

## Stepping into the 60s: Tomas Kuhn's intellectual turn towards the Philosophy of Science

Entrando en los 60's:  
el giro intelectual de Thomas Kuhn hacia la filosofía de la ciencia

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**Abstract:** In 1957 Kuhn publishes *The Copernican Revolution*, and in 1962 *The Structure of Scientific Revolutions*. Most commentators believe both works to be an expression of the same philosophical project. Against this interpretation, we argue that there is a lack of continuity between both books, arising from the fact that between 1957 and 1958 Kuhn comes into contact with the works of Hanson, Wittgenstein and Feyerabend, whose influence marks a break from his previous work. We also suggest that in 1957 Kuhn applies a *case-based historiography*, and, in 1962, a *structural historiography*. We conclude that there is no relationship of continuity between Kuhn's first two works.

**Keywords:** Thomas Kuhn, Historiography, Scientific revolutions, Copernican revolution, History of Science, N. R. Hanson.

**Resumen:** En 1957 Kuhn publica *The Copernican Revolution*, y en 1962 *The Structure of Scientific Revolutions*. La mayoría de los comentaristas considera ambas obras como expresión de un mismo proyecto filosófico. Contra esta interpretación, defendemos que existe una discontinuidad entre los dos libros. Esto responde a que entre 1957 y 1958 Kuhn entra en contacto con los trabajos de Hanson, Wittgenstein y Feyerabend, cuya influencia marca una ruptura con su trabajo previo. Proponemos también que en 1957 Kuhn maneja una *historiografía casuística*, y en 1962 una *historiografía estructural*. Concluimos que no es posible pensar en términos de continuidad la relación entre las dos primeras obras de Kuhn. **Palabras clave:** Thomas Kuhn, Historiografía, Revoluciones científicas, Revolución copernicana, Historia de la Ciencia.

### 1. Introduction<sup>1</sup>

In a recent work, Pietro Omodeo (2016), reconstructs the epistemological basis of Kuhn's book *The Copernican Revolution* (1957) – hereinafter, *CR*- and of its influence on Kuhn's later work. Omodeo believes that *CR* represents 'the paradigm of paradigms' at least in two senses. Firstly, the study of the Copernican revolution afforded Kuhn several historical

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keys to coin concepts such as “paradigm” and “normal science”; secondly, the book may be regarded as a historical case representative of the philosophical ideas that will show up in *The Structure of Scientific Revolutions* (1962) –hereinafter, *SSR*– which leads to believe that “Evidently, *Copernican Revolution* and *Structure* are the two sides of one and the same endeavor.” (Omodeo, 2016, 72)

This insight implies that Kuhn’s first two works are two expressions of a same philosophical project, which started to take shape in the early 50s and developed without significant reworking at least up to the following decade: “As a matter of fact, *Structure* was preceded by a monograph on this crucial historical case, *The Copernican Revolution* (1957). Kuhn probably composed the two works in parallel. At least he had conceived them together.” (2016, 72)

The idea of the existence of a relationship of continuity between *CR* and *SSR* has predominated in the studies about Kuhn, partly encouraged by the statements of the author himself regarding his intellectual development. Works such as those by John Heilbron (1998), Noel Swerdlow (2004) and James Marcum (2005) have underlined that in the historical review of 1957 we may already find seeds of the ideas that spring up in 1962, so that in the research on the Copernican revolution we may identify signs of the notion of paradigm and the incommensurability thesis. Likewise, authors like Irzik (2001), González (2004) and Martínez Solano (2004) introduced a periodization of Kuhn’s work, the first stage of which ranges from the early 50s up to *SSR* “Postscript” in 1969, under the idea that this is a thematically and methodologically homogeneous period. Kuhn himself contributed to creating this image, by pointing out that *SSR* basic ideas have already been outlined before: “The essay that follows is the first full published report on a project originally conceived almost fifteen years ago” (1962, vii), in addition to several references made to *CR* as a case study that illustrates the nature of scientific revolutions as are described in *SSR* (1962, x, 69, 83, 117, 150).

