from which we have just quoted contains no hint

that the expediency of adopting P-rules rests on their ability to authorize something that would not be authorized in a language with L-rules alone.

At this point it is relevant to mention that according to Carnap, P-rules, like L-rules, may take either one of two forms: (1) They may be formulated as rules of inference. This is the form we have supposed them to have in the above discussion. (2) They may be formulated as sentences to the effect that certain sentences in the object language are "primitive sentences", that is, *privileged* sentences in that their assertion is unconditionally authorized by the rules of the language. Notice, however, that each form may be established on the basis of the other provided that the language contains, as it must, at least one L-rule of the first form, i.e., formulated as a rule of inference, in short a rule of detachment or *modus ponens*. It is interesting, however, to note that although P-rules may be introduced in either form, Carnap prefers to state them in the second form as singling out certain object-language sentences (usually generalized material implications) to be primitive sentences. This inevitably suggests he is not thinking of the expediency of the adoption of P-rules as a matter of diminishing of the number of premises needed for inferences. For when P-rules are stated in the second form, the generalizations they characterize as primitive sentences must be used as premises in inferences, even though as being unconditionally assertable on the authority of the P-rules of the language, they are premises of a privileged kind.

III

Now, we may well imagine Metaphysicus to have been following the above exploration of Carnap's views with the most intense interest. He has read with approval Carnap's account of the formal distinction between L-rules and P-rules of inference, but shared our disappointment at

Carnap's failure to explain either the status or the specific contribution of the latter. Metaphysicus notes that we have been asking whether Carnap's P-rules authorize any linguistic activity which, dispensable or not, is incapable of being authorized by L-rules alone. Pointing out that we have as yet failed to find any mention of such in the *Logical Syntax of Language*, he now seizes the initiative with the claim that there is indeed such an activity, and that it provides the key to an understanding of the status of material rules of inference.

What Metaphysicus has in mind, of course, are such subjunctive conditionals as "If I *had released* this piece of chalk, it *would have fallen*", and "If there *were to be* a flash of lightning, there *would be* thunder". But before Metaphysicus attempts an analysis of these statements, bringing out their relevance to our problem, he first turns his attention to those subjunctive conditionals which are clearly true on purely formal grounds. He points out that "If anything were red and square, it would be red" cannot plausibly be claimed to assert the same as "(In point of fact) all red and square things are red", and suggests that this subjunctive conditional conveys the same information as the logical rule permitting the inference of *x is red* from *x is red and x is square*. This rule is a derivative logical rule, a special case of the logical rule proper, which latter, of course, does not single out the terms *red* and *square*. According to this line of thought, one who asserts "If this *were* red and square, then it *would* be red", is committing himself to the falsity of "This is red and square", while in some sense giving expression to a logical rule of inference. On the other hand, a person who says "Since this is both red and square, it is red", is giving expression to the same rule of inference, while asserting both "This is red and square", and "This is red". Metaphysicus now argues that if we accept this analysis, we must interpret the subjunctive conditionals with which we began this paragraph as expressions of *material* rules of inference. "If there were to be a flash of lightning, there would be thunder",

giving expression to some such rule as "*There is thunder at time t-plus-n* may be inferred from *there is lightning at time t*", and this rule is not in any obvious way a specifcation of a purely logical rule of inference. He therefore claims to have shown beyond reasonable doubt not only that there are such things as material rules of inference, but, which is far more important, *that they are essential to any conceptual frame which permits the formulation of such subjunctive conditionals as do not give expression to logical principles of inference*. Since we are all conscious of the key role played in the sciences, both formal and empirical, in detective work and in the ordinary course of living by subjunctive conditionals, this claim, if substantiated, would indeed give a distinguished status to material rules of inference.

At this point, our empiricists are tempted to reply by claiming that even the latter subjunctive conditionals owe their force to purely logical principles and that if this does not appear to be the case it is because the content of these conditionals has not been made fully explicit. This is, of course, essentially the same claim as the one considered at the opening of this paper to the effect that "It is raining, therefore the streets will be wet", is an enthymeme. It will prove quite rewarding, however, to explore this claim in its present guise.

