Philosophy of Science: Post-positivism, part I

Kristina Rolin 2012

Logical empiricism

- The Vienna Circle (e.g., Moritz Schlick, Otto Neurath, Rudolf Carnap, and Herbert Feigl).
- The early 20th century developments in logic were seen as a key to understanding the relations between empirical evidence and hypotheses/theories, between statements about observable and unobservable phenomena.
- Verificationism: The meaning of a proposition is related to its method of verification.
Positivism as logical empiricism

- **Empiricism**: Scientific knowledge is based on observation statements (which are understood to be basic beliefs).
- **Logical**: Philosophy of science aims to reconstruct the logical structure of scientific knowledge (e.g., rules that can be used to connect observation statements to hypotheses and theories).
- **Unity of the sciences**: All sciences are united by certain epistemic goals and methods.

Verificationism

- **Scientific theories and hypotheses** have meaning (or empirical content) only insofar as scientists are able to “translate” them into observation statements.
- **The aim is** to provide a demarcation criterion for science versus metaphysics.
Analytic versus synthetic

Scientific knowledge consists of two kinds of claims:

(1) *Analytic* claims are true (or false) merely in virtue of the meaning of the terms in the claim (“translations”).

(2) *Synthetic* claims are true (or false) in virtue of both the meaning of the terms and how the world actually is (observations statements and properly “translated” theories and hypotheses).
Analytic truths

- Logical truths (tautologies) are true in virtue of the meaning of the logical terms.
  - “p or not p.”
  - “No unmarried man is married.”
- Conceptual truths are true in virtue of the meaning of the other (non-logical) terms.
  - “No bachelor is married.”

Two kinds of knowledge

- A priori (“from what comes before”): A statement can be known to be true (or false) without reference to experience (except in so far as experience is necessary for understanding its terms).
- A posteriori (“from what comes after”): A statement can be known to be true (or false) only by reference to experience.

The “old” debate between rationalists and empiricists concerned the question of whether concepts are derived from “pure reason” or experience (or both).
### Kant’s transcendental philosophy

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### Purely “analytic” philosophy

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Willard Van Orman Quine (1908-2000)

“Two dogmas of empiricism” (1951)
1. The distinction between analytic and synthetic truths.
2. Reductionism (verificationism): “…the belief that each meaningful statement is equivalent to some logical construct upon terms which refer to immediate experience” (1961, 20).

“The two dogmas are, indeed, at root identical” (41).

Meaning?

Can we make sense of the notion of “analytic”?

“A statement is analytic when it is true by virtue of meanings and independently of fact” (21).

- Meaning is not to be identified with naming: “evening star” versus “morning star” (21).
- Meaning is not to be identified with extension: “creature with heart” versus “creature with kidneys” (21).
- Synonymy: “A bachelor is an unmarried man” (23).
Synonymy?

Can we make sense of the notion of "synonymy" (independently of the notion of "analytic")?

Logical truths (tautologies) are true in virtue of the meaning of the logical terms.
- "No unmarried man is married."
Conceptual truths are true in virtue of the meaning of the other (non-logical) terms.
- "No bachelor is married."
- Synonymy: “Bachelor” is equal to “unmarried man.”
- Logical truth: “No unmarried man is married.”

Definitions?

- How do we find out that “bachelor” is defined as “unmarried man”? Who defined it thus, and when? (24)
- “Clearly the ‘definition’ which is the lexicographer’s report of an observed synonymy cannot be taken as the ground of the synonymy.” (24)
- Carnap’s “explication” is intended to improve upon definitions. But the problem is that both definitions and explications are dependent on the notion of synonymy (25).
Interchangeability *salva veritate*?

- “The synonymy of two linguistic forms consists simply of their interchangeability in all contexts without change of truth value” (27)?
- Counter-example:
  - “‘Bachelor’ has less than ten letters.”
  - “‘Unmarried man’ has less than ten letters.”

**Quine’s conclusions**

- We cannot make sense of the notion of “analytic.”
- “My present suggestion is that it is nonsense, and the root of much nonsense, to speak of a linguistic component and a factual component in the truth of any individual statement” (42).
- “Taken collectively, science has its double dependence upon language and experience; but this duality is not significantly traceable into the statements of science taken one by one” (42).
Quine’s holism

- “Our statements about the external world face the tribunal of sense experience not individually but only as a corporate body” (41).
- “The unit of empirical significance is the whole of science” (42).
- “The totality of our so-called knowledge or beliefs... is man-made fabric which impinges on experience only along the edges” (42).
- “It is misleading to speak of the empirical content of an individual statement” (43).

Holism in epistemic justification

Only a “web of beliefs” can have empirical content, not a single belief. Therefore, we cannot test a single hypothesis in isolation (the Duhem-Quine thesis).

Pierre Duhem (1861-1916)
Popper’s falsificationism?

If (H and B1 and B2 and B3), then E.
Not E.
Therefore, it is not the case that (H and B1 and B2 and B3).


