The Ideal Language Tradition

Material vs. Formal Mode

Meaning Criterion again

- As we had said last week, one of the problems that Carnap's criterion of meaning was troubled with, was the problem that a meaningful sentence (as judged by the criterion) could be logically conjoined with a meaningless sentence (as judged by the criterion) and thus result in a sentence which is in part meaningless, but could not be proven to be meaningless with the criterion.

Hempel's example against complete verifiability

- Suppose that S is a sentence which satisfies the proposed criterion, whereas N is a sentence such as "The absolute is perfect", to which the criterion attributes no empirical meaning. Then the alternation S v N (i.e., the expression obtained by connecting the two sentences by the word "or"), likewise satisfies the criterion; for if S is a consequence of some finite class of observation sentences, then trivially S v N is a consequence of the same class. But clearly, the empiricist criterion of meaning is not intended to countenance sentences of this sort. In this respect, therefore, the requirement of complete verifiability is too inclusive.

Hempel's example against complete falsifiability

- If a sentence S is completely falsifiable whereas N is a sentence which is not, then their conjunction, S•N (i.e., the expression obtained by connecting the two sentences by the word "and") is completely falsifiable; for if the denial of S is entailed by some class of observation sentences, then the denial of S•N is, a fortiori, entailed by the same class. Thus, the criterion allows empirical significance to many sentences which an adequate empiricist criterion should rule out, such as, say "All swans are white and the absolute is perfect."

Changing the project

- The logical empiricists thought that it was useless to continue the search for an adequate criterion of testability in terms of deductive relationships to observation sentences.
- The past development of this seemed to warrant the expectation that as long as we try to set up a criterion of testability for individual sentences in a natural language, in terms of logical relationship to observation sentences, the result will be either too restrictive or too inclusive, or both.

Changing the project

- In particular it appears likely that such criteria would allow empirical import, in the manner of the Hempel examples just considered, either to any alternation or to any conjunction of two sentences of which at least one is qualified as empirically meaningful; and this peculiarity has undesirable consequences because the liberal grammatical rules of English as of any other natural language countenance as sentences certain expressions ("The absolute is perfect" was our illustration) which even by the most liberal empiricist standards make no assertion whatever; and these would then have to be permitted as components of empirically significant statements.

An Ideal Language Solution

- The predicament would not arise, of course, in an artificial language whose vocabulary and grammar were so chosen as to preclude altogether the possibility of forming sentences of any kind which the empiricist meaning criterion is intended to rule out.
- Let us call any such language an *empiricist language*. This reflection suggests an entirely different approach to our problem:
- Give a general characterization of the kind of language that would qualify as empiricist, and then lay down the following:

Translatability Criterion of Cognitive Meaning

- A sentence has cognitive meaning if and only if it is translatable into an empiricist language.

Testability and Meaning

- As any language, so also any empiricist language can be characterized by indicating its vocabulary and the rules determining its logic; the latter include the syntactical rules according to which sentences may be formed by means of the given vocabulary.
- In effect, therefore, the translatability criterion proposes to characterize the cognitively meaningful sentences by the vocabulary out of which they may be constructed, and by the syntactical principles governing their construction.
- What sentences are singled out as cognitively significant will depend, accordingly, on the choice of the vocabulary and of the construction rules.

A Sample Language – One of Many

We might qualify a language L as *empiricist* if it satisfies the following conditions:

(a) *The vocabulary of L contains:*

(1) The customary locutions of logic which are used in the formulation of sentences; including in particular the expressions "not", "and", "or", "if... then...", "all", "some", "the class of all things such that...", "... is an element of class...";

(2) Certain observation predicates. These will be said to constitute the basic empirical vocabulary of L;

(3) Any expression definable by means of those referred to under (1) and (2).

(b) *The rules of sentence formation for L* are those laid down in some contemporary logical system such as *Principia Mathematica.*

Thing Language

- Since all defined terms can be eliminated in favor of primitives, these rules stipulate in effect that a language L is empiricist if all its sentences are expressible, with the help of the usual logical locutions, in terms of observable characteristics of physical objects.
- Let us call any language of this sort a *thing-language* in the narrower sense.
- Alternatively, the basic empirical vocabulary of an empiricist language might be construed as consisting of phenomenalistic terms, each of them referring to some aspect of the phenomena of perception or sensation.

