

A KUHNIAN RECONSTRUCTION OF KANT'S CONCEPT OF "COPERNICAN REVOLUTION"

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Abstract. The hypothesis that we want to test is whether the Kantian revolution, based on a Copernican-type hypothesis, is a revolution in the Kuhnian sense of "scientific revolution". By answering it we accomplish the two aims of this paper : to draw a recuperative and justificatory perspective to the fundamental ideas from Thomas Kuhn's *Structure of Scientific Revolutions*, related in particular to the refutation of Larry Laudan's criticism on it and, by our own Kuhn-type reconstruction of the term "Copernican revolution" attributed to Kant, to demonstrate the nominal hypothesis formulated above. Accordingly, we argue not only that, with Kant, we find analogously the Kuhn-type model of revolution, and that the results of his revolutionary hypothesis on how reporting to the object coincide not only with the results provided by science and with their scientific status ; but also that it is consistent with the model provided by Kuhn.

Key words: Kantian revolution, Thomas Kuhn, Copernican revolution, models of science, Larry Laudan.

This paper has two aims: on the one hand, it is trying to draw a recuperative and justificatory perspective to the fundamental ideas from Thomas Kuhn's *Structure of scientific revolutions*¹, related in particular to Larry Laudan²'s criticism to the famous essay; on the other hand, by our own Kuhn-type reconstruction of the term "Copernican revolution" attributed to Kant, it is trying to demonstrate that Kantian revolution in metaphysics is more analogous to the Kuhnian structure of scientific revolution than to that achieved by Copernicus in astronomy. In our intention, these two objectives occur as interrelated and mutually justifying in the following sense:

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¹ Thomas S. Kuhn, *The Structure of Scientific Revolutions*, Second Edition, Enlarged, International Encyclopedia of Unified Science Vol. II, The University of Chicago Press 60637, The University of Chicago Press Ltd., London, 1970.

² Larry Laudan, "Dissecting the Holist Picture of Scientific Change" in: *Science and Values*, University of California Press Berkeley and Los Angeles, California, 1984, pp. 67–102.

the “hard core” of Kuhn’s theory stands fortified by successfully formulating the so-called “Kant’s Copernican revolution” (or, as we shall see, more accurately the “Kantian revolution in thinking”) in terms of an analogous model to the Kuhn-type revolution. Moreover, and in relation with what we have said above, we believe that our perspective on the type of theory unfolded in the *Critique of Pure Reason*³, although it relates to the term “Copernican revolution” as it is developed by M. Miles⁴, it cannot remain to it. To the extent that our two aims are achieved (the dismissal of Laudan’s criticism, independently but also in the context of our interpretative model – namely, Kant’s “Copernican revolution” as “Kuhn-type revolution” – which supports the principles of *The Structure*..., and the very success of this interpretation), both Kuhn’s perspective on the status of objectivity and rationality of science, and the epistemological consequences of conceiving the model of *Critique*’s theory as a “Kuhnian revolution” refer not only to their mutually provided validity, but also to some epistemological convergences on the issue of scientific certainty in general.

In the first part of our study we shall present briefly the central ideas of *The Structure*... in the critical vision of L. Laudan, one of the most relevant commentators of Th. Kuhn. Laudan’s criticism focuses apparently on some less spectacular elements such as: the occurrence of simultaneous changes at ontological, methodological and axiological levels in a paradigm shift, the building scientists’ consensus at intra and inter-paradigmatic levels, the status of scientific standards on the issue of scientific choice, and so on. However, as we shall see, the fact of relating these issues to the indefensible blame (released shortly after the launching of *The Structure*) that Kuhn has brought the irrational in science makes of Laudan’s criticism a rejection of the very core of Kuhn’s theory: namely, the concept of scientific revolution. By the reticulation model that he proposes in order to replace the so-called holist picture of scientific change of *The Structure*..., Laudan not only weakens the fundamental concept of scientific paradigm and of their successful shift through revolutionary periods, but he also minimizes at most the “context of discovery” in science, making of its history a gradual indexing with constant developments as recorded in the science textbooks.

LAUDAN’S CRITICISM ON KUHN

Our interpretation is aiming at improving Laudan’s criticism by introducing both an accuracy on reporting Kuhnian assumptions to their originating contexts and, by means of a particular use of the distinction between the “context of

³ For a better reading, this title will be written as *Critique*.

⁴ Murray Miles, „Kant’s ‘Copernican Revolution’: Toward Rehabilitation of a Concept and Provision of a Framework for the Interpretation of the *Critique of Pure Reason*”, in *Kant-Studien* 97. Jahrg, S 1–32, Walter de Gruyter, 2006. As we shall see, this author does not confine to the “traditional” significance of the Kantian phrase Copernican revolution – considered, among others, by B. Russell as an actual “anthropocentric fallacy” – but suggests a different interpretation, maintaining the phrase, but changing its meaning.

discovery" of a theory and its "justification", an understanding of the fundamental ideas of Kuhn's *Structure...* that neither leaves science at the "individualistic and idiosyncratic criteria"⁵, nor removes the "context of discovery" with its fundamental significations from the real progress of science. In this respect, the Kuhn-type model of Kantian revolution seems to sufficiently reflect some validity of the perspective we proposed, both in terms of epistemological consequences of this model as such and in terms of relevance in supporting the validity of the ideas of *The Structure...*

Laudan asks whether Kuhn argued that theories are always really incommensurables, so rival scientists understand each other invariably wrongly, or was he convinced that the problem solving skills of rival theories can be objectively compared? Also, if he really believed that the acceptance of a new theory was a "conversion experience" subject only to the Gestalt-type requirements of religious life⁶? L. Laudan regards Kuhn's further writings particularly as studded with all sorts of opportunities for clarifying some of the ambiguities and confusions generated by the language of the first edition of *The Structure of Scientific Revolution*. In this respect, Kuhn's message was an improved and compromising one. Several commentators, such as Alan Musgrave, have accused Kuhn of retracting a significant part of what constitutes the interesting and challenging novelty of his original message⁷. Following Laudan, we do not think that this is quite accurate, since, even if many of Kuhn's clarifications have sweetened the deep challenge of his original position, many ideas from the first edition of *The Structure ...* still remain unchanged. Laudan will refer critically to the latter. Laudan's "reticulation" model of scientific change starts from a criticism of Kuhn's theory "hard-core" claims and pretends an increased validity against it.