What, then, would be the explicit formulation of this subjunctive conditional? Perhaps,

A. Since every time it rains the streets are wet, if it were to rain the streets would be wet,

the since clause dropping out to give the usual formulation. The logical principle of inference sanctioning this expanded version would presumably be "From '(x) ϕx implies ψx' can be inferred 'ϕa implies ψa'", which is a special case of the principle authorizing the inference from "(x) fx" to "fa". But we see right away that something is wrong. For the subjunctive conditionals

which this principles authorizes would be of the form "If *(x) fx* were the case, then *fa* would be the case". Consequently, if "Every time it rains the streets are wet" expresses a material implication, as it must, if we are not to introduce a P-rule in the very attempt to dispense with such, we would get a subjunctive conditional of the form "If it were the case that *(x)* $\phi x \supset \psi x$, then it would be the case that $\phi a \supset \psi a$". But the "since" statement corresponding to this is "Since *(x)* $\phi x \supset \psi x$, $\phi a \supset \psi a$". In other words, the logical principle would justify not A, but rather

A[1]. Since every time it rains the streets in point of fact are wet, it will rain ⊃ the streets will be wet.

Here the subjunctive mood has disappeared from the consequence clause, and with a merely material implication, we are no longer asserting that a wetting of the streets can be inferred from the occurrence of rain. Nor is it an adequate reply that "it will rain ⊃ the streets will be wet" is inferable from "all cases of rain are in point of fact cases of wet streets", and that it is this inferability which makes its presence felt in the original subjunctive conditional. For on this alternative, wherever we accept "all A's are in point of fact B" we should be warranted in asserting "if x were A, x would be B"—whereas whenever we assert a subjunctive conditional of the latter form, we would deny that it was merely in point of fact that all A's are B.

On the other hand, if "Everytime it rains the streets are wet" is interpreted as the expression of an entailment, then the abovementioned logical principle of inference would warrant a subjunctive conditional of the form "If it were the case that *(x)* ϕx *entails* ψx then it would be the case that ϕa *entails* ψa". The corresponding "since" statement would be "Since *(x)* ϕx *entails* ψx, ϕa *entails* ψa". Thus we would get,

A″. Since every time it rains the streets are wet (interpreted now as an entailment), it will rain entails the streets will be wet.

Since an entailment statement has the same force as a subjunctive conditional, A″ is equivalent to A, and our logical principle of inference has given us what we want. But a moment's reflexion reminds us that to get A″ we have had to pay the price of introducing a material rule of inference. *To say that rain entails wet streets is to convey exactly the same information as to say that a sentence asserting the existence of wet streets may be inferred from a sentence asserting the existence of rain*. Thus our ultimate purpose of explaining the original subjunctive conditional without appealing to a material rule of inference would not have been achieved.

Let us try again. Perhaps the explicit formulation would be,

B. If it were the case both that everytime it rains, the streets are wet and that it is raining, then the streets would be wet.

The logical principle which finds expression in this statement is, schematically, "From '(x) (ϕx implies ψx) and ϕa' can be inferred 'ψa'". Notice that on this interpretation the original subjunctive conditional would not be the implicit formulation of a since sentence, as the since clause would include the assertion of "It is raining", and this would be incompatible with the significance of contrary to fact subjunctive conditionals. Now it is at first sight not too implausible that the original subjunctive conditional is an abbreviated formulation of B. But to see that this won't do it is sufficient to point out that on this interpretation *all such subjunctive conditionals would be true!* Surely some sentences of the form "If a were ϕ, a would be ψ" are false, in other words some sentences of the form; "Even though a were ϕ, it need not be ψ" are

true. But on the theory under examination, the former, when explicated turns out to be a logical truth, and the latter a contradiction.

Now, unless some other way can be found of interpreting such subjunctive conditionals in terms of logical principles of inference, we have established not only that they are the expression of material rules of inference, but that the authority of these rules is not derivative from formal rules. In other words, we have shown that material rules of inference are essential to the language we speak, for we make constant use of subjunctive conditionals of the type we have been examining. It is very tempting to conclude that material rules of inference are essential to languages containing descriptive terms. Yet to draw this conclusion would be hasty, for the most we have shown is that if there are descriptive languages which are not governed by material rules, they do not permit the formulation of material subjunctive conditionals. We now notice that, as a matter of fact, most of the linguistic structures Carnap considers, being extensional, do not even permit the formulation of subjunctive conditionals, and that though they are not natural languages in actual use, he clearly thinks that they could be. Carnap, then, is clearly convinced that subjunctive^{A} conditionals are dispensable.