However, after the publication of “Two cultures or one?: A second look at Kuhn’s the Copernican revolution” by Robert Westman in 1994, a line of interpretation takes shape, asserting that there are substantial differences between Kuhn’s two first books, that lead to conclude that Kuhn, in *CR*, starts from philosophical and historiographical assumptions that are incompatible with those adopted by him in the 60s<sup>2</sup>. This means that Kuhn’s thinking is significantly reoriented after *CR* was published (1957) and before publishing the *SSR* (1962), which largely explains the revolutionary nature of the latter.

In previous works (author, 2015), we attempted to demonstrate that in 1957 Kuhn maintains a good deal of the philosophical matrix he will criticize in 1962. In our opinion, this explains the total absence of notions such as paradigm, normal science and incommensurability in *CR*. Our purpose here is to clarify this process and account for the shift in Kuhn’s thinking from the late 50s to early 60s. In section 2 we discuss Kuhn’s insight presented by Omodeo, indicating that many of *SSR* main philosophic influences, including the works by N. R. Hanson, L. Wittgenstein and P. Feyerabend, only came to Kuhn’s attention after 1957.

2 In a field different to the one tackled by us hereunder, yet as another attempt to indicate the lack of continuity in Kuhn’s thinking, it is proper to mention the paper by John Schuster who, in his review on *The Essential Tension*, pointed out substantial divergences between the notion of *significant discovery*, introduced by Kuhn in “The Historical Structure of Scientific Discovery”, 1961, and the *SSR* subsequent developments (Schuster, 1979, 303-307).

In section 3 we focus on the historiographical aspects of this process, and we affirm that, in *CR*, Kuhn starts from a *case-based historiography*, while in *SSR* he shifts to a *structural historiography*. In section 4 we uphold that this methodological difference extends to a difference in the domain of historical reconstruction, considering that *RC* bestows on several extra-scientific factors an explanatory role that is banned in *SSR*. Finally, we conclude that the differences identified between *CR* and *SSR* are sufficiently significant so as to deny a continuity between both works, while they reveal the important transformation that operates in Kuhn's thinking between 1957 and 1962.

## 2. More than a change of decade

Based on the statement of Kuhn himself in *SSR* Preface, Omodeo underlines that *CR* and *SSR* were either 1) written in parallel, or else 2) conceived simultaneously. They are two hypotheses of a different interpretive status; the first refers to the chronology of Kuhn's work, and, to a certain extent, it may be confirmed by studying documents and biographical information. The second is related to Kuhn's intellectual process, and is far more difficult to confirm. If we check certain data on the production of both books we may shed some light on the matter, as well as on Kuhn's intellectual process at the end of the 50s.

Kuhn received his PhD from Harvard University in 1949. By this time he was already involved with James B. Conant -the President of the University-, teaching a series of science courses to Humanities students, in the *General Education in Science* syllabus. According to Kuhn, his work with Conant gives birth to the writing of *CR*<sup>3</sup> as a course book, thus indicating that the drafting of the book started in 1949. Besides Kuhn, the teaching staff included Conant and the Chemist Leonard Nash, with whom Kuhn worked until 1956 – a year before *CR* was published- when he left for the University of California at Berkeley (Marcum, 2005). It may be gathered from the date of the preface (1957, x) that Kuhn had already finished the writing in November 1956 so, strictly speaking, the *CR* production period ranges from 1949 to 1956.

When the book comes to light in 1957 Kuhn is already in Berkeley, starting a period that will set the further course of his thinking. He gets acquainted with Paul Feyerabend, who in 1958 was already immersed in an anti-empiricist crusade, through the release of "An attempt at a realistic interpretation of experience", and with Stanley Cavell, who later introduces him to the work of Wittgenstein (Kendi, 1995; Gunnel; 2014). Yet, 1958 is a significant year not only for the release of Feyerabend's seminal paper, but also for one of the books that will have the biggest influence on the writing of *SSR*: *Patterns of Discovery*, by Norwood Russell Hanson. As we all know, in *SSR* Kuhn relies on Hanson's thesis, whereby observation is conditioned by a prior theoretical framework, so that two scientists with different conceptual frameworks see different things. The fact that Hanson's book was written after *CR* not only reveals that one of Kuhn's main philosophic influences appears just in 1958, but it also allows to understand the almost empiricist matrix that Kuhn manages in *CR*, where –as we have proven in (...)-, he subscribes without hesitation the theory that science

3 "The book grows out of a series of lectures delivered each year since 1949 in one of the Science General Education courses at Harvard College..." (1957, 8).

is constructed on an observational basis independent from the theories. Only after having read Hanson, Kuhn may assert that all observations are theory-dependent, based on which we may understand why the function of observation is so differently characterized in *SSR* as compared to *CR*.

