

# THOMAS KUHN AND “THE NEW PHILOSOPHY OF SCIENCE”

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**Abstract.** The transition from Kuhn’s philosophy of science to the “new philosophy of science” can be synthesized in the formula: the transition from an “image of science” to the theory of science. The distinction between them is particularly important for understanding the significance of Kuhn’s work and the remarkable progress of post-Kuhnian philosophy of science.

**Keywords:** “mature science”; “new philosophy of science”; Kuhn; theory of science.

In this paper I will formulate several elements of a perspective on Kuhn’s ideas regarding how (change in) science should be understood distinct from the majority of contemporary approaches. I will focus not so much on the ideational content or “what Kuhn said” and how his viewpoint can be criticized/interpreted; what interests me here is to what extent a theoretical reconstruction of his position in the philosophy of science is possible in terms of the “new philosophy of science”.

## PRELIMINARY REMARKS

The phrase “new philosophy of science” can refer to several types of philosophical activity:

a) Theodore Kisiel and Galen Johnson first used the expression “new philosophies of science” to characterize the research of St. Toulmin, N. R. Hanson, Th. S. Kuhn and P. Feyerabend;

b) The phrase “new philosophy of science” has also been used to characterize the “post-Kuhnian philosophy” of science, and it refers to Kuhn’s influence on the philosophy of science;

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c) Harold Brown published a book in 1979 addressing the new philosophy of science (*Perception, Theory and Commitment: The New Philosophy of Science*) that only had a minimal echo among philosophers of science;

d) The expression “new philosophy of science” is also used to designate the philosophy of contemporary science, of real science as it was constituted following the great revolutions in the 20<sup>th</sup> century science, the mathematical, the foundational-theoretical, and the structuralist revolutions, changes which started with the construction of the theory of relativity and quantum mechanics, with the theoretical structuralism and the abstract mathematics, etc.

In a text that will continue this one, a theoretical model of the structure and dynamics of mature science allowing, for a constructive surpassing of Kuhn's conception of the evolution of science, will be presented.

### **1. THOMAS KUHN'S SELF-PRESENTATION OF THE INTENTIONS AND RESULTS OF HIS WORK *THE STRUCTURE OF SCIENTIFIC REVOLUTIONS.***

Right at the beginning of his work, in “Introduction: a role for history”, Kuhn writes that the aim of this essay “is a sketch of the quite different concept of science that can emerge from the historical record of the research activity itself”<sup>1</sup>.

In turn, Kuhn points out: “History, if viewed as a repository for more than anecdote or chronology, could produce a decisive transformation in the image of science by which we are now possessed. That image has previously been drawn, even by scientists themselves, mainly from the study of finished scientific achievements as these are recorded in the classics and, more recently, in the textbooks from which each new scientific generation learns to practice its trade. Inevitably, however, the aim of such books is persuasive and pedagogic; a concept of science drawn from them is no more likely to fit the enterprise that produced them than an image of a national culture drawn from a tourist brochure or a language text. This essay attempts to show that we have been misled by them in fundamental ways.”<sup>2</sup>

Kuhn's intention is to produce, following Al. Koyré's path, “a historiographic revolution in the study of science”. This is characterized by the fact that “Rather than seeking the permanent contributions of an older science to our present vantage, they attempt to display the historical integrity of that science in its own time.”<sup>3</sup> Kuhn's essay “aims to delineate that image by making explicit some of the new historiography's implications”<sup>4</sup>.

<sup>1</sup> Th. Kuhn, *The Structure of Scientific Revolution*, second edition, enlarged, Chicago, Univ. of Chicago Press, 1962–1970, p. 1.

<sup>2</sup> *Ibidem*.

<sup>3</sup> *Ibidem*, p. 3.

<sup>4</sup> *Ibidem*.