Does this commit him to holding that P-rules are dispensable? Clearly not, no more than it follows from the dispensability of logically true subjunctive conditionals that a language need have no L-rules. Thus, even though material subjunctive conditionals may be dispensable, permitting the object language to be extensional, it may nevertheless be the case that the *function* performed in natural languages by material subjunctive conditionals is indispensable, so that if it is not performed in the object language by subjunctive conditionals, it must be performed by giving direct expression to material rules of inferences in the meta-language. *In other words, where the object language does not permit us to say "If a were ϕ, it would be ψ" we can achieve*

the same purpose by saying "'ψa' may be inferred from 'ϕa'". Since it is the importance of the function served by material subjunctive conditionals on which we have been insisting, the fact that Carnap emphasizes the possibility of extensional descriptive objective languages by no means rules out the idea that material rules of inference might be indispensable to languages containing descriptive terms.

To sum up the results of the last few paragraphs: Alternative (4) has been shown, at least provisionally, to be untenable. This would leave Carnap with alternative (3)—(material rules of inference are dispensable but underived). However, in the process of disproving alternative (4) we have been led to notice the importance of the function played in natural languages by material subjunctive conditionals. Since these are object language expressions of material rules of inference, and since the same function can be performed by the formulation of a rule of inference in the metalanguage, it has occurred to us that alternative (2)—material rules of inference, though not essential to the meaning of descriptive terms, are indispensable features of languages containing descriptive terms, and have an authority underived from formal rules though rejected by Carnap, is worth reconsidering.

Now, if we were to accept the second alternative, it is clear that we should have to explore the relation of material rules of inference to the meaning of descriptive terms, to see if we could rest in alternative (2) without ultimately embracing alternative (1)—according to which material rules of inference are as essential as formal rules to the meaning of descriptive terms. It is also worth noting, at this stage, that the Humean suggestion that causal inferences are really not inferences at all, but rather habitual expectations masquerading as inferences, loses all plausibility when it is stretched to cover ostensible material subjunctive conditionals, particularly when contrary to fact. Yet if we are now in a position to insist that materially valid inferences are

as much inferences as formally valid inferences, we must also recognize that we have as yet given no account of what a rule of inference is (whether formal *or* material). It is to this task that we now turn, in the hope of getting further light on our problem.

IV

We have already had occasion to remark on the central role played in Carnap's conception of a language by the notion of a rule of inference or "transformation rule". Indeed, he writes on occasion (e.g., p. 4) as though a language, formally considered, were identical with its syntactical rules, from which it would follow that the transformation rules of a language would be at least a part, and might—in the light of the passage we have quoted on the power of transformation rules to specify the syntactical structure of a language—be identical with the language. Now, I think we would all grant that there is a sense in which a calculus, or a game (e.g., chess) or even a language, is what it is as specified by certain rules. But surely there is a perplexing Hibernian ring to the statement that a calculus is identical with "its" rules. After all, the rules of a calculus belong in the syntactical metalanguage, so that in making this identification, one would be identifying a calculus with expressions in its metalanguage, and thus doing violence to a distinction which is the central theme of Carnap's book. Let me hasten to add that the identification of a calculus, or game or language, with its rules, though strictly a mistake, can be regarded as a paradoxical way of stating an important truth; and I have dwelt on the matter only because Carnap's statement is symptomatic of a carelessness with the term "rule" which pervades his otherwise admirably incisive and patiently meticulous argument.