Quine’s underdetermination thesis

• “But the total field is so underdetermined by its boundary conditions, experience, that there is much latitude of choice as to what statements to reevaluate in the light of any single contrary experience” (42-43).

• “Any statement can be held true come what may, if we make drastic enough adjustments elsewhere in the system” (43).
"Epistemology naturalized"

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Quine’s “Epistemology naturalized” (1969)

Two cardinal tenets of empiricism remain unassailable:

- Whatever evidence there is for science is sensory evidence.
- The meaning of words must rest ultimately on sensory evidence.
Epistemology as psychology?

Alternative to “rational reconstruction” of scientific knowledge:

“The simulation of his sensory receptors is all the evidence anybody has had to go on, ultimately, in arriving at his picture of the world. Why not just see how this construction really proceeds? Why not settle for psychology? Such a surrender of the epistemological burden to psychology is a move that was disallowed in earlier times as circular reasoning.” (249)

Circular reasoning?

- “Such scruples against circularity have little point once we have stopped dreaming of deducing science from observation” (249).
- “Better to discover how science is in fact developed and learned than to fabricate a fictitious structure to a similar effect” (251).
- “We are after an understanding of science as an institution or process in the world, and we do not intend that understanding to be any better than the science which is its object” (255).
The indeterminacy of translations

Can we make sense of the notion of “theoretical sentence”?  
- “Theoretical sentences have their evidence not as single sentences but only as larger blocks of theory” (253).
- “A statement about the world does not always or usually have a separable fund of empirical consequences that it can call its own” (253).
- “The predicament of the indeterminacy of translation has little bearing on observation sentences” (258).

Quine’s empiricism

- “The observation sentences are the sentences on which all members of the community will agree under uniform stimulation” (257)?
- “They afford the only entry to a language” (258).
- “The observation sentence, situated at the sensory periphery of the body scientific, is the minimal verifiable aggregate; it has an empirical content all its own and wears it on its sleeve” (258).
Community-wide acceptance

Can we make sense of the notion of “analytic”?

“A sentence that is true by mere meanings of words should be expected, at least if it is simple, to be subscribed to by all fluent speakers in the community” (257)?

Quine’s conclusion

“Epistemology, or something like it, simply falls into place as a chapter of psychology and hence of natural science” (254).
Philip Kitcher on naturalism in philosophy of science (1992)

- There are several forms of naturalism in contemporary philosophy of science.
- Yet all share an opposition to the Frege-Wittgenstein conception of “pure” philosophy above empirical sciences.
- They reject two presuppositions:
  - Logic is the proper idiom for epistemological discussion.
  - The products of philosophical analysis are known a priori.

The demise of rational reconstruction

- Logical relations and causal relations are not the same kinds of relation. What relations matter in the analysis of knowledge?
- “Take any set of favored logical relations among propositions that a subject believes. It is nonetheless possible that the subject lacks knowledge and lacks justification because the psychological connections among her states of belief have nothing to do with the logical relations” (60).
The role of normativity?

- Normative approaches in philosophy of science offer accounts of how people ought to think. Since ‘ought’ implies ‘can’, normative approaches must take into account that human beings are “highly fallible cognitive systems, products of a lengthy evolutionary process” (Kitcher 1992, 58).
- Normative approaches should specify the goals of scientific inquiry (e.g., significant truth) and use empirical methods to find out the best means to achieve these goals (under some circumstances).

Example

- The requirement of total evidence: All available and relevant evidence is to be considered in forming a belief.
- Most people are incapable of bringing together all the relevant information they have (heuristics).
- In most cases, “all available and relevant evidence” is just too much for an individual to process (socially distributed cognition).
Thomas Kuhn’s naturalism

- There is a mismatch between the deliverances of methodology and the reasoning that scientists actually employ (Kitcher 1992, 73).
- Philosophers are confronted with a dilemma: “Either they can continue to insist that philosophers know a priori the principles of confirmation and evidence, concluding that the actual reasoning of scientists is cognitively deficient, or they can abandon the a priori status of methodological claims and use the performances of past and present scientists as a guide to formulating a fallible theory of confirmation and evidence” (Kitcher 1992, 73).

Kitcher’s naturalism

- Epistemology aims to understand the epistemic quality of human cognitive performance, and to improve on it (Kitcher 1992, 74-75).
- The epistemic status of a state is dependent on the processes that generate and sustain it (75).
- Epistemology aims to describe processes that are reliable, in the sense that they have a high frequency of generating epistemically virtuous states in human beings (75-76).
- Virtually no epistemological principle is knowable a priori (76).
References


Today’s message

- Positivism: Scientific theories and hypotheses have empirical content only insofar as scientists are able to “translate” them into observation statements.
- But we cannot have such “translations” because the notion of “analytic truth” is corrupt.
- A “web of beliefs” is the unit of empirical content in science.
- Holism in epistemic justification: Scientific theories and hypotheses cannot be tested in isolation.
- Holism is not contextualism!