Finally, a single fragment with methodological implications: “In addition, the view of science to be developed here suggests the potential fruitfulness of a number of new sorts of research, both historical and sociological.”<sup>5</sup> All these determinations of Kuhn’s conception lead to the following assessment by Wolfgang Stegmüller: “Kuhn’s work on scientific revolutions represents the greatest existing challenge to contemporary science theory.”<sup>6</sup>

The above quotes are in themselves significant for understanding Kuhn’s vision and achievement: a new philosophy of science and a new historiography of science. On the other hand, Stegmüller’s statement is justified as long as no widely accepted theoretical formalization of Th. S. Kuhn. With respect to Joseph D. Sneed’s interpretation and reconstruction, that we shall address later, Th. S. Kuhn, while accepting that Sneed’s terminology promises a precision and systematic development impossible in my language, and I welcome the insight it offers<sup>7</sup>, nevertheless finds it appropriate to point out that in Sneed’s reconstruction a major problem remains to be solved, represented by “the comparison of incompatible theories”, against which “the effect of Sneed’s formalism is drastically diminished”.

## 2. THE DIRECTIONS IN WHICH THE *STRUCTURE OF SCIENTIFIC REVOLUTIONS* HAS BEEN INTERPRETED AND RECONSTRUCTED

The “underdetermined” nature of the presentation of Kuhn’s ideas (acknowledged by Kuhn himself by the fact that his work is presented not as a theory but as an “essay”), of Kuhn’s conception, or of Kuhn’s “concept of science” has provoked a variety of attempts to analyze and reconstruct *The Structure ...*, to project, appropriate or take up in other frameworks the image of science present in Kuhn’s work.

I will start from the systematic study of A. Ibarra and Th. Mormann on the main modes of theoretical-philosophical reconstruction in *The Structure....* To these I will add an interpretation of *The Structure...* from the perspective of a contemporary theory of science that allows a theoretical redesign of Kuhn’s conception of science.

The theoretical interpretations and reconstructions of Kuhn’s work, which Ibarra & Mormann analyze, are those of Rudolph Carnap, Joseph D. Sneed, W. Stegmüller and Michael Friedman. They come from different directions, and

<sup>5</sup> *Ibidem*, “Preface”, p. IX.

<sup>6</sup> W. Stegmüller, „Theoriendynamik und Logisches Verständnis”, in *Theorien der Wissenschaftsgeschichte*, ed. by Werner Diedrich, Suhrkamp Verlag, Frankfurt, 1974 (translated in Romanian in I. Pârvu ed., *Istoria științei și reconstrucția ei conceptuală. Antologie* [The History of Science and its Conceptual Reconstruction], București, Editura Științifică și Enciclopedică, 1981, p. 416).

<sup>7</sup> See Th. Kuhn, “Theory-Change as Structure-Change: Comments on the Sneed Formalism”, in *Erkenntnis*, vol. 10, no. 2, July, 1976, pp. 179–199.

theoretically project Kuhn's work differently. A. Ibarra and Th. Mormann confront Kuhn with the main orientations and conceptions in the philosophy and theory of science: logical empiricism and the logic of science (Carnap), set-theoretic structuralism (Sneed, Stegmüller) and neo-Kantianism (M. Friedman). Other projections turned to topology and the mathematical theory of categories, relying on the premise that these formalizations of the scientific theory are expressed in terms specific to these mathematical disciplines (Th. Mormann, H. Halverson).

Carnap's attitude towards Kuhn's work seems highly unexpected, as the two perspectives on science (logical and historical) are considered by many philosophers of science to be incompatible. The interpretations of how R. Carnap related to Kuhn's work, starting from Carnap's role in the "Encyclopedia of Unified Sciences" project, the official theoretical platform of logical empiricism, where he invited Kuhn to publish his work, seem to offer a new perspective on the dialogue between the two great philosophers of science. Moreover, C. Hempel, Ph. Frank and O. Neurath, through their works, provide a further foundation for the idea that "the relationship between the logical-empiricist philosophy of science and Kuhn's historical approach cannot simply be described as a clear and radical opposition" [p. 2]. Rather, this relationship can be seen, according to Ibarra and Mormann, as two versions of a common conception of science. Thus, "following the works of Reisch, Grinberg, and many others one can construct a kind of dictionary between the perspectives of Carnap and Kuhn. Thus, Carnap's "linguistic frameworks" will correspond to Kuhn's "paradigms" and Kuhn's "normal science", which can be described as puzzle solving within a given paradigmatic framework, finds its counterpart in Carnap's concept of question answering and theorem demonstration within a given linguistic system. Finally, the replacement of one linguistic or ontological framework by another corresponds to a scientific revolution where one paradigm is replaced by another. "To put it briefly", write Ibarra and Mormann, "Kuhn's approach based on the notion of paradigm could be considered an informal version of Carnap's or, conversely, Carnap's linguistic frameworks can be considered as a logicized counterpart of Kuhn's paradigms."<sup>8</sup> In this way, Kuhn's conception could be seen by Carnap as a "complement to the logical approach of logical empiricism". Thus, Carnap had long before recognized as fully legitimate "in complementing the logic of science... empirical research into scientific activities, such as historical, sociological and, above all, psychological research"<sup>9</sup>.