Another *prima facie* puzzling feature of Carnap's treatment of transformation rules is his preference for formulating them as definitions of "direct consequence in S", where S is the

language whose rules are under consideration. Thus, in a passage already quoted, Carnap writes, "In the following discussion we assume that the transformation rules of any language S, i.e. the definition of the term 'direct consequence in S', are given" (p. 168). Now, this term, like any other syntactical predicate, is for Carnap, a formal predicate. That is to say it is to be defined in terms of structural properties of the expressions belonging to language S. Thus, by telling us that transformation rules can be formulated as definitions of "direct consequence in S", Carnap gives the impression that the force of a rule to the effect that expressions of kind A can be "transformed" into expressions of kind B, relates solely to the existence of a structural relationship between these two kinds of expression. In ethics the corresponding thesis would be that moral rules can be formulated as definitions, in naturalistic terms, of the predicate "morally right"; thus, the rule "Happiness ought to be maximized" as the definition "x is morally right $=_{Df}$ x maximizes human happiness". Here we should all know what to say. We would point out that the definiendum is no mere synonym for the definiens, and that even if it has the same components of descriptive meaning as the latter, it has a surplus meaning over and above these which can be indicated by the word "ought". In other words, the most that such a definiens can do is specify the type of circumstances in which a certain kind of action ought to be done; it cannot specify *that* it ought to be done. If one is an emotivist in one's account of *ought,* one will say that the "*cognitive* content" of a rule is indeed exhausted by the definiens in such a definition; and that provided one does not overlook the surplus pragmatic meaning of the definiendum, there need be nothing mistaken about the enterprise of formulating moral rules as naturalistic definitions of "morally right". Intuitionists, on the other hand, would hold, of course, that such definitions are in principle mistaken.

Now, the basic moral of the above discussion is that if a definition is, with any plausibility, to do the work of a rule, the definiendum must have the normative flavour characteristic of "ought", or "ought not" or "may" or "may not". But when one turns to Carnap's thesis that transformation rules may be formulated as definitions of "direct consequence in S", one finds no such flavour. The term "direct consequence" has the same sort of feel as "next to" or "between". This is not true of the predicate i.e. "derivable" in terms of which he formulates certain transformation rules which are more restricted in scope than those he associates with the predicate "direct consequence". The term "derivable" is one of those "-able" words which connotes "may be done" in the sense *not* of "can be done" but rather "is permissible", an expression which obviously belongs in the context of rules. Now it is my impression that when Carnap was looking for another word to share the burden of transformation rules formulated as definitions with "directly derivable", he failed to bear in mind that what he needed was another word with this same rulish force. If he could not find one in current use, it would have been better to make one up (e.g., "directly extractable") than to choose a word with such purely cognitive flavour.

The next point I wish to make is the closely related one that a rule is always a rule for *doing* something. In other words, any sentence which is to be the formulation of a rule must mention a doing or action. It is the performance of this action (in specified circumstances) which is enjoined by the rule, and which carries the flavour of *ought*. With this in mind, let us examine Carnap's formulation of certain transformation rules as definitions of "directly derivable in S". Here the interesting thing to note is that while the definiendum seems clearly to mention a kind of action, namely, deriving something directly from something else, and to indicate that this deriving is permissible, the definiens on the other hand, specifies only a structural relationship

between the *terminus a quo* and the *terminus ad quem* of the deriving. In short, Carnap's claim that he is giving a definition of "directly derivable in S" is a snare and a delusion. It is as though one offered the following "definition" as a formulation of a basic rule governing the activities of policemen: "X is arrestable $=_{Df}$ X has broken a law". It is obvious that such a definition would be a mistake not only because the definiendum "arrestable" has, as we saw, a normative force not shared by the definiens, but also, because it designates an act, the act of arresting, which is not designated by the definiens. I think we would all be inclined to say that a person who offered such a "definition" was really attempting, in a confused way, to do something quite different, namely, specify the circumstances in which a person is arrestable. "X is arrestable if and only if X has broken a law" reminds us of "X is a triangle if and only if X is a plane figure bounded by three straight lines", an analytic statement which is true by definition. In both cases an "if and only if" sentence is affirmed which is not an empirical assertion. Yet it would be a mistake in principle to take "X is arrestable if and only if X has broken a law" to be an analytic proposition which is true by definition. Compare, "I will shoot you if and only if you cross that line". In short, instead of defining "directly derivable in S" Carnap is at best specifying the circumstances in which it is permissible to derive one expression from another. The same considerations apply *mutatis mutandis* to Carnap's formulation of less restricted transformation rules as definitions of "direct consequence in S". As the technical difference between the more and less restricted transformation rules considered by Carnap is irrelevant to our problem, and as we have found the term "derivable" to be more satisfactory than "consequence" we shall use the former in a broad sense which covers the ground of Carnap's two terms "derivable" and "consequence".