Abandoning Phenomenalism

- The construction of adequate phenomenalistic languages, however, presented considerable difficulties, and Carnap's attention had thus been focussed primarily on the potentialities of languages whose basic empirical vocabulary consists of observation predicates; for the latter lend themselves more directly to the description of that type of intersubjective evidence which is invoked in the test of scientific hypotheses.

A Solution?

- If we construe empiricist languages in this sense, then the translatability criterion avoids all of the short-comings pointed out in our discussion of earlier forms of the testability criterion

Solutions

(a) Our characterization of empiricist languages makes explicit provision for universal and existential quantification, i.e., for the use of the terms "all" and "some"; hence, no type of quantified statement is generally excluded from the realm of cognitively significant discourse;

(b) Sentences such as "The absolute is perfect" cannot be formulated in an empiricist language; hence there is no danger that a conjunction or alternation containing a sentence of that kind as a component might be qualified as cognitively significant;

Solutions

(c) In a language L with syntactical rules conforming to *Principia Mathematica,* the denial of a sentence is always again a sentence of L. Hence, the translatability criterion does not lead to the consequence that the denials of certain significant sentences are non-significant;

(d) Despite its comprehensiveness, the new criterion does not attribute cognitive meaning to all sentences; thus, e.g., the sentences "The absolute is perfect" and "Nothingness nothings" cannot be translated into an empiricist language because their key terms are not definable by means of purely logical expressions and observation terms.

Solutions

- Moreover, Carnap had shown in *Testability and Meaning* that all meaning criteria provided so far (by Popper, Wittgenstein, etc.) could be understood as suggestions how to build up an empiricist language.
- The question of what the demarcation between science and metaphysics or sense and nonsense comes to was the question of what language we should choose to reconstruct the cognitively significant statements of the sciences.

Philosophy is the Study of the Syntax of the Language of Science

- Given all this different languages L_0-L_∞ that as a family of languages are characterised in *Testability and Meaning*, it was now a pragmatic affair to choose between them.
- Popper's criterion of falsifiability was not deemed to be *false* by Carnap, it was now turned into one possible proposal that was then rather *impracticable* for an empiricism that wanted to express certain things in its language.

Languages L_0-L_∞

- The languages Carnap characterised differed with respect to their quantificational resources.
- The most simple language L_0 had no quantificational resources whatsoever, a typical sentence of that language was of the form Fa.

Wittgenstein and L_o

- Carnap read Wittgenstein as suggesting L_0 as the language of empiricism.
- In fact, Wittgenstein had (in the Tractatus) insisted on total verifiability and claimed that all sentences of science are truth-functions of elementary sentences.
- This was impractical for the reason that science apparently used quantification in its most important sentences, the natural laws.

Popper and L_1

- Similarly, Poppers proposal was reconstructed as L_1, a language that allowed for universal quantification, as in

$\forall x (Fx \rightarrow Gx)$

[For all x, if x is F then x is G.]

Carnap and L_∞

- Carnap himself proposed L_∞, a language in which all cases of nested quantification was allowed (as in the cases considered last week, e.g. 'Everybody loves somebody sometimes').
- At the same time the languages came with differently strong notions of confirmation and testability.

The Logical Syntax of Language

- In *Syntax* Carnap had laid the groundwork for this new pragmatic approach to philosophy.
- Whereas the study of logic had so far been concerned with reconstructing a universal language, *Syntax* showed that there is in fact a plurality of formal languages.
- It was further shown that these languages could be studied scientifically – *Syntax* provides the means to talk about the syntax of a language in terms of the very same language.

Wittgenstein

- Wittgenstein's view that the *Tractatus* is meaningless is rejected.
- It is the purpose of Syntax to give reasons for this claim, to show a way of formulating the results of logical analysis, and thus to exhibit an *exact method of philosophy*.