A. Ibarra and Th. Mormann further present a more complex relationship between Carnap and Kuhn. On Carnap's side we have to acknowledge a "pluralist

<sup>8</sup> A. Ibarra, Th. Mormann, "Appropriating Kuhn's Philosophical Legacy – Three Attempts: Logical Empiricism, Structuralism, and Neokantianism", *Cadernos de Filosofia das Ciências*, 8, 2010, p. 7.

<sup>9</sup> R. Carnap, *Logische Syntax der Sprache*, Vien, Springer, 1934, p. 279.

conception of a comprehensive theory of science”, a theory of science with a much broader spectrum that does not neglect the different modes of empirical research of science. This view was also endorsed by other members of the Vienna Circle (O. Neurath, Ph. Frank, etc.) who argued that we can find “a living link between science and the evolution of the human race”<sup>10</sup>. However, it is worth noting that this link between the logical theory of science and the history of science was not realized by the members of the Vienna Circle at a high level, perhaps also because no common methodology or common object was found for the two meta-scientific disciplines, the logic of science and the history of science.

This unifying project has not been achieved, and this is due to both sides. Although Kuhn later became interested in the logic of science in the structuralist version of J. D. Sneed and W. Stegmüller, he did not coherently and comprehensively develop a theory of science compatible with the idea of science underlying the *Structure*. In turn, Carnap did not integrate Kuhn’s historical perspective into his research, nor even into his more general works in philosophy of science such as the *Philosophical Foundations of Physics* (1966). Emerging as a possible synthesis between the philosophy of science (whether logical or mathematical) and the history of science, Carnap’s and Kuhn’s initial attitude did not lead to a theoretical model that unified the logic of science with the history of science. In this way, “the bipartite meta-theory was nothing more than a juxtaposition of two unrelated components”<sup>11</sup> that had no influence on each other.

The German philosopher Wolfgang Stegmüller played a decisive role in this “dispute”. He found in the formalism of the theoretical reconstruction of science developed by Joseph Sneed, in the so-called “structuralist conception of theories”, a “suitable framework for overcoming the scission between the logical or formal approaches to science and the socio-historical approaches”, such as that of Kuhn<sup>12</sup>. In other words, the structuralist meta-theory of Sneed and Stegmüller’s Munich School had “the capacity to provide the philosophy of science with the conceptual tools for a conceptual reconstruction of Kuhn’s socio-historical approaches”<sup>13</sup>. In this sense, the structuralist philosophy of science offered a comprehensive synthesis of formal and socio-historical aspects on science.

At one time, Kuhn himself considered that “the new formalism makes new territories accessible to analytical philosophy”. If ways could be found to represent the essential elements of Sneed’s position, philosophers, scientists and historians of science would, for the first time, have fruitful channels for interdisciplinary communication<sup>14</sup>.

<sup>10</sup> Ph. Frank, *Modern Science and Its Philosophy*, New York, George Brazillév, 1949, p. 278.

<sup>11</sup> A. Ibarra, Th. Mormann, *op. cit.*, p. 11.

<sup>12</sup> *Ibidem*, p. 12.

<sup>13</sup> *Ibidem*.

<sup>14</sup> Th. Kuhn, “Theory-Change as Structure-Change: Comments on Sneed Formalism”, *Erkenntnis*, 10:181.