What, then does it mean to say of one sentence, B, that it is derivable from another, A? Roughly, that it is permissible to assert B, given that one has asserted A, whereas it is not

permissible to assert not-B, given that one has asserted A. In other words, we have here a rule of conditional assertion (which must not be confused with a rule for the assertion of a conditional). To be contrasted with rules of this type, e.g. *modus ponens*, are rules which specify certain sentences as unconditionally assertable. Rules of this latter type are formulated by Carnap (with all the mistakes criticized above) as definitions of "primitive sentence of S". Thus, to say that "(x) $\phi x \supset \psi x$" is a primitive sentence of S, is to say that one is authorized by the rule of S to assert this sentence, *without having to appeal to evidence or grounds, in other words, to other sentences on whose prior assertion the authorization would depend*. It should, of course, be noticed that to say that a sentence is unconditionally assertable entails that its contradictory ought not to be asserted. In this respect an unconditionally assertable sentence differs from a contingently assertable sentence, e.g., "It is raining", whose contradictory is also contingently assertable.

Let us now pause to sum up the substance of the last few paragraphs. We have been pointing out that a syntactical rule, like any other rule, prescribes or permits a certain kind of action in a certain type of circumstance. In the case of syntactical rules, the relevant kind of action would seem to be *asserting*, a concept of which we have offered no analysis, but which is, we shall assume, to be understood in terms of the concept of a token, so that to assert a sentence is to bring about the existence of a token of that sentence. (Though after Ryle's painstaking analysis of mentalistic terms we must be prepared to find that even the "event" of asserting has a dispositional component.) Be this as it may, it follows from our analysis that a syntactical metalanguage cannot permit the formulation of syntactical *rules*, unless (1) it contains a term for the activity of asserting, and (2) it contains an expression having the force of "ought". To the extent that a so-called "syntactical metalanguage" falls short of these requirements, it is an

abstraction from a syntactical metalanguage proper. It is undoubtedly convenient to study calculi by means of such truncated metalanguages as mention only the structural inter-relationships of the sign-designs of these calculi, but it is essential for our purposes to stress that these truncated metalanguages become capable of formulating *rules* only when supplemented by the equipment mentioned above.

V

We are now in a position to develop an account of the logical and physical modalities which, though based on Carnap's account in his *Logical Syntax of Language*, is an improvement in that it explicitly takes into account the *rulishness* of syntactical rules. It will be remembered that the central concept of Carnap's treatment is that of a quasi-syntactical sentence. As a simple example we may take the sentence "Red is a quality". This is a quasi-syntactical sentence in that it conveys the same information as the syntactical sentence "'Red' is a one-place predicate". Furthermore, "red is a quality" is a quasi-syntactical sentence in the *material* mode of speech, as opposed to the *autonomous* mode of speech, in that "'red' is a quality" is not a syntactical sentence conveying the same information as "red is a quality". Carnap tells us that

> ... The material mode of speech is a transposed mode of speech. In using it, in order to say something about a word (or a sentence) we say instead something parallel about the object designated by the word (or the fact described by the sentence...) …

Consider, now, the sentence "If a is red and square, then it is *logically necessary* that a be red". According to Carnap's account, this is a quasi-syntactical sentence in the material mode of speech which conveys the same information as the syntactical sentence "'a is red' is an L-consequence of 'a is red and a is square'". Now, as I see it, this account is essentially sound, and

is vitiated only by the fact that Carnap's account of the consequence relation makes it merely a matter of a structural relationship obtaining between two expression designs. If, in accordance with our earlier proposal, we reformulate the above in terms of the syntactical predicate "derivable", then the claim becomes that the sentence "If a is red and square, then it is logically necessary that a be red" is a quasi-syntactical sentence conveying the same information as the syntactical sentence, "'a is red' is L-derivable from 'a is red and a is square'".