Laudan shows that, for Kuhn, the paradigm would provide a conceptual framework for classifying and explaining natural objects. Thus, each paradigm will issue certain claims on the entities that inhabit the world. Such claims, called "ontological" by Laudan referring to Kuhn, separate one paradigm from the others, as long as each paradigm is conceived as postulating entities and ways of interaction that distinguish it from other paradigms. Secondly, the paradigm should specify its own investigatory methods, techniques and tools necessary to objects research in the relevant field of application. As different paradigms imply different ontologies, they analogically imply different methodologies. Laudan also claims that these methodological commitments are persistent, characterizing the paradigm throughout its history.⁸ Finally, proponents of different paradigms, will adopt – in Kuhn's view – different sets of cognitive goals. Although supporters of two different paradigms can share (and often do) certain common goals, Kuhn insists that goals do not coincide for those who belong to rival paradigms. Indeed,

⁵ L. Laudan, *ibid.*, p. 70.

⁶ *Ibidem*, p. 67.

⁷ See note 1 of Laudan's paper.

⁸ L. Laudan, *ibid.*, p. 69.

embracing a paradigm is, for Kuhn, subscribing to a set of cognitive values that proponents of other paradigms do not fully support.

Laudan's account does not cover the appreciation of such conclusions as "a break of great magnitude"⁹ compared with the traditional understanding of what science is, nor the fact that replacing one paradigm to another involves changes at three different levels, namely ontological, methodological and axiological. But, and this is one of the central points in Laudan's criticism, that these changes are rather *simultaneous* than *consecutive*. Kuhnian theory's aspect of radical rupture with respect to tradition lies in its insistence to consider rationality as relative to choices rather within a given paradigm than between rival paradigms, namely in the fact that there is no similar rationality in choosing between rival paradigms as there is in the choice within a paradigm. Another "strong" feature of Kuhn's conception, presented in Laudan's study, is that paradigm shifts occur „in ways that make them seem to be abrupt and global ruptures in the life of a scientific community"¹⁰ This would be the most serious charge of Kuhn's critics (among which, more or less implicitly, Laudan would seem not to include himself), because such a radical scientific change may inevitably turn into a non-rational or irrational process. Laudan thinks that terminology is only partially responsible for such an impression. As to terminology, the acceptance of a new paradigm in terms of "conversion"¹¹ is questioned – with respect to some radical criticisms which Laudan himself subsequently joins (!) – on the grounds that it would evoke nothing but a picture of the revolutionary scientist similar to that of a reborn Christian zealous, but without arguments.¹² Likewise, the similarity of paradigm shifts and "irreversible Gestalt-shift"¹³ is put under observation. Laudan's criticism to the language used by Kuhn in 1962 is set aside in order to investigate some central features of the Kuhnian model of science that would raise some serious obstacles to a rational analysis of scientific change.¹⁴ Thereby, Kuhn's insistence on the fully static character of the individual paradigms (the fact that changes occur between paradigms, and not inside them) constitutes, in Laudan's view, a serious obstacle in understanding the dynamics of theory change. The point is that Kuhn supposedly conceives the parts of a paradigm as a unified whole. In *The Structure of Scientific Revolutions*, he puts it like this: "In learning a paradigm the scientist acquires theory, methods, and standards together, usually in an inextricable mix."¹⁵ This theme of the indestructibility and inseparability of one paradigm's elements persists throughout the work of Kuhn. Therefore, one of the main targets of Laudan's work, consists in "to show tightly the pieces of a paradigm's puzzle fit together before we can expect to understand how paradigm like change occurs"¹⁶.

⁹ *Ibidem*.

¹⁰ *Ibidem*, p. 70.

¹¹ Apud, Th. Kuhn, 1962 p. 70.

¹² L. Laudan, p. 70

¹³ *Ibidem*.

¹⁴ *Ibidem*.

¹⁵ Th. Kuhn, *ibidem*, p. 109.

¹⁶ Apud, Th. Kuhn, in: L. Laudan, *ibidem*, p. 71.

Another issue raised by Laudan with respect to Kuhn's theory targets the formation of consensus, ie the manner in which scientists can reach an agreement to support one world view or another. The uncontrollable character of choice by objective and recognized standards in forming consensus can be corrected, in Laudan's account, by bringing two amendments to the Kuhnian view. The first consists in replacing the hierarchical perspective on justification with the reticulational perspective, thus making cognitive values "negotiable". The second consists in giving up the completeness of paradigms.

In other words, "we solve the problem of consensus once we realize that *the various components of a world views are individually negotiable and individually replaceable in a piecemeal fashion* (that is, in such a manner that replacement of one element need not require wholesale repudiation of all the other components)"¹⁷. Laudan recognizes, however, that Kuhn himself "grants, of course, that some components of a world view can be revised; that is what «paradigm articulation is all about»"¹⁸. Laudan's observation that the central commitments of a worldview, its "hard core" (Lakatos), are not revisable without rejecting the worldview as a whole is translated by the fact that "the core ontology of a world view or paradigm, along with its methodology and axiology, comes on a take-it-or-leave-t basis."¹⁹. Laudan disagrees with this issue and holds that Kuhn's position with respect to the levels of commitment, conceived as a shift between incommensurable worldviews (hence the shift between competing paradigms cannot be made "gradually"), is wrong. Mainly because "like Gestalt type change" this shift "must occur all at once [though not necessarily in an instant]²⁰ or not at all"²¹. In fact, Laudan maintains that paradigms or research programs do not require such a rigid concept, nor they are actually conceived this way by scientists, nor even should they be conceived this way. In my view, argues Laudan, "there are complex justificatory interconnections among a scientist's ontology, his methodology, and his axiology. If a scientist's methodology fails to justify his ontology; if his methodology fails to promote his cognitive aims; if his cognitive aims prove to be utopian – in all these cases the scientist will have compelling reasons for replacing one component or other of his world view with an element that does the job better. Yet he need not modify everything else."²². Here we just want to point out the fact that, as it occurs rather frequently in his study, Laudan generalizes some of Kuhn's statements referring to a specific context. For example, Kuhn's assumption on the paradigms' "incommensurability" at the time of theory shift refer primarily to the period following the "crisis" of solutions offered by the old paradigm, and the conflict is

¹⁷ *Ibidem*, p. 73.

¹⁸ *Ibidem*, p. 74.