There was a hope among philosophers of science that the new meta-theoretical framework constructed by Sneed and Stegmüller's group (which found its quasi-complete expression in the treatise *An Architectonic for Science* that W. Balzer, C.U. Moulines, and J. D. Sneed published in 1987) will lead to the formulation of a theory of science that essentially incorporates aspects of scientific evolution and progress as informally presented by Th. Kuhn. After the enthusiasm with which Sneed, Balzer and Moulines' reconstruction was received, the interest in Sneed's theory waned without being able to find a rational explanation for this decline.

The third interpretative direction of Kuhn's work is illustrated by Michael Friedman, who has attempted in his studies to formulate a comprehensive conception of the philosophy of science that describes the dynamics of (scientific) reason in an accurate manner and at the same time takes into account its social and historical complexities. Ibarra and Mormann have called Friedman's perspective of analysis "neo-Kantian" or, more precisely, neo-neo-Kantian. Friedman presented his conception in a series of studies and in the book *Dynamics of Reason*<sup>15</sup>.

As Ibarra and Mormann see it, Friedman's "appropriation" of Kuhn's ideas stems from the similarities that can be observed between Kuhn's "paradigm" and Carnap's "linguistic frameworks", and these similarities can best be understood as representing contemporary versions of those constitutive a priori of scientific knowledge present in Kant's conception. In this way the neo-Kantian perspective allows not only an understanding of those general thematic ideas of Kuhn's about normal science but also of the relationship between Kuhn's perspective and that of Carnap.

### **3. MOVING FROM ESSAY TO THEORY. KUHN AND THE NEW PHILOSOPHY OF SCIENCE**

In respect with Kuhn's relation to the "new philosophy of science", I will now make just a few general considerations.

First, I have to say that by "the new philosophy of science" I mean the current philosophy of real contemporary science, characterized as a mature, theoretically sound, mathematically sound science with a solid experimental ground (although in recent years a conception of contemporary science has emerged according to which it is not absolutely necessary to resort to experimental proof of theoretical constructions for science to justify its hypotheses). This view was generated by attempts to "verify" the String Theory. An extensive development of this anti-Popperian perspective and methodology can be found in Richard David's book *String Theory and Scientific Method* (2013).

<sup>15</sup> M. Friedman, *Dynamics of Reason*, Stanford, CSLI Publications, 2001.

Secondly, I think it is necessary to analyze how Kuhn’s philosophical conception is projected in the new philosophy of science. I am referring here to how the requirements present in Kuhn’s work are taken up at the level of the theoretical construction of science (the theme par excellence of the new philosophy of science). In particular, we will take as actual examples the Kuhnian themes that require a philosophical extrapolation in the new philosophy of science.

The starting point of such an analysis is the theoretical projection of Kuhn’s philosophy of science. In order to make the transition from Kuhn’s philosophy to the new philosophy of science, we will return to the work of Ibarra and Mormann where the levels at which Kuhn’s philosophy of science can be projected into the architecture of science (= theoretical construction + foundational research) are presented. Broadly speaking, this projection can be made at the following levels:

- 1) the level of theory as an elementary unit of science;
- 2) the level of the theoretical program in science – Einstein’s concept;
- 3) the level of the theoretical architecture of science, the theoretical construction of a scientific discipline as a whole, based on a foundational theoretical program. This is the level of the architecture of science (= fundamental program + foundational research carried out within the theoretical core of the program); this level forms the last level of the theoretical construction of science. Note: here the very rationality of science is discussed and the very conditions of possibility of theoretical construction are revealed. It is also considered that at this level we are dealing with a transcendental projection of the theoretical science.

Note: these theoretical levels of projection align with the perspectives of R. Carnap, Sneed + Stegmüller, and M. Friedman. Through this potential and multifaceted projection, Kuhn’s ideas are incorporated into the theoretical framework of the philosophy of science, undergoing theoretical reconfiguration. They cease to be merely historical-methodological considerations on science, instead finding a meaningful place within the emerging philosophy of science. This theoretical contextualization of Kuhn’s conception, by embedding it into the theoretical framework of mature science, elevates the examination of Kuhn’s work to a higher level, treating it not merely as a historiographical endeavor accompanied by epistemological reflections, but as a major contribution to the philosophy of science.