To appreciate the significance of this claim, let us remember our previous conclusion that in thinking of one expression as derivable from another, we are thinking of one kind of activity as permissible and of another kind as not permissible, in a certain kind of circumstance, where, for syntactical purposes, the significant feature of both activities and circumstance is that they involve the exemplification of specified types of linguistic structure. Let us now notice that the contrast between the permissible and the non-permissible can be explicated in terms of *ought to be done*, to say of x that it is permissible being to say that it is not the case that it ought not to be done. Let us assume, then, that consciousness of ought to do is the basic consciousness involved in recognizing a set of rules, whether they be moral rules or, as in the present case, rules of syntax; and that consciousness of *may do* is to be understood in terms of it.

Returning now to the problem of interpreting modal sentences, we notice that Carnap's analysis has become the claim that sentences involving the phrase "logically necessary" convey the same information (the use of the vague expression "convey the same information" is deliberate) as syntactical rules to the effect that we may do thus and so, and ought not do this and that, in the way of manipulating expressions in a language. The language of modalities is interpreted as a "transposed" language of norms.

This theory, as it stands, is open to two related and rather obvious objections. (1) It might be objected that the thought of necessity is radically different from the thought of permission-*cum*-obligation. (2) It might be objected, that the sentence "If a, is red and square, then a must, of logical necessity, be red", mentions neither linguistic expressions nor language users, and consequently cannot mention an obligation of language of language-users to use linguistic expressions in certain ways; whereas, as we have seen, the sentence "'a is red' is L-derivable from 'a is red and a is square'" does both.

To answer these objections, it is sufficient to remind ourselves that there are two senses in which an utterance can be said to convey information. There is the sense in which my early morning utterance, "The sky is clear", conveys meteorological information; and there is the sense in which it conveys information about my state of mind. Let us use the term "asserts" for the first sense of "conveys", and "conveys" for the second. Then it is clear that if Carnap's theory is to hold water, it must be reformulated as the claim either (1) that the utterance "'ψa' is L-derivable from 'ϕa'" *asserts* what the utterance "ϕa necessitates ψa" *conveys*, or (2) that the utterance "'ψa' is L-derivable from 'ϕa'" *conveys* what the utterance "ϕa necessitates ψa" *conveys*.

To choose between these alternatives, it suffices to ask What does the utterance "ϕa necessitates ψa" convey? Clearly it conveys (and does not assert) that the speaker conforms to the rule "'ψa' is L-derivable from 'ϕa'", and says what he says in some sense because of the rule. In other words, the utterance conveys the existence of a rule-governed mode of behaviour in the speaker. But it is equally clear that the utterance "'ψa' is L-derivable from 'ϕa'", being a normative utterance, does not *describe* the psychological mechanisms of the speaker.

Consequently, "'ψa' is L-derivable from 'ϕa'" does not assert that which is conveyed by "ϕa necessities ψa", and we are left with the second of the above alternatives.

Moreover, it also follows from considerations like these that although utterances of the term "necessary" have psychological implications which overlap with those of utterances of "ought" in the context of linguistic rules, neither the term "necessary" nor the term "ought" designates a psychological property. In short, modal terms, normative terms and psychological terms are mutually irreducible. Note also that because utterances of "ϕa necessitates ψa" convey but do not assert the existence of a linguistic rule governing the use of 'ϕ' and 'ψ', there is no contradiction in the sentence "ϕa would necessitate ψa even though there were no language users". Opponents of the position we are developing should be wary of saying that according to it "necessities are created by linguistic rules".

Let us now agree, and in so doing we continue in the spirit of Carnap's philosophy, that everything which can properly be called a conceptual awareness of qualities, relations, particulars or states of affairs, can be identified with the occurrence (in human beings) of symbol-events, events of which it can correctly be said that they "mean such-and-such". Included in the class of symbol-events are events which belong to languages as social phenomena. I shall, however, for present purposes, assume that the class of symbol-events coincides with the class of linguistic events in the narrower sense. Specifically, I shall assume that concepts are meaningfully used predicates. "Necessary" and "ought", as occurring in living English usage, then, are concepts. Indeed, they would seem to be as much concepts as "red" or "longer than". Yet there is an important difference between logical, modal and normative predicates, on the one hand, and such predicates as "red" on the other. In the case of the former, it is obvious that their conceptual meaning is entirely constituted by their "logical grammar", that

is, by the fact that they are used in accordance with certain syntactical rules. In the case of the latter, this is not obvious—though, as we are about to argue, it is equally true.