¹⁹ *Ibidem*.

²⁰ These words were forgotten by Laudan; we believe that we witness here a slight temptation to elude Kuhn's genuine words, in order to reinforce his position, because as we can see, Kuhn himself understands this change in a fashion not so *instant*.

²¹ Th. Kuhn, *The Structure...*, p. 150.

²² L. Laudan, *ibidem.*, p. 74.

not primarily between persons (which could act more or less rationally), but between objective contexts offered by the sets of instruments of the different paradigms (the old one and the new one). Only if the more efficient paradigm is not fully convincing, the shift could be more gradual, more “negotiated”, although even in this case, there are adhesions grounded rather on beliefs than on “perfectly rational” choices according to “absolutely objective” criteria. The reason why we believe this is what happens will be justified below. In the context of a scientific revolution like the one where Newtonian mechanics was superseded by quantum mechanics, things actually happened as Kuhn claims in respect with *this* case. Here, the adhesion can be “conversion” like for two reasons: either because, in the absence of any “objective” communication between the two paradigms, the paradigm change (*Gestalt*) occurs suddenly, or because there are reasons that cannot be “rationally” denied for which the scientists continue to hold on to the old paradigm – for instance, the new paradigm does not have yet enough specific objective instruments to impose itself. The situation envisaged by Laudan is that there are several competing paradigms with equal opportunities to replace the old paradigm in impasse. This case is different from the other and is handled as such by Kuhn; subjective elements can play, of course, a greater role here than in the other case, but this is justified, according to us, and also will be motivated below, in the same context in which we shall try to explain the “conversion”. Laudan regards both the “conversion” to a new paradigm, the holding on to the old paradigm for it “works”, even if there were objective reasons to abandon it in favour of another one, and the choices based on subjective criteria between rival paradigms as dangerous agents of the “irrationality” pervaded into science. We consider, on the contrary, that far from being the “irrational monster” of science, they are a reality that cannot be denied and they belong equally to the “rationality” and “objectivity” of the science of the most obvious theorem. Laudan’s error is related to him confusing the different stages of the process of the scientific constitution, from “scientific discovery” to a trivial presentation of a physics formula in a manual.

Laudan’s concern in this issue (as he himself puts it, although rather implicitly) has to do with his confidence in the fact that, in imposing their views, rival scientists eventually manage to because „there is enough common ground between the rivals to engender hope of finding an «Archimedean standpoint» which can rationally mediate the choice”. And further: „When such commonality exist, there is no reason to regard the choice as just a matter of taste or whim,”²³. Therefore, as discovering “rationality” in all scientific change related cases continues to be at stake for Laudan, he mistakes “the matters of taste and whim” with actual assessment in the context of lacking the proper objective and functional criteria. Laudan thinks that, by conceiving theory change as a gradual one, there are sufficient grounds to consider it as an entirely rational process.

As for the argument of the examples provided by the history of science, used by Kuhn among others to support his account, Laudan considers it false, firstly

²³ *Ibidem*.

because things would happen quite differently, and then, because these appear to be so only if we look at the "macro scale" picture and after a longer period of time. Laudan claims that actually the phenomenon of scientists suddenly changing their views within scientific revolutions is much less common, and anyway, insignificant. We shall return below to this point with several references.

Laudan puts together the "historical" argument and the issue of the choice between two models (Kuhn's and his) as follows: „It is true that the major historical shifts in the methodological rules of science and in the cognitive values of scientists have invariably been contemporaneous with one another *and* with shifts in substantive theories and ontologies?“ Unlike the holistic view, that answers yes to this question, Laudan thinks that "there are plenty of examples one may cite to justify the assertion made here that changes at the three levels do not always go together."²⁴

The first of the two examples intended to support his allegation refer to a change at the methodological rules level since the time of Bacon. Laudan holds that the transition from the inductive inference rules (associated with Bacon, Hume and Newton²⁵) providing that agreement, difference and concomitant variations represent the standard elements of the arsenal of the majority of scientists for 200 years – rules that excluded postulating of any theoretical or hypothetical entities since the observable bodies represented the only type of objects and properties to which traditional inductive methods could apply – to the hypothetical-deductive method had occurred towards the end of the nineteenth century²⁶.

It is obvious, even from his own claims, that Laudan's model targets an entirely different perspective than that related to Kuhn's scientific revolution. Laudan is even talking about "readjustments of methodological orientation, *in the absence* [my italics] of a paradigm shift", about "a shift in the history of the explicit methodology of the scientific community as significant as one can imagine – from methods of enumerative and eliminative induction to the method of hypothesis – occurring across the spectrum of the theoretical sciences, from celestial mechanics to chemistry and biology"²⁷ and would represent "a direct corollary of his reticulational model". And also therefore, we consider, *unlike* Laudan, that these items do *not* constitute "a serious anomaly for Kuhn's analysis."

With respect to cognitive values change, Laudan uses the example of abandoning the scientific ideal of "infallible knowledge". Although his assertion that during the nineteenth century the conception of science as aiming certainty gave way, for many scientists, "to a more modest program of producing theories that were plausible, probable, or well tested" seems plausible, to consider that

²⁴ *Ibidem*.

²⁵ As we shall try to show in the final part of our paper, it is at least arguable the assessment that Newton used the rules of "enumerative induction" and also that his achievement of *Principia* does not belong to a scientific revolution.

²⁶ L. Laudan, p. 81.

²⁷ *Ibidem*, p. 82.

during the late nineteenth century the “demonstrative and infallibilist ideal was well and truly dead”²⁸ is an assertion that disregards, in this respect, the fundamental influence of the scientific revolution within modern physics (the theory of relativity and the quantum mechanics) and mathematics (the failure of Hilbert’s program and the abandon of researches grounded in an ontic targeting of mathematical objects) from the early twentieth century. Moreover, only these revolutions have provided, as a derivative ontological view, the core of the fallible account that replaced the dominant scientific perspective that Laudan refers to.