Similarly, in the 1958-1959 period there takes place the academic stay at the *Center for Advanced Study in the Behavioral Sciences* at Stanford, California. This period at Stanford University will have a profound effect on Kuhn, as he becomes aware of the strong contrast between the work of social scientists and that of natural scientists, providing him with the raw material to formulate the notion of paradigm:

I was struck by the number and extent of the overt disagreements between social scientists about the nature of legitimate scientific problems and methods. Both history and acquaintance made me doubt that practitioners of the natural sciences possess firmer or more permanent answers to such questions than their colleagues in social science. Yet, somehow, the practice of astronomy, physics, chemistry, or biology normally fails to evoke the controversies over fundamentals that today often seem endemic among, say, psychologists or sociologists. Attempting to discover the source of that difference led me to recognize the role in scientific research of what I have since called 'paradigms'. (1962, viii)

As we mentioned before, Kuhn states that his stage at Stanford coincides with "The final stage in the development of this essay..." (1962, vii), sustaining the idea that the process of writing the *SSR* dates back to the early 50s. However, since his arrival at Berkeley in 1956 up to the publication of *SSR* in 1962, there is a series of facts that reveals that Kuhn's intellectual path is being built brick over brick. The exchange with Feyerabend, the access to Wittgenstein's works, the influential theory of Hanson's insight, and the visit to Stanford lead Kuhn's thinking along roads unknown to him, which flow into the *SSR* innovative formulations.

The above does not in itself evidence that both works were not written at least partially in parallel; however, it allows to clearly establish that *SSR* key concepts only take a defined shape in 1958, two years after *CR* was finished. Therefore, we may not infer that both works were either written or conceived simultaneously, as the core concept of *SSR* is the result of the conceptual tools and philosophical influences acquired by Kuhn after the publication of *CR*. Below, we mention certain historiographical differences between both books, regarded as signs of the turn in Kuhn's thinking by the end of the 50s.

### 3. The historiographical turn

Another element that has exacerbated the image of continuity between Kuhn's first two books is that both are aimed at scientific revolutions. An apparently superficial difference is that, while *CR* is focused on a specific revolution, *SSR* deals with several revolutionary episodes. This alone does not constitute a significant divergence, yet it reveals that, in each case, Kuhn works under a different notion of scientific revolution, and under a different per-

ception of the relations between history and philosophy of science. In this regard, Omodeo points out that Kuhn

presented the relation between the two fields of investigation [history and philosophy of science] as a thematic overlapping, as an 'interdisciplinary' instead of 'intra-disciplinary' relation. Copernicus was the author of one scientific upheaval, if seen from a historical perspective, but also *the model* revelatory of the structure of *any scientific revolution*, from the universalizing viewpoint of philosophy. (2016, 73)

It is true that, both in *SSR* and in later writings (1968, 1971, 1977), Kuhn explicitly tackled the relations between history and philosophy of science, as well as the historiographical implications of scientific revolutions; however, no such analysis may be found in 1957 book. Inasmuch as *CR* is a strictly historical monograph, without specific resort to any philosophical thesis, you will hardly find in its pages the notion of the scientific revolutions as transhistorical structures that present different cases over time. The book is exclusively centered on the Copernican revolution, and it not only does not postulate inherent traits of *any scientific revolution*, but, quite to the contrary, it asserts scientific revolutions to be rather infrequent processes in the history of science.

