

Lecture 34
Carnap on the Empirical Content of Theories

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L-truth and A-truth

L-truth (259)

A sentence is *logically true* (*L-true*) if it is true in virtue of the meanings of the logical terms occurring in it.

- Logical terms are “and,” “or,” “not,” “if ... then,” etc.
- “If no bachelor is a happy man, then no happy man is a bachelor” is L-true.

A-truth (259–60)

A sentence is *analytic* (*A-true*) if it is true in virtue of the meanings of the terms occurring in it.

- Every L-true sentence is A-true.
- “No bachelor is married” is A-true but not L-true.

A sentence is *synthetic* if its truth or falsity is not determined by the meanings of its terms. *Example*: “Objects fall to the earth with an acceleration of 32 feet per second per second.”

Quine's criticism

- Some philosophers, most notably W. V. Quine, have attacked the distinction between analytic and synthetic statements.
- If you are interested in this, I recommend reading Carnap's reply to Quine in *The Philosophy of Rudolf Carnap*, ed. Paul Arthur Schilpp, Open Court 1963, 915–22.

A-postulates

- In a natural language, such as English, there are words whose meaning is unclear, and hence sentences for which it is unclear whether they are analytic or not.
- In an artificial language, this problem is avoided. Meaning relations between terms are specified by *A-postulates*. A sentence is analytic iff it follows from the A-postulates.

Example (262–63, simplified)

Consider the traditionally ambiguous assertion, “All men are rational animals.” The main difficulty here lies in the great ambiguity of what is meant by “men.” In our artificial language, there is no difficulty because the list of our A-postulates settles the matter by fiat. If we desire to interpret “men” in such a way that “rationality” and “animality” are essential meaning components of the word, then “All men are rational” and “All men are animals” are listed among the A-postulates. On the other hand, if the A-postulates for “men” refer only to the structure of men’s physical bodies, then the statement, “All men are rational animals,” is synthetic.

Terminology (258)

Kinds of terms:

- 1 Logical terms, e.g., “and,” “or,” “not,” “if ... then.”
- 2 O-terms (observation terms), e.g., “blue,” “cold,” “heavier.”
- 3 T-terms (theoretical terms), e.g., “electric charge,” “proton.”

Kinds of postulates of a theory:

- 1 T-postulates (theoretical postulates) contain T-terms but no O-terms.
- 2 C-postulates (correspondence rules) contain both T-terms and O-terms.

The problem (265–69)

- T-terms acquire their meaning from the T-postulates and C-postulates of the theory.
- These postulates cannot all be A-postulates, since together they make contingent empirical predictions.
- Is there a way to separate the two functions of the postulates, to identify the part that specifies meaning (A-postulates) and the part that is factual?
- Quine and Hempel said that's impossible.

The Ramsey sentence (247–55)

- Let TC be the conjunction of all the T - and C - postulates of a theory. Let t_1, \dots, t_n be the theoretical terms in TC and o_1, \dots, o_m the observation terms. We'll write the theory as:

$$TC(t_1, \dots, t_n, o_1, \dots, o_m).$$

- Let x_1, \dots, x_n be variables. The Ramsey sentence for TC is:

$$\exists x_1 \dots \exists x_n TC(x_1, \dots, x_n, o_1, \dots, o_m).$$

This says there are some things x_1, \dots, x_n which have the features that the theory attributes to t_1, \dots, t_n .

It is easy to show that any statement about the real world that does not contain theoretical terms—that is, any statement capable of empirical confirmation—that follows from the theory will also follow from the Ramsey sentence. In other words, the Ramsey sentence has precisely the same explanatory and predictive power as the original system of postulates. (252)

i.e.,

$TC(t_1, \dots, t_n, o_1, \dots, o_m)$ implies $S(o_1, \dots, o_m)$

iff

$\exists x_1 \dots \exists x_n TC(x_1, \dots, x_n, o_1, \dots, o_m)$ implies $S(o_1, \dots, o_m)$.

Logical notation: " $A \supset B$ " means "if A then B ."

More precisely: Either A is false or B is true.

Carnap's solution (270)

Let ${}^R TC$ be the Ramsey sentence for TC .

- ${}^R TC$ contains the entire factual content of TC .
- Therefore, the part of TC that gives the meaning of the T-terms in TC is the part of TC that goes beyond ${}^R TC$.
- That part of TC is ${}^R TC \supset TC$. (Because this is the weakest sentence which, together with ${}^R TC$, implies TC .)
- Therefore, we can take ${}^R TC \supset TC$ as the A-postulate for all the T-terms in TC .

Simplified example

Suppose TC is a theory whose only theoretical terms are “atom” and “molecule.”

- TC makes assertions about atoms and molecules.
- ${}^R TC$ says that there are some things that have the properties that TC says atoms and molecules have. This is the factual part of TC .
- ${}^R TC \supset TC$ says if that is so, then TC is true, i.e., atoms and molecules have the properties that TC says they have. This merely specifies the meaning of “atom” and “molecule.”

- 1 What does Carnap mean by “L-true” and “A-true”? Give an example that shows the difference between these concepts.
- 2 What is the connection between A-truth and A-postulates for an artificial language?
- 3 Explain what the Ramsey sentence for a theory is.
- 4 Let TC be the conjunction of the theoretical postulates and correspondence rules for a theory. According to Carnap, what is the part of TC that specifies meanings of the theoretical terms, and hence can be taken as an A-postulate? What reasons does Carnap have to justify this choice?



Rudolf Carnap.

An Introduction to the Philosophy of Science.

Dover, 1995.

First published in 1966 with the title *Philosophical Foundations of Physics: an Introduction to the Philosophy of Science.*

Numbers in parentheses are page numbers of this book.