On the one hand, the (historical) examples raised by Laudan do not fit, as we have seen and we shall see below. On the other hand, as I pointed out above, for Laudan it seems to be entirely out of the question an important moment of the scientific revolution: namely, the crisis of the normal science, of the current theory. Conceiving Kuhn’s model only in terms of methodological, ontological, and axiological changes without taking into account the fundamental (Kuhnian) moment – that of the “normal science crisis” and even of the revolutionary period, as he does above – means separating “crisis” and revolution, and holding on to a critical argumentation working for other model (the “reticulation” replacing the so-called holistic). Eluding the impasse moment of the current paradigm when arguing on values or methods changes during a revolutionary moment, or even without one, is not a serious criticism to Kuhn’s theory simply because the invocation of such a moment – the “impasse” altogether with the “crisis” of the old paradigm – is used just to convince that a reference is made to the fundamental concepts of Kuhn’s theory. When Laudan strives to prove the opposite, he attempts to argue his thesis without reference to the crisis and/or revolutionary context. In fact, the significance of crisis is crucial when invoking *simultaneously* fundamental changes in methodology, axiology and ontology – i.e. when we deal with a revolutionary context.

One last matter to be discussed here, with respect to Laudan’s criticism on Kuhn’s theory, refers to “the inability of shared cognitive values and methodological rules to solve global scientific disagreements.” They represent, for Laudan, “instruments of forming consensus.” Kuhn states four arguments to support his point of view: the „the «ambiguity of shared standards” argument”, „the «collective inconsistency of rules” argument”, “the shifting standards argument” and the „the problem-weighting argument”. Kuhn would say that, if we examine the situations in which scientists must choose between competing paradigms, we find that the relevant evidences and the appropriate methodological standards fail to select one as undoubtedly superior to its rivals. He calls them cases of “local” under-determination to distinguish them from more global forms of under-determination (which say, in effect, that the rules are insufficient to pick out any theory as being uniquely supported by the data)²⁹.

²⁸ *Ibidem*, p. 83.

²⁹ *Ibidem*, p. 88.

Mainly, Laudan holds that each of the arguments above is intended to prove that, although methodological rules and standards constrain and limit the scientist's choices, they are never sufficient to unequivocally ground or guarantee the choice of one paradigm over another. There is neither the place, nor our purpose here to analyze each argument and Laudan's positioning thereon; we are referring to the general idea that emerges from these arguments indexing, with focus only on the first.

Kuhn wants to give a positive role, although reduced (compared to traditional account), to methodological standards in the scientific choice, claims Laudan. For Kuhn, the shared criteria, standards and rules that scientists explicitly and publicly refer to in the justificatory process of the theory or paradigm choice would be typically "ambiguous" and "vague" to the extent that "individuals [who share the same standards] may legitimately differ about their application to concrete cases"³⁰. It is about transparadigmatic values as simplicity, competence and efficiency. Kuhn also claims that, although scientists share some cognitive values „and must do so if science is to survive, they do not all apply them in the same way. Simplicity, scope, fruitfulness, and even accuracy can be judged differently (which is not to say they may be judged arbitrarily) by different people."³¹ Thus, as shared standards are ambiguous, two scientists can subscribe to the "exact same standard" (say, the simplicity rule), and yet, hold opposite views. In conclusion, Kuhn maintains that each case of theory choice must involve a combination of objective and subjective factors, since the shared and presumed objective criteria are too amorphous and too ambiguous to guarantee a certain preference. He puts it as follows: „I continue to hold that the algorithms of individuals are all ultimately different by virtue of the subjective considerations with which each [scientist] must complete the objective criteria before any computations can be done."³²

Laudan considers that statement very ambitious, and if it were true, would force us to "to drastically rethink our views of scientific rationality."³³ Once again, Laudan eludes the "context of discovery" and the context of competing paradigms having not reached yet a sufficient degree of evidence for a "rational" decision in choosing one paradigm over the others. As being so close to the actual moment of discovery, the moment of choice is subject rather to the regime of discovery than to the one of winning theory/paradigm justification. Here, the insufficiency of standards, etc. seems real precisely because the nature of choice is one whose stake "still" escapes the "rationality" criteria of scientific standards. Otherwise, as Kuhn puts it, if the rationality of the available criteria and standards would be the only responsible for the choice, then all scientists in these situations should think likewise! Which is ludicrous! From this point of view, I consider justified Kuhn's account over Laudan's.

³⁰ Apud, Th. Kuhn (1977) in: L. Laudan, *ibid.*, p. 89.

³¹ *Ibidem*, p. 262.

³² *Ibidem*, p. 329.

³³ L. Laudan, *ibidem*, p. 90.

The issue here is not some science failure by means of “irrationality” or fundamental relativism; but the fact that fundamental standpoints suppose, firstly, convictions (not necessarily irrational), and beliefs are part of what determines scientists options. No rational aspect makes a scientist scientific, nor a chemist persistent in holding on, at least in first instance, to certain inefficient account, when facing an alternative: but his convictions make him pre-suppose things could be explained in a way rather than otherwise (the new and not enough tested, like any new alternative, it is generally regarded cautiously). The explanation lies in the fact that, even in the history of science (or especially here), it was not rationality that called scientists into a hypothetical-deductive competition, but more paradoxically perhaps than in other cases, both the context of discovery and the emergence of new theories from the “crisis” have to do mainly with the moment of discovery often characterized by inspiration and/or chance – if we take it in terms of “causality”; and in the latter case, do notice that, at least the new fundamental theories initially look as childlike fictions (e.g., the “string theory”). Rationality and power of scientific rationality are not decoded, even by scientists, so that anything related to science – firstly, scientific discoveries and/or imposition of new theories during revolutions (fundamental parts of the dynamics, progress, and change in science) – to be achieved strictly rationally, as some of Scientist (as L. Laudan) *wish*, in accordance with their *conviction*. For his (and others) arguments, are not only far less efficient than Kuhn’s, but, through a thorough analysis, they reveal their underlining *conviction* (supported by rational arguments). Blind faith in scientific rationality and its infallibility applied at *all* levels of scientific change and progress is rather a belief than a reasonable attitude. Indeed, the nature of scientific objectivity and performance within knowledge is not covered by the scientific ideal (non-seventeenth century abandoned their even or After 1911); and Kuhn states it very distinctly for the first time, and from within the field. However, this does not mean opening the way to irrational in science or giving all up, for there are sometimes other factors than the “objective”, such as standards and criteria of choice and consensus. Not everything *has to* be rational in the first place, at least because it is not so.