Formality

- The Logical Syntax of a language is the *formal* theory of that language.
- "Formal" means, exclusively concerned with syntax, "without any reference to sense or meaning".
- This is an extension of Hilbert's metamathematics to "the whole language-system of science".

Formation Rules

- A language consists of a system of rules, which may be either *formation* rules or *transformation* rules.
- Formation rules determine how sentences of the language can be constructed. They are like grammatical rules except that they may not at any point make reference to semantic matters.
- For natural languages this is hard to do, but languages can be devised for which this can be done, e.g. that of *Principia Mathematica*.

Transformation Rules

- Transformation rules determine how from given sentences we may *infer* others.
- The totality of transformation rules for a language S determines the relation of "*direct consequence* in S".
- A sentence C is a *consequence* of a set of sentences P in S if it can be obtained by a chain of transformations from the sentences in P.
- Thus, formation rules correspond to grammar and transformation rules correspond to logic, both of which have a purely *formal* character.
- The word "sentence" is preferred to "proposition" because of the concern for syntax rather than semantics.

Terminology

- "term" here means "concept". The terms "sentence" and "direct consequence" are primitives which may be used to define the other syntactical terms of interest in logical syntax.
- "true" and "false" cannot be defined syntactically, but where a sentence is true or false "only by reason of rules of the language" then it is termed *valid* or *contravalid* respectively.
- A sentence A is *valid* if it is a consequence of the null class of premises, and is *contravalid* if every sentence of the language is a consequence of A. A sentence is *determinate* if it is either *valid* or *contradictory* and *indeterminate* otherwise.

Terminology

- *L-rules* are rules of a purely logical character. A system may include rules which are not L-rules (e.g. rules expressing laws of physics) which are called *P-rules*.
- C is an *L-consequence* of P if it is derivable from P using only L-rules. If C is a consequence but not an L-consequence, then it is a *P-consequence*.
- Other L- and P- terms may be defined analogously, e.g. a sentence is *L-valid* or *analytic* if it is an L-consequence of the null class of premises. Similarly *L-contravalid* or *contradicatory*, *L-determinate* (analytic or contradictory), *L-indeterminate* or synthetic.

Sentences

<table>
<tr><td colspan="2">valid</td><td>indeterminate</td><td colspan="2">contravalid</td></tr>
<tr><td>L-valid</td><td>P-valid</td><td></td><td>P-contravalid</td><td>L-contravalid</td></tr>
<tr><td>analytic</td><td colspan="3">synthetic</td><td>contradictory</td></tr>
</table>

Content and Synonymy

- The class of non-valid consequences of a sentence is called the *content* of the sentence.
- The content of a sentence represents is sense (excluding psychological connotations). Two sentences are called *equipollent* if they have the same content.
- Two expressions are called mutually *synonymous* if the content of any sentence containing one of them is not changed if we replace that expression by the other.

Gödelization

- But doesn't this still rely on English as a metalanguage in which all the explanations are given?
- As Gödel had shown, it need not. Many of the syntactical features of a language can be described by the language itself.

Gödelization

- The trick is to assign numbers to the logical constants and to the sentences in a language. If this is done in a specific way, from any resulting number it is always possible to retrieve the corresponding sentence.
- So far, this is just a specific coding, a notational variant of the language you started with.
- However, also sequences of sentences (as in a proof) have a number that identifies this specific sequence.

Gödelization

- But this way, all metalogical sentences (now about numbers and their properties) become themselves analytical truths of arithmetic.
- That is, the metalogical truths are truths *within* the object language.
- (Note that this can only be done for certain languages and only for some of their properties, as Gödel also showed.)

Syntax as Analysis

- The task of "syntax" is to analyse given sentences, proofs or theories in the above terms.
- The results of such an analysis should be formulated as *syntactical sentences*, e.g. "such and such a sentence contained in a certain theory is synthetic, but a certain other sentence is merely analytic," or: "This particular word of such a theory is synonymous, but not L-synonymous, with that and that combination of words", etc.
- However, many properly philosophical sentences are not apparently about syntax.