Why is it obvious (once we escape from the mental eye) that the conceptual meaning of a modal or normative term is constituted by its logical grammar? Because it is obvious that it cannot be constituted by the term's being a learned response to a class of extra-linguistic particulars. A modal or normative property (if we permit ourselves to speak of them as such) cannot significantly be said to be exemplified by a particular (or pair of particulars). On the other hand, it does make sense to speak of a particular as an instance of *red*, and of a pair of particulars as an instance of *longer than*. It does make sense to speak of "red" as a learned response to red objects. It would therefore seem open to us to hold that the conceptual meaning of "red" is constituted (apart from its purely formal properties) by this relationship.

Now, that at least some of the descriptive predicates of a language must be learned responses to extra-linguistic objects in order for the language to be *applied*, is obvious. But that not even these predicates ("observation predicates") owe their conceptual meaning to this association should be reasonably clear once the following considerations are taken into account:

(1) By no means all descriptive predicates which are not themselves observation predicates are explicitly definable in terms of observation predicates. The conceptual meaning of those which are not cannot consist in being learned responses to objects of the kind they are said to mean.

(2) To say of a predicate "ϕ" that it is an observation predicate entails that it is a learned response to extra-linguistic situations of a certain kind K, where K is the kind of which it is correct to say "'ϕ' means K". But, clearly, one can grant that the successful use of language requires, for certain predicates "ϕ", a coincidence of the kind of object

evoking the verbal response "ϕ" with the kind of object which "ϕ" is (correctly) said to mean, without identifying "'ϕ' is evoked by K" with "'ϕ' means K".

(3) "(In Schmidt's language) 'rot' means red" (S_1) appears to assert an empirical relationship between "rot" as used by Schmidt, and the class of red objects. Once this is taken for granted, it is natural to infer that this relationship consists in Schmidt's having learned to respond to red objects with "rot". If one should then notice that "(In Schmidt's language) 'und' means and" (S_2) can scarcely be given the same interpretation, one is likely to say that S_2 concerns a different species of meaning, and informs us that Schmidt uses "und" in accordance with rules which are analogous to our rules for "and". Now the truth of the matter is that *neither S_1 nor S_2 makes an empirical assertion*, though both *convey* empirical information about Schmidt's use of language. The "means" of semantical statements (idealized as "Designates" in the Pure Semantics of Carnap and Tarski) is no more a *psychological* word than is the "ought" of ethical statements or the "must" of modal statements, even though it is correctly used, and gains application through being used, to *convey* psychological information about the use of language. And once we cease to be hypnotized by the form "'red' means red" into taking for granted that the psychological fact (conceptual meaning) corresponding to S_1, is a dyadic relation between Schmidt's "rot" and red, and realize that since the fact in which we are interested is conveyed rather than asserted by S_1, so that the logical form of the latter is no guide to the form of the fact for which we are looking, we see that "rot" might well owe its conceptual meaning to Schmidt's using "rot" in accordance with rules analogous to our rules for "red".

(4) That it is fruitful to distinguish those aspects of the use of an observation

predicate which relate to its *application* from those which relate to its conceptual meaning, has been obscured by a careless use of the term "rule". There is at first sight some plausibility in saying that the rules to which the expressions of a language owe their meaning are of two kinds, (a) syntactical rules, relating symbols to other symbols, and (b) semantical rules, whereby basic descriptive terms acquire extra-linguistic meaning. It takes but a moment, however, to show that this widespread manner of speaking is radically mistaken. Obeying a rule entails recognizing that a circumstance is one to which the rule applies. If there were such a thing as a "semantical rule" by the adoption of which a descriptive term acquires meaning, it would presumably be of the form "red objects are to be responded to by the noise *red*". But to recognize the circumstances to which this rule applies, one would already have to have the concept of red, that is, a symbol of which it can correctly be said that it "means red".