Laudan himself recognizes, in two passages of the text we took into account, that his reticulational model explicitly aims situations where the “crisis” of normal science is not correlated with the revolutionary moment, on the one hand; when there are competing paradigms with equal chances of success, changes occur either in methodology or in the ontology derived from theories, without any scientific revolution, on the other hand. He draws his reticulational model by weakening Kuhn’s central idea of scientific change by scientific revolutions occurring simultaneously at the three levels. Laudan’s interest is to weaken Kuhn’s theory by attacking the simultaneous character of change at all three levels that we have emphasized. Therefore, his reticulational model looks more efficient by means of its alleged universality concerning the issue of scientific changes and dynamics: if Kuhn’s so-called holistic model is not able to account for all scientific changes, for

they do not occur, in fact, simultaneously, Laudan comes with its own model of gradual changes that presumably apply more widely than Kuhn's. But Laudan loses sight of the fact that this way his criticism is no longer referring primarily to scientific revolutions – that he cannot deny, and still conceives them as occurring simultaneously at all three levels but “not necessarily” – and is only aiming a different way of explaining the scientific changes. Thus, the issue of “saving the scientific rationality” reveals itself as being a false one, that Laudan raised only in order to justify the “objectivity” of his approach. We could already see that Laudan's view is far less efficient than Kuhn's: we have seen that his (at least) uninspired choice of examples from the history of science altogether with his mystifying interpretations to many of Kuhn's assumptions (removed from their original context) do not explain scientific novelty and even miss providing a convincing picture about scientific discoveries and their dynamics. In fact, as we have pointed out above, Laudan's theory rests on his conviction that his own view is superior to Kuhn's.

KANT'S SO CALLED “COPERNICAN REVOLUTION” AS KUHNIAN REVOLUTION

In the following we will try to honour the explicit promise of our title, and also to justify the connexion between the two parts of this article, as it was outlined from the beginning. Therefore, a successful interpretation of the *analogy* between Kant's so-called “Copernican revolution” (from the *Preface* to the second edition of *Critique of Pure Reason*³⁴) and what Copernicus has done in astronomy, as scientific revolution in the Kuhnian sense (also in terms of analogy), not only requires a different understanding of the theory of *Critique* (B), also justifying what is known about the interpretation of the Kantian program as a “second order theory”³⁵; also it does justice to the theoretical core of Kuhn's account in *The Structure...* that can thus withstand even more criticisms as Laudan's. Moreover, through all this, it will be revealed a convergence of the two accounts that originate in two distinct standpoints – the history and philosophy of science (Kuhn) on the one hand, and the (Kantian) philosophy of the conditions of possibility for any reference to object (not just the philosophical or the epistemological); in fact, both perspectives are, independently and indirectly, a blow to scientism.

Accordingly, M. Miles's account on how should be understood the analogy between the Copernican revolution and Kant's so-called Copernican revolution is extremely useful because it paves the way for our own interpretation. As we shall see, Miles contests, as we do, the assignment of the phrase Copernican revolution

³⁴ Imm. Kant, *Critique of Pure Reason*, translated and edited by Paul Guyer (University of Pennsylvania) and Allen W. Wood (Yale University), Cambridge University Press, 1998.

³⁵ An historical and systematic interpretation of the theory of *Critique* as a second order theory I have tried in my volume *Experimental rațiunii pure. Deducția kantiană a categoriilor*, Cluj-Napoca, Editura Grinta, 2010 (in translation: *The Experiment of Pure Reason. Kant's Transcendental Deduction*).

per se to Kant's account in *Critique*, and, although he holds on to the phrase itself (only *analogically*), he completely changes its meaning, bringing it near to its use in criticisms such as B. Russell's. The interpretation we propose here starts from Miles's view, but moves, as we have said, towards *rethinking* this phrase (of the Kantian "reversal") in the sense of Kuhn's scientific revolution.

Therefore, we will resume some of the remarks just sketched in the first part of our paper, in order to reconsider, for instance, Laudan's understanding of the place and significance of Copernicus and Newton's achievements in the context of methodological changes in science, and of *simultaneous* changes at the three levels of the paradigm. Also, in order to achieve our explicit goal, we shall immerse the essential characteristics of Kantian thought into the model provided by Kuhnian criteria of scientific revolution – purified of Laudan's criticism.

It is well known in Kantian exegetics³⁶ the discussion about the "Copernican revolution" accomplished by the transcendental philosophy. After legitimately abandoning the phrase "Copernican revolution" to the "Copernican *hypothesis*", we shall see that what Kant achieves in philosophy and in the reflection on science is, in fact, not a Copernican revolution, but a *Kuhn-type* revolution.

The main confusion – that will be clarified by bringing into question Miles's paper – targets, firstly, the terms "revolution" and "hypothesis" when referring to Copernicus and its achievement in natural sciences: in stead of "Copernican hypothesis" it is wrongly used "Copernican revolution". Likewise, often the phrase "revolution in the way of thinking"³⁷ (appropriate) is wrongly identified with "Copernican revolution", by hastily considering them both as referring to the same thing: namely, the mutation in theoretical reporting to the object of investigation conducted by Kant particularly in the second edition of *Critique*. The reason for amending this confusion goes beyond the usual fact of correcting errors, as its relevance aims the very understanding of the Kantian approach: namely, the *Kantian revolution*, that is not a "Copernican revolution", but rather a *Kuhn-type revolution*. Therefore, holding on to the phrase "Copernican revolution" would not only mean being wrong about the proper use of terms (systematically and historically), but really missing the deep significance of Kant's transcendental philosophy developed in the program of *Critique*.

M. Miles emphasizes the fact (already known among specialists) that the phrases "Copernican revolution" and "Copernican hypothesis" do not appear in the text of the *Critique*, but there are occurring terms such as: *revolution* (six times in the *Preface B*, especially with respect to the phrase *the secure path of science*³⁸)³⁹ *hypothesis*, *analogy*, and the explicit reference to Copernicus (twice). The term *revolution* occurs in the context of radical innovation, consisting in changing the

³⁶ To complete the picture, see M. Milles, *ibidem*.

³⁷ „Der Revolution der Denkart" [B XI–B XII (913)].

³⁸ „Der sichere Gang einer Wissenschaft" [B VII–B VIII (701), B XI–B XII (913)].

³⁹ For a comprehensive perspective of the exegesis of this matter see the first pages and notes of M. Miles's paper quoted above.

way of thinking that led mathematics and physics to the secure path of science, and of the need for changes of the same type (changing the way of thinking and of reporting to the object) in metaphysics, by analogy – if possible – with the achievements in natural sciences. The task of *Critique*, circumscribed in the context of an explicit mention of Copernicus, would consist in testing and validating a new hypothesis (the changed way of thinking) by the transcendental experiment of pure reason, analogical to the experiments of physicists and chemists.