Real- and Pseudo-Object-Sentences

- Sentences containing irreducible references to not syntactic objects are called *real object-sentences*.
- There is another class of sentences which are like object-sentences in their form but like syntactical sentences in their content. These are called *pseudo-object-sentences*.

Empirical Science and Philosophy

- We now have three kinds of sentence, real-object, pseudo-object, and syntactical.
- Empirical science contains propositions of the first kind, and philosophy of the second and third kinds, which differ in their mode of expression rather than their content, which in both cases is syntactical.

Material and Formal Mode

- This difference in mode of expression is designated by the phrases *material* mode of speech and *formal* mode of speech.
- In the former there are apparent references to real objects, in the latter these are not present or have been eliminated. e.g. "The morning star and the evening star are identical." is in the material mode, and can be translated into the formal mode as "The words 'evening star' and 'morning star' are synonymous".

Material Mode in Philosophy

- Sentences in the material mode are deceptive in that they appear to refer to real objects but do not really do so.
- Most of the statements of philosophy are of this kind.

The Root of Confusion

- A lot of philosophical confusion results from the deceptive form of syntactical sentences expressed in the material mode.
- Idle philosophical controversies can be resolved by translating these confusing theses into the formal mode.

Translation to the formal mode

- Often the material mode involves reference to abstract objects such as numbers. Statements about such abstract entities can be replaced by statements which are about the kind of syntactic object used to refer to them. e.g. "7 is a number" can be translated into "'7' is a numerical sign". This process can be adapted to all kinds of abstract object.

Translation

- Similarly, talk about *meanings* (which are themselves abstract objects) can be translated into the syntactical analogues of semantic terms, such as *equipollent* and *synonymous*.
- By these means logical analysis will be able to convert logical statements into purely syntactic forms, permitting their status to be established by syntactical methods. Of course this doesn't apply to the real-object statements of the empirical sciences.

Modality

- Modality sentences are in fact veiled syntactical sentences, namely sentences of the material mode of speech. "That A is older than B, and B is older than A, is an impossible state." can be translated into the formal mode as "The sentence 'A is older than B, and B is older than A' is contradictory".

Other Modality

- Similar considerations apply to physical as well as logical modalities. e.g. "The state of a particular solid iron ball swimming on the water is a physical impossibility" can be translated as "The sentence 'This solid iron ball is swimming on the water' is contravalid" (actually P-contravalid).

Modality in the Formal Mode

- In general modal sentences are expressed in the material mode and can be translated into the formal mode using the following table:

Modality Translated

Modality	**Parallel syntactical terms**	
terms	L-terms	General terms
log. or phys. impossible	contradictory	contravalid
log. or phys. possible	non-contradictory	non-contravalid
log. or phys. necessary	analytic	valid
log. or phys. contingent	synthetic	indeterminate

Pluralism / Relativism

- Since, as this method makes clear, philosophical statements are *about language* it is clear that their truth will depend upon *which* language they are about.
- Translation into the formal mode makes it more conspicuous that a reference to the language under consideration is necessary, and this enables some kinds of philosophical confusion to be remedied.

Philosophy of Mathematics

- For example, a dispute between Russell and Hilbert about what numbers are, can be seen to be spurious since on translation their relative claims can be seen to be claims about what numbers are in distinct formal languages, and the claims are therefore not incompatible.

Confusion

- Use of the material mode of expression, while not incorrect in itself, can lead one into making statements which are not real-object statements but cannot be translated into the formal mode.
- These statements are metaphysical pseudo-questions, e.g. whether numbers are real objects or ideal objects.

Remedy

- It is advisable therefore to use the material mode with caution and to translate back into the formal mode at key points in discussion.
- Faced with someone unwilling to undertake this kind of explication, withdrawing from the debate may be the best policy.

Philosophy is Syntax

- The properly philosophical part of epistemology includes the logical analysis of the verification of assertions.
- Questions of this kind can be expressed in the formal mode, since they are concerned with the observation sentences which are deducible from the assertion in question.
- Hence *epistemology* - (as philosophy) - *is a part of syntax*.