Thomas Kuhn’s Concept of Incommensurability and the Stegmüller/Sneed Program as a Formal Approach to that Concept

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Overview

• The formal approach to scientific theories
• The historical approach (Kuhn)
• Stegmüller‘s approach (Kuhn Sneedified)
• Feyerabend‘s criticism of Stegmüller
• Stegmüller‘s reaction
• Conclusion
The formal approach I:

the 'statement view' (Carnap etc.)

• A scientific theory is a set of statements
• There is empirical vocabulary (observable things) and theoretical vocabulary (unobservable things)
• There are some correspondence rules that allow us to reduce the theoretical vocabulary to the empirical vocabulary
The formal approach II: 
the 'non-statment view' 
(Suppes, Sneed, Stegmüller, etc.)

- A scientific theory is a pair \((K,I)\) that consists of a structure core \(K\) and a class of intended applications \(I\)
- \(K\) is a class of semantic structures which is axiomatically defined
- \(I\) is a class of fragments or substructures of elements of \(K\)
- \(I\) represents the empirical world
The formal approach III

statement view vs non-statement view

• The statement view and the non-statement view are not theories about theories but different forms of formal notation for theories

• We have a question of different formal frameworks here and not a question of different scientific views
The historical approach I

a role for the history of science

• A scientific theory is not merely a formal thing, but a thing with psychological, historical and sociological aspects.

• If we analyze not only formal caricatures of scientific theories but theories in their historical context we obtain substantial changes of our picture of scientific theories:
The historical approach II

Paradigms and normal science

• Theories are paradigms that are shared by a whole scientific community
• In normal science the scientific community is concerned only with puzzle solving in the realm of a fixed scientific paradigm
• Failure of an experiment does not lead to the immediate rejection of the whole paradigm
The historical approach III

scientific worldviews

• The empirical vocabulary of a scientific theory is *theory-laden*, because it is constituted by the theoretical paradigm that the observer holds.

• A paradigm forms a *scientific worldview* of a highly unique nature, including formal, psychological and methodological aspects.
The historical approach IV

Incommensurability
(Kuhn, according to Feyerabend)

(A) „different paradigms use *concepts* that cannot be brought into the usual logical relations of inclusion, exclusion, overlap“ (formal)

(B) „different paradigms make us see things differently“ (psychological)

(C) „different paradigms contain different *methods* for setting up research and evaluating its results“ (methodological) (CPR, 363)
Stegmüller’s approach I

• The following ideas were developed in their formal aspects essentially by Joseph Sneed („The Logical Structure of Mathematical Physics“ (1971), Ch. VIII)
• Wolfgang Stegmüller added numerous philosophical interpretations and refinements of the formal apparatus in:
  – „Theorienstrukturen und Theoriendynamik“ (1973)
  – „Structure and Dynamic of Theories“ (1975)
From 1973 until 1978 Stegmüller almost exclusively was concerned with his program of a „Sneedification of Kuhn“

In 1975 he added a chapter on Kuhn to his introductory book „Main Currents in Contemporary Philosophy“, where he also introduces his formal reconstruction („Sneedification“) of Kuhn

But only in 1978 Stegmüller added an own chapter on Sneed and theory- „structuralism“

This supports the thesis that before 1978 Sneed was merely a tool for Stegmüller that allowed him to close a “rationality gap” in Kuhn’s theory
Stegmüller’s approach III

the strategy

• Extend the semantic picture of a theory to a notion of „holding a theory“
• This formal framework allows a formalization of paradigms:
  • A paradigm is a theory that is held by a particular person or scientific community
  • Here “theory” and “holding a theory” are understood in the formal sense just suggested
Stegmüller’s approach IV

Consequences for paradigms

• Different paradigms (in the sense of Sneed/Stegmüller) may have disjoint and overlapping theoretical parts
• Different paradigms may be (partially) *empirically equivalent* at the same time
• One paradigm may be part of another, paradigms may overlap or may be disjoint
• Every (theoretical or empirical) concept of paradigm x has a clearly defined relation to every (theoretical or empirical) concept of paradigm y
Stegmüller’s approach V

Consequences for Incommensurability

• Different paradigms are not at all incommensurable
• There is progress in the sciences
• The formal approach (“Kuhn Sneedified”) allows us to close a “rationality gap” in Kuhn’s account
There is no formalizable relation at all between different paradigms.

Paradigms form a partial order with aspects of inclusion and exclusion, disjunction, and overlap.
Feyerabend’s criticism I

- In a detailed review “Changing Patterns of Reconstruction”, BJPS 28, 1977 Paul Feyerabend criticized Stegmüller’s program of a “Sneedification of Kuhn” (Feyerabend)
- This is probably the only detailed critical review that takes into account both the formal and the non-formal side of the problem
- I mention three points of criticism
Feyerabend’s criticism II

Overformalization

• Stegmüller’s account is full of unnecessary formalizations

“there are informal informal explanations followed by informal formal explanations followed by formal formal explanations and I often did not see the point of a formal definition […] hardly any of the definitions are used as a starting point for the derivation of novel theorems and thus of fruitful knowledge; the most we get are lemmas for further definitions” (p. 363)
Feyerabend’s criticism III

restriction to non-statement view

• It is not true that we necessarily have to adopt the non-statement view, in order to express the formal aspects of paradigm-change that Stegmüller wants to express.

• The statement view may do also a good job here.
“Stegmüller discusses only area (A) [of incommensurability in the sense of Kuhn], shows that there can be comparability despite conceptual disparity and seems to assume that incommensurability in Kuhn’s sense has now been done away with. […] His discussion of Kuhn is therefore defective at a decisive point”. (p. 364)
Feyerabend’s criticism V

Only incommensurability (A)

• This is a serious shortcoming of Stegmüller’s theory
• But interestingly Feyerabend (and even Kuhn) seem to buy Stegmüller’s claim that there is no incommensurability (A)
• Thus, one only had to *complete* the analysis by considering both the commensurable paradigms (in the formal sense) and the incommensurable paradigms (in the psychological and methodological sense):
Paradigms are incommensurable in a psychological and in a methodological sense (the empirical perspective).

Paradigms are commensurable if we understand them as items of a formal language (the formal perspective).

Kuhn B, C

Kuhn A
Stegmüller‘s paradoxical reaction

- Stegmüller wrote a whole book („The Structuralist View of Theories“, 1979) as a reply to Feyerabend
- Stegmüller did not refine his account, in order to clarify the relation between the formal and the psychological and methodological aspects of the sciences
- Instead, he played down the relevance of Kuhn‘s approach to his „structuralism“ (as being „a side-effect only“, p. 1)
- And he purified his account as a restrictively and exclusively formal business without any aspect of „naturalization“
Conclusions

• In the seventieth there were efforts to combine the new historical approach to the sciences with the older formal approach

• These efforts did not fail systematically but were given up for pragmatic and strategic reasons

• Looking back to these efforts may help us to find a way out of the recent unfortunate situation of purified historical/sociological accounts and purified formal accounts of the sciences