Miles's work is intended to retrieve the phrase Copernican revolution – despite the fact that Kant never used it as such, and it was subsequently assigned to him by interpreters – but not in the misleading fashion (to which criticisms such as Russell's are perfectly justified) that it was set in exegetics. We present below, briefly, Miles' position from which we initiated our interpretation with respect to the type of revolution rendered by Kant in *Critique* and thus to the validity of the significant part of Kuhn's theory of *The Structure...*

Despite Kant's unambiguous expression, Miles argues that the debates raised by an inexistent phrase in the text of *Critique* proved to be too long, unnecessarily complicated, and some of them downright frivolous. He targets not only the opinion of B. Russell, who – by a contrastive investigation of the "content" of Kantian revolution (conceived as anthropocentric) and of Copernican revolution (conceived as heliocentric) – labels the Kantian project as an "anti-Copernican revolution" or a "Ptolemaic counter-revolution"⁴⁰. Russell's error consists, and we agree here with Miles, in misunderstanding the fact that Kant's interest in Copernicus revolution aimed the method, the deliberate reversal of perspective with respect to common sense and to the dominant theory. Thus, Kant's own analogy is between the reversal of the ontological and epistemological naive realism (the Kantian project) on the one hand, and the opposition to common sense and the dominant (Copernican thesis) theory (geocentric), on the other. Here we do not agree with Miles, and even he admits later that the Copernican hypothesis is not of the same type as the Kantian, except for the reversal of the common sense knowledge with respect to the issue of reporting to the world; with the German philosopher, it is more than just an "reversal" that replaces the content of one assumption to another, as in the case of the Copernican astronomy. Miles holds that this is still a dogmatic attitude, although with Kant we discover a critical and self-reflexive attitude, of another order. We go further and argue that, with Kant, we witness a change of view, a *Gestalt* like shifting – as we also witness in Kuhn's account on the moment of discovery of a new paradigm during the revolutionary context of scientific change.

For Miles, the metaphysical and epistemological innovations that constitute the Kantian revolution can be grouped as follows⁴¹: the "transcendental turn", the

⁴⁰ For the whole discussion, see M. Miles, *ibidem*, pp. 1–3.

⁴¹ *Ibidem*, p. 4. Miles does not assume authorship of this group, and notes that such a distinction has sparked controversy among commentators over time. As I said, this author uses in his text to highlight the parallelism analogy between Kant and the Copernican hypothesis, and how they validate and fill the meaning of the phrase Copernican revolution when it comes to the conduct of assumptions foreword II of the *Critique*.

“transcendental difference” and the “transcendental question”. In Miles’s view, each of these types has a corresponding motif, namely: the “moving spectator” motif (for the “transcendental turn”), the “thought experiment” motif (for the “transcendental difference”) and the “critical” motif (for the “transcendental question”).

The transcendental turn aims the transition (done properly for the first time, by Kant) from the psychological Cartesian ego and that of the English empiricism to the transcendental subject (the pure ego) conceived as necessary and universal form of any empirical consciousness in general. The Kantian innovation consists in the conception that our mind does not discover lawfulness in objects, but enforces upon the objects of knowledge an unalterable structure (in fact, it does not discover, but construe the object).

It should be emphasized that in the two passages where Copernicus is explicitly mentioned also appears the allusion (recognizable from a post-Kuhnian perspective, that constitutes the hypothesis of this research) to paradigm changing, consisting of replacing the fundamental presupposition of the traditional metaphysics – within which our intuition is guided by the properties of objects – with the presupposition that the objects (as objects of senses) are guided by the nature of our faculty of intuition. The principles that form the conceptual spatio-temporal framework of our reporting to the world are not innate (in a Cartesian psychologist sense), nor acquired (through experience and inductive generalization), but they are constitutive of our way of thinking. Therefore, knowledge within Kantian standpoint also (particularly) presupposes investigating the structures of our way of knowing, that is it presupposes self-knowledge not in the sense that implies the knowledge of one’s self, but in the sense of self-reflexive knowledge and second-order knowledge.

By the transcendental turn, the mind understands perfectly only what itself produces, that is, puts in things as objects of experience. Miles holds that thereby occurs a “structural radicalization of the epistemic turn of the seventeenth century” – the Cartesian topic that mind is able to completely understand only what itself has brought into being. We believe that here it occurs rather a mutation, a radical change of standpoint (*Gestalt*), as we have already said. Indeed, this topic of subject central placing accomplishes a radical opposition to the common sense and the traditional metaphysics, including the Cartesian perspective, and a reversal analogous to the Copernican in astronomy. In addition, there is a different reporting to Hume and his scepticism, as we shall see below.

For Miles, the “Copernican revolution” redefined implies that we can find fundamental forms for sensorial representations and conceptual organization of objects within the structures of our mind – without these forms nothing can become object of our knowledge (which means that these forms apply necessary and universally to the objects of our knowledge, that is they are synthetic a priori). In Miles’s view, Kant emphasizes the importance of “the subject as observer” in the sense that all objects must lie under the conditions of experience, and not vice versa. The analogy with Copernicus hypothesis seems to be only that in philosophy, as in

astronomy, progress sometimes requires a reversal of the traditional assumptions. According to the general approach of Copernican hypothesis about how objects are possible to us, the subject constitutes its object; these objects that the subject constitutes form the only reality that we have access to (according to this idea, the sceptics claim that reality, in the strong sense of the term, cannot be known, it is not accepted by Kant, and here again we disagree with Miles). For Kant not only goes further and argues that we can have knowledge of reality; but this knowledge is not, as Miles thinks, "in the weak sense of the term", for "we are who constitute it". It is just the way it is, this is the knowledge grounded in our a priori structures, and it cannot be weaker than a knowledge that, with Kant, cannot even be conceived without making a serious error – as it occurred in the traditional metaphysics. It is an a priori synthetic knowledge appropriate to *phenomenon*.