(5) A uniformity in behaviour is rule-governed not *qua* uniformity, for then all habitual responses would be obeyings of rules—which is clearly not the case—but *qua* occurring, in a sense by no means easy to define, because of the conception of the norm enjoined by the rule. Yet the fact that both rule-governed and merely associative uniformities are *learned* uniformities, and differ in this respect from, say, the uniformities studied in chemistry, has blinded many philosophers to the important respects in which they differ from one another, and has led to much of the nonsense peddled under the heading "ostensive definition".

VI

It will be remembered that at the end of section III we had arrived at the conclusion that P-rules are indispensable to any language which permits the formulation of material subjunctive conditionals, though the use of the latter may be avoided by a direct statement of the rules themselves. This, in turn, inclined us to hold that P-rules are essential to any language which contains non-logical or descriptive terms. This would eliminate all but the first two interpretations of the status of material rules of inference listed at the end of section I. If, however, the argument of section V is sound, it is the first (or "rationalistic") alternative to which we are committed. According to it, material transformation rules determine the descriptive meaning of the expressions of a language within the framework established by its logical transformation rules. In other words, where 'ψa' is P-derivable from 'ϕa' (in modal language, ϕa necessitates ψa), it is as correct to say that '$\phi a \supset \psi a$' is true by virtue of the meanings of 'ϕ' and 'ψ', as it is to say this where 'ψa' is L-derivable from 'ϕa'. In traditional language, the "content" of concepts as well as their logical "form" is determined by rules of the Understanding. The familiar notion (Kantian in its origin, but present in various disguises in many contemporary systems) that the form of a concept is determined by 'logical rules', while the content is 'derived from experience' embodies a radical misinterpretation of the manner in which the 'manifold of sense' contributes to the shaping of the conceptual apparatus 'applied' to the manifold in the process of cognition. The contribution does not consist in providing plums for Jack Horner. There is nothing to a conceptual apparatus that isn't determined by its rules, and there is no such thing as choosing these rules to conform with antecedently apprehended universals and connexions, for the "apprehension of universals and connexions" is already the use of a conceptual frame, and as such presupposes the rules in question. The role of the given is rather to be compared to the role of the environment in the evolution of species; though it would be

misleading to say that the apparent teleology whereby men "shape their concepts to conform with reality" is as illusory as the teleology of the giraffe's lengthening neck. After all, it is characteristic of modern science to produce deliberately mutant conceptual structures with which to challenge the world. For primitive thought the analogy is much less misleading.

Our thesis, in short, turns out, as we have developed it, to be quite unlike the dogmatic rationalism of Metaphysicus. For whereas he speaks of *the* conceptual-frame, the system of formal and material rules of inference, we recognize that there are an indefinite number of possible conceptual structures (languages) or systems of formal and material rules, each one of which can be regarded as a candidate for adoption by the animal which recognizes rules, and no one of which has an intuitable hallmark of royalty. They must compete in the market place of practice for employment by language users, and be content to be adopted haltingly and schematically. In short, we have come out with C. I. Lewis at a "pragmatic conception of the *a priori*". Indeed, my only major complaint concerning his brilliant analysis in *Mind and the World Order*, is that he speaks of the *a priori* as *analytic*, and tends to limit it to propositions involving only the more generic elements of a conceptual structure (his "categories"). As far as I can gather, Lewis uses the term "analytic" as equivalent to "depending only on the meaning of the terms involved". In this sense, of course, our *a priori* also is analytic. But this terminology is most unfortunate, since in a perfectly familiar sense of "synthetic", some *a priori* propositions (including many that Lewis recognizes) are synthetic and hence *not* analytic (in the corresponding sense of "analytic"). That Lewis does not recognize this is in part attributable to his ill-chosen terminology. It is also undoubtedly due to the fact that in empirically-minded circles it is axiomatic that there is no synthetic *a priori*, while the very expression itself has a strong negative emotive meaning. Whether or not it is possible to rescue this expression from its

unfortunate associations I do not know. I am convinced, however, that much of the current nibbling at the distinction between analytic and synthetic propositions is motivated by what I can only interpret as a desire to recognize the existence of synthetic *a priori* propositions while avoiding the contumely which the language traditionally appropriate to such a position would provoke.

[A] [Correction of "subjective" in original printing]