Omodeo believes that "Copernicus was not just the protagonist of one among many revolutions. Rather, he became *the symbol* of the Scientific Revolution. As a consequence, Kuhn's first book cannot be read, understood and criticized *solely* from the viewpoint of history. *The Copernican Revolution* is a point of departure for a correct assessment of his philosophy of science." (2016, 73) Still, such a statement fails to take into account that, in 1957, conditions were not yet appropriate to postulate a philosophy of science in Kuhn, or a consideration of the scientific revolutions under a clear philosophical agenda; this is the reason why *SSR* basic philosophical vocabulary -incommensurability, conversion, changes in *Gestalt*, paradigms, normal science- is completely absent in *CR*.

Kuhn affirms in *CR* that the Copernican revolution reveals unique elements of scientific change, which may rarely be found in a few other cases such as those of Freud, Darwin or Einstein, and part of its uniqueness comes from its impact on different levels of social life: "In its extra-scientific consequences, however, the Copernican theory is not typical: few scientific theories have played so large a role in non-scientific thought." (1957, 4). On the other hand, in *SSR* the domain of historical reconstruction is not defined by any given revolution, nor by a limited set of revolutions, but rather by a wide range of revolutionary events that follow the same structure. Based on this framework, Kuhn is able to formulate in *SSR* the thesis that scientific revolutions constitute a key mechanism for scientific progress; this assertion could not have been rendered under *CR* historiographical framework.

As shown by Alexander Bird (2000), the above arises from the fact that, in *CR*, Kuhn makes history focused on a specific case, while in *SSR* he provides a 'theoretical history', oriented towards a general model of scientific revolutions. Bird attributes this to a difference of purposes as compared to *CR*, but we believe that there is a difference in the historiographical framework rather than in the approach only. The distinction introduced by Floris Cohen (1994) between the *singular* concept and the *categorial* concept of scientific revolution is helpful to clarify this issue. According to Cohen, the singular concept sees modern science

revolution as the revolution par excellence, and operates as a model for other revolutionary episodes. This, is the model followed, for example, by the book by Ernst Rupert Hall, *The Scientific Revolution* (1954), systematically quoted by Kuhn in *CR* and only once in *SSR*<sup>4</sup>.

The categorial concept implies that ‘scientific revolution’ refers to a formal category rather than to a specific historical episode, so that the historical reconstruction is intended to establish the traits inherent to any scientific revolution. Based on this terminology, it may be asserted that in *CR* Kuhn manages a singular concept of scientific revolution, while in *SSR* he shifts towards the categorial concept, and therefore both books are not only separated by a matter of approach but rather by differences in the historiographical framework.

Westman (1994) has illustrated such differences by asserting that, in *CR*, Kuhn manages a *historical* narrative, although not yet a *historicist* narrative. Noting the similarities among Cohen’s categorial notion of scientific revolution, Westman’s historicist narrative and Bird’s notion of theoretical history, we find that this issue may be more accurately formulated by indicating that, in *CR*, Kuhn starts from a *case-based historiography*, to the extent that the historical reconstruction of the Copernican revolution is an end in itself. Hence, the Copernican revolution as a singular episode -in Cohen’s sense- acts as a self-delimited unit, insofar as the outcomes of historical narrative apply almost exclusively to the case defined as domain of analysis.

In turn, in *SSR* Kuhn operates under a *structural historiography*, considering that the singular revolutions act as cases that provide the raw material for a much more far-reaching philosophical mechanism aimed at revealing certain structural traits of the revolutionary change. At this time, the historiographical turn in Kuhn’s thinking represents a shift from the methodology whereby each scientific revolution is an object of analysis in its own right, towards a very different conception that states that the study of each scientific revolution reveals a structure shared by them all. Thus, a change in the methodological approach brings a change in the unit of analysis of historical reconstruction, marking the turning point from casuistical historiography to case-based historiography.

#### 4. The historian and the philosopher

So far, we have provided some adverse comments to Omodeo’s insight (2016) –with reference to his antecedents in Heilbron (1998), Swerdlow (2004), Marcum (2005)- about the leading role of such an early work as *CR* in a general overview of Kuhn’s production. In fact, it may not be reasonably asserted that *CR* is a preceding event to *SSR* in chronological terms only and not in substance. Besides, it is also proper to inquire whether his investigations have not suffered increasingly deeper changes over time that drove him away from his initial approaches.

In this section we will delve into some other elements of Kuhn’s later work, that drive him further away from *CR*. In this regard, we will take as reference the postulation of a *linguistic turn* in the works subsequent to *SSR*, thematized by Irzik and Grünberg (1998), Gattei (2008), Gentile (2013) and Marcum (2015), among others. Initially, we come across

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4 This is an indicator of a change in the content and in the categorial status of the concept of scientific revolution in 1962 compared to 1957.

CR methodological approach: open, interdisciplinary, permeable to multiple experiences: "Though the Revolution's name is singular, the event was plural. Its core was a transformation of mathematical astronomy, but it embraced conceptual changes in cosmology, physics, philosophy, and religion as well" (1957, vii). Its amplitude is perceived, for example, by the reference made to the voyages that widened the horizons of Renaissance man: "...the Atlantic voyages which widened the terrestrial horizons of Renaissance man" (1957, vii).

It may be inferred that the attention paid to the science-society relationship and to the extra-scientific factors arises from the influence of J. B. Conant (1947). Conant believed science development to be an activity regulated by social structures, and therefore he thought essential to study the relationship between scientific theories and the ideas –political, religious, philosophical– prevailing in each era<sup>5</sup>.

It is worth mentioning the outstanding role that the CR confers upon certain historical figures, mostly religious authorities, indissolubly linked to the emergence of a new concept of Universe. About the words of cardinal Bellarmino –who will condemn Copernican viewpoints one year later– "But as for myself, I shall not believe that there are such proof until they are shown to me" (in Kuhn, 1957, 198), Kuhn reflects "We may wonder what sort of evidence Bellarmino would have considered 'real proof' against the literal word of Scripture" (ibidem). As to Giordano Bruno, qualified in CR as an "Italian mystic" (1957, 235), Kuhn states that the fundamentalism of the Inquisition came from the religious realm and had strong social and political consequences, which pierced through the scientific development:

Bruno was not executed for Copernicanism, but for a series of theological heresies centering in his view of the Trinity, heresies for which Catholics had been executed before. He is not, as he has often been called, a martyr of science. But Bruno had found Copernicus' proposal congenial to his Neoplatonic and Democritean vision of an infinite universe containing infinity worlds generated by a fecund deity... Certainly the Church feared Bruno's Copernicanism, and that fear may also have stimulated their reaction. (Kuhn, 1957, 199)

Likewise, weaving the same dialectical braid of precedents, polemical opposites and processes aligned with the new conception of the Universe, CR introduces other figures of history and culture from different periods: an extensive quote of Plato's *Timaeus*, "an allegorical story of the creation in which the universe appears as an organism, an animal" (28-29); references to the neoplatonic Nicholas of Cusa (233); comments on Dante, the Italian poet, and its *Divine Comedy* (112-114); quotes of Melanchton, "Luther's principal lieutenant, soon joined in the increasing Protestant clamor against Copernicus" (191); thoughts of poets John Donne and John Milton (194-195); elucidations on Andreas Osiander, "the Lutheran theologian who saw Copernicus' manuscript through the press", who wrote the anonymous preface of *De Revolutionibus* without Copernicus permission (187), together with other figures of the political, religious, literary and philosophical fields.

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5 An interest account of Conant's influence over Kuhn may be found in Pacheco (2011).

The contrast of all this historical openness in *CR* is extremely shocking if we turn to analyze *SSR*. We start by describing certain different trends: the mention to B.L. Whorf in the Preface<sup>6</sup>, or the reference to Wittgenstein's language games (Kuhn, 1962, 45-46). We are far from the broadmindedness of the Renaissance man crossing the Atlantic, which has been restricted to a consideration of scientific communities by and faced to themselves.

As the 60s come to an end, and Kuhn's philosophical interests forged ahead of his vocation as a historian, the attention to certain details, and the almost Darwinian importance given to specialization, generates a longing for a particular harmony of disparate elements, a certain generous spaciousness that was present in *CR*. On the other hand, in *SSR* we may find observations such as: "In many environments a group that could not tell wolves from dogs could not endure. Nor would a group of nuclear physicist today survive as scientists if unable to recognize the tracks of alpha particles and electrons" (opus cit., 195-196).