The second step that Miles takes in his attempt of recovering the Kantian approach defined in the preface to the second edition of *Critique* as analogous to that of Copernicus in the redesigned sense of the Copernican Revolution is the "transcendental difference". This has in its foreground the formula of what Kant called in the preface the "experiment of pure reason" that aims ultimately the distinction between things in themselves and phenomena and the fact that only phenomena can be objects of our knowledge. The objects of knowledge are not given, they are constructed or, in other words, the intellect puts something in the objects of experience and of scientific investigation. The background of the discussion about the twofold standpoint and the necessity of the distinction between thing in itself (that can only be thought) and phenomenon (that can be known) is – Miles argues – that of the explicit analogy between the critical method consisting of a transcendental experiment of pure reason designed to test the Copernican hypothesis (the changed mode of reporting to object) and the crucial experiments in the scientific research (the explicit references to the experiments of physicists and chemists). Kant highlights also the appropriateness of adopting an analogous method in metaphysics: „This method, imitated from the method of those who study nature, thus consists in this: to seek the elements of pure reason in that which admits of being confirmed or refuted through an experiment.“, „This experiment of pure reason is very similar to that done in *chemistry*, which is called sometimes the experiment of *reduction*, but generally the *synthetic procedure*.”⁴²

Both the changing of the way of thinking and the experimental character appear explicitly linked in a note referring to Copernicus, where it is emphasized the fact that the revolution of the way of thinking in natural sciences is provided by the method of investigation consisting of experimental testing of hypotheses – method that Copernicus anticipated, in Kant's vision, by advancing a bold hypothesis (the heliocentrism) that contradicted the evidence of the senses, and the dominant theory at the time. Kant confesses his interest in the reversal of the widely accepted standpoint of the shared experience accomplished by the Copernican

⁴² Imm. Kant, *Critique*, pp. 111, 112 (B XIX–B XXI).

hypothesis, and precisely in this respect he is considering the analogy to his own approach within metaphysics.

The two moments above, as accounted for by Miles, presuppose – in our view – an interdependent relationship in the sense that the transcendental turn is profoundly connected to the success of Kant’s hypothesis by its validation within the transcendental experiment of pure reason; therefore, these moments, though distinguished, are related to the fundamental idea, to Kant’s innovative thought that “we can intuit a priori” by a different understanding of space and time – as pure a priori forms. Consequently, the understanding of our reporting within knowledge not to the thing in itself but to the phenomenon – the natural conclusion in the case of a successful experiment – cannot be justified in the absence of the “transcendental turn”, that followed the moment of the “awakening” from the dogmatic slumber (a *Gestalt* like change) related to the answer to the “crisis” due to Hume’s scepticism.

In Miles’s interpretation, the third moment of the Copernican revolution is instituted as the “transcendental question” of “How are synthetic judgments a priori possible?” This question registers the transition from the dogmatic attitude to criticism and the reversal of traditional epistemology, by overcoming not only common sense and traditional metaphysics, but also the order of knowledge established since the Cartesian project. In this context, Miles argues that the opposite of criticism is dogmatism (represented by the entire pre-Kantian metaphysics) that claims a direct knowledge of objects others than the knowledge itself. By contrast, Kant’s criticism is a self-reflexive knowledge, whose starting point lies in investigating the human faculty of knowledge about the possibility and legitimacy of pure knowledge based solely on principles, and aims the answer to a second order question concerning the conditions of possibility of a particular type of first order knowledge. Thus, Miles maintains further that criticism involves setting, through (second order) transcendental reflection, the legitimacy of a priori knowledge of the objects before issuing (first order) doctrinal claims on such knowledge. Therefore, Kant’s innovation lies mainly in asking the critical decisive question, and in answering it: our possibility to “intuit” a priori.

We now recover our main task as a hypothesis that we want to put to test like this: is the Kantian revolution, based on a Copernican-type hypothesis, a revolution in the Kuhnian sense of “scientific revolution”? In order to answer why the Kantian revolution is not a “Copernican revolution” or why it is a Kuhn-type revolution (including the account to Kuhn’s criteria for paradigm shift), it is important to bring up the signification of the (radical) sceptic challenge for the German philosopher’s standpoint: how does Kant report to Hume’s view?

We shall discuss further below the (Kuhnian) fundamental criteria decisive with respect to the succession of “normal science” and “scientific revolution” periods in the model of scientific paradigms changes: establishing the context prior to the revolutionary moment in terms of *incommensurability* of competing paradigms and *performance* of the new paradigm (unlike the others) to efficiently respond to current issues of the moment, impossible to overcome within the old paradigm. We recall here a methodological caution: determining the Kantian

program of *Critique* as the one responsible for changing the traditional paradigm of thinking the subject-object relationship by a "revolution in the way of thinking" does not target an actual overlap with the type of scientific theory endorsed by Kuhn in *The Structure of scientific revolutions*, but a determination by an analogous model to be presented in our paper.

How I. Kant reported to Hume's scepticism is revealing, on the one hand, in the sense of considering it as a moment, in metaphysics, analogous to the moment of "crisis" within normal science (Kuhn), and on the other hand, in the sense of the extreme difference of Kantian approach of the issues of the traditional "epistemology" – that of the so-called rationalist-empiricist tradition.

An important point in the debate over "Kantian revolution" itself is that of Kant's account to the problem raised by David Hume's standpoint. Historically, it is well-known that Hume's scepticism is regarded as a time of "crisis" in philosophical thinking with respect to knowledge and to man-world relation. Logical empiricism struggled with Hume's type of scepticism, neither gaining nor losing the fight. Our interpretation springs out from a view conceiving Kant's transcendental criticism as precisely that program that has solved the gnoseology problems of his time by changing the paradigm (analogously, two centuries later, to the winning theory of the competition for the paradigm shift in science – as accounted for in Kuhn's view). More simply, it has to be checked whether the incommensurability, the radically different (and incommunicable in respect to the theoretical content of the new theories) language and the superior performance of the Kantian model are actually sustainable, and with this respect, one of the elements to be taken into consideration is the crisis generated by Hume's view. If Imm. Kant accounts differently to the issues raised by scepticism (actually redesigning them) and successfully reformulates the "epistemology" problem of his time – through the theoretical program of *Critique B* – then we can say that we have taken an important step in supporting our hypothesis.

Hume's account is particularly important for Kant – as himself confesses – not only because it contributes decisively to his "awakening from dogmatic slumber" – as we have already said, we see it analogously to the scientific "discovery" characterized by Kuhn as a *Gestalt* shift. The truly important thing here is how Kant reported to Hume's challenge. Our concern aims Kant's way of rethinking and redesigning Hume's problem (the criticism of induction, and of the principle of causation, the "crisis" between empirical and theoretical). In order to highlight more clearly the importance of Kant's relation to Hume, we bring together the criticism of induction of the latest and his scepticism, focused on the impossibility of theoretical (*a priori*) reporting directly to the world, with the classical ideal of knowledge: the rational justification of scientific propositions, certainty, truth, etc. The question is whether Kant really accounts to *this* problem or not⁴³. We maintain that in *Critique (B)* the German philosopher actually introduces

⁴³ This passage resumes, here, *this* issue, as it has been investigated in more detail, but in an attempt of theoretical reconstructing Kant's *Critique of Pure Reason* in my work already cited.

a new “epistemological” paradigm grounded in a radically different approach with respect to the working (and failing to respond to radical scepticism) one (provided by logical empiricism and rationalism). Also in this different, original way that Kant refers to the XVII century epistemology, in this case to Hume’s issue, we find basis to support our hypothesis: Kant answers a question that only intersects this issue (inadequately stated by the contemporary epistemology), a question that has never been put this way, and that has to be answered by any epistemologist since Kant: how are synthetic propositions *a priori* possible? Furthermore, Kant’s answer completes the picture of what metaphysics as a science – his fundamental project – provides: namely, a reconsideration of mathematics and physics (natural science) through the training of the *Critique of Pure Reason* stated in the following questions: “How is pure mathematics possible?” “How is pure physics possible?” Kant’s generic answer highlights, from the standpoint of our hypothesis, the register of terminology and issues in terms of essential radical novelty with respect to what contemporary philosophy could offer: “through time and space understood as pure *a priori* forms” and the categories of intellect grounded in the “original synthesis of transcendental apperception”.

Kant’s transcendental philosophy has no direct relation to the world, its level of abstraction being different. In this respect, an answer to the question of *how* Kant reported to Hume’s challenge, and what such an answer means attain their truly significance. It is necessary to know to which Hume replied Kant – to the radical negatory sceptic or to the “methodical sceptic” whose attitude is not only healthy, but necessary, and that provided the “true century of criticism”. In other words: if Kant’s Hume is the radical sceptic, the German philosopher’s response in the *Critique* is given to the problems of the classic epistemology: namely, the ideal of certainty, the truth of propositions, the justification of the outside world, etc. But if Kant’s Hume is the methodical sceptic – as we maintain – then the *Critique* answers to an utterly different question: “*how* are synthetic propositions *a priori* possible?” – question that leads to wholly different topics such as: the problem of *a priori* synthesis (hence, the analysis of our ability of knowledge), the method, the different reporting to experience (not by induction, but by the intellect power of constructing the object), and so on – all of them issues that fit, analogously, the framework provided by Kuhn’s model of scientific “revolution”.

In the „Preface” to the *Prolegomena* Kant envisages „the *connection of cause and effect* (and also its derivative concepts, of force and action, etc.)”⁴⁴, on which Hume would require from reason, „which pretends to have generated this concept in her womb to give him an account of by what right she thinks: that something could be so constituted that, if it is posited, something else necessarily must thereby also be posited; for that is what the concept of cause says.”⁴⁵ Further it is said that if it comes to think by reason “*a priori* and from concepts such a relation”

⁴⁴ Imm. Kant, “Preface” to *Prolegomena to Any Future Methaphysics...*, translated and edited by Gary Hatfield, New York, Cambridge University Press, 2004, p. 7 [4: 257–258].

⁴⁵ *Ibidem*.

(this phrase has to do with the type of philosophical knowledge of the uncritical philosophy), „Hume indisputably proved that it is wholly impossible for reason to think such a connection *a priori* and from concepts, because this connection contains necessity;”⁴⁶ (the topic here is the relation determined from concepts only and *a priori* by reason, that cannot introduce anything synthetic about what occurs in the experience – therefore, determining the relation of causation by reason only and *a priori* from concepts is not possible, for the relation of causation concerns some respect to the object, some “content”: the synthetic *a priori*).

Hume asks himself what, beyond experience, can provide certainty for statements about facts. Rather, he wonders whether those statements concerning facts may be grounded *a priori*. Raising the issue of the cause-effect relation, he notices that its knowledge is acquired, in all cases, by experience, not by *a priori* reasoning; we presuppose it when certain items are always together. A simple examination of the sensitive qualities of an object, argues the author, cannot give an account of its possible effects. “The mind can never possibly find the effect in the supposed cause, by the most accurate scrutiny and examination.”⁴⁷

For Kant, Hume's conclusion seems only legitimate, because such a relation is not the product of imagination that stimulated by experience “having brought certain representations under the law of association, passes off the resulting subjective necessity (i.e., habit) for an objective necessity (from insight).”⁴⁸ The reappraisal of Hume's approach that Kant attempts here, we believe, amounts not to a mere criticism of the knowledge acquired by induction, but precisely to the Kantian project itself stated as the question not “whether the concept of cause is right, useful, and, with respect to all cognition of nature, indispensable, for this Hume had never put in doubt”, but if „it is thought through reason *a priori*, and in this way has an inner truth independent of all experience, and hence also a much more widely extended use that is not limited merely to objects of experience”. The problem is to find “just the origin of this concept”, for if “it were only discovered, the conditions of its use and the sphere in which it can be valid would already be given.”⁴⁹

In our view, Kant reconstructs Hume's criticism in the following sense: Hume feared that the causal principle is obtained by empirical experience; but he did not believe that it can be brought out *a priori* from the intellect by deduction, and that is only because he could not see the whole⁵⁰, that is – we argue – because he only saw the empirical side, without the *a priori* side, and he could not conceive the possibility of *a priori* intuition. In other words: Hume feared that this principle should be considered as yielded from experience – because it is not possible to be empirically valid; but he also knew that it cannot be true if derived from reason by

⁴⁶ *Ibidem*.

⁴⁷ David Hume, *An Enquiry Concerning Human Understanding*, Oxford, Oxford University Press, 2007, p. 21.

⁴⁸ *Ibidem*, p. 7

⁴⁹ *Ibidem*, p. 9 [4:259].

⁵⁰ *Ibidem*.

concepts (we acknowledge again here the distinction between philosophical knowledge and mathematical knowledge: the reference is made to the principle of causation of traditional metaphysics). Hume would have found it necessary to delimit the