Omodeo acknowledges this in pointing out that

In the Structure no technical or practical aspects significantly account for the historical development of science. The economical basis is completely absent. Thus, the structure underlying science has nothing to do with the socio-economical basis. It is rather a conceptual framework. (2016, 86)

It is precisely the consideration of the 'socio-economical basis' of science that marks another significant different between both Kuhn's works, as the diagnosis of exclusion of technical factors and the socio-economic influences may only be fairly attributed to *SSR* rather than to *CR*.

In Kuhn's later writings this trend will continue to rise, paying more and more attention to the inner workings of science and to the semantic and ontological issues of scientific language, and giving less importance to the history of science. The above marks the abandonment of the open and plural program of the history of science that *CR* puts forward, for the sake of deepening in other issues such as the theories of truth and the relationship between the language and the world. Without diminishing the importance of such dimension, several critics observed with disappointment how Kuhn, after *SSR*, shifts towards linguistic matters, deflating the attractive historical dimension that made his work famous:

While he previously told us about sociology of science projects, computer programs, there seems to have occurred a progressive displacement towards language-centered issues ... the question arises as to whether we have lost a historian, we have lost Kuhn for the history of science. (Beltrán in Kuhn, 1987, 52-53)

In *CR* Kuhn tried to give an account of the different levels of interaction between science and extra-scientific factors, including social practices, philosophical systems or religious beliefs, on the premise that they play a key role in the explanation of scientific revolutions. Instead, in *SSR* the domain of the historiographical reconstruction is restricted to the scientific ideas and practices, inasmuch as the notions of paradigm and normal science embody

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6 An interesting review about Whorf's influence on Kuhn's work may be found in Irzik and Grünberg (1998).

scientific communities as self-sufficient historical entities, whose working dynamics may be understood without resorting to external elements. Thus, the methodological differences we found between *CR* and *SSR* are added to the domain differences between both works, given that the first upholds the inclusion of extra-scientific factors in historical narrative, in a way that is implicitly eradicated in the second.

## 5. Conclusions

Both, the retrospective image offered by Kuhn himself on the intellectual development and the reconstructions of his followers fuelled the idea that the publication of *SSR* is the end of a project that dates back at least to the early 50s, and that reaches, seamlessly, to the year 1962. In these conditions, the publication of *CR* is usually regarded as a preceding event to the well-known theses presented by Kuhn in 1962, and as a case study that illustrates the philosophical matrix that takes shape in *SSR*. Against this widespread viewpoint, we have tried to argue that the relationship between Kuhn's two books may not be determined in terms of continuity, not only because most *SSR* basic terminology is absent in *CR*, but also because, in the time elapsed between publication of the two books, Kuhn receives and processes a series of influences which will be crucial to his changes of approach in the beginning of the 60s.

The encounter with Wittgenstein's studies of language and N. R. Hanson's theory of perception, the exchange with Feyerabend, and his stay at Stanford University, all of which took place after *CR*, account for most of the interests and the theses advanced by Kuhn from *SSR*, which were totally non-existent in his study on the Copernican revolution. Here, Kuhn merely provides a strictly historical narrative on a specific revolution of the history of science, yet without drawing the philosophical consequences that will influence his future way of thinking. We have tried to demonstrate that this difference between what we call case-based historiography and a structural historiography arises from the fact that, in 1957, the philosophical mechanism developed by Kuhn in 1962 is yet far from maturing, partly because Kuhn remains firmly committed to certain notions of the traditional philosophy of science, and partly because he still had not processed many of the main influences that will nourish his mature work.

As we see it, this type of comprehension of Kuhn's thinking prior to *SSR* is essential to understand the genesis and development of one of the most important philosophers of the 20th century, whose work prior to 1962 has frequently been overlooked or subsumed to a preliminary chapter of *SSR*. Insofar as we may come further closer to young Kuhn, the science historian, we will surely acquire better interpretative tools to understand the rest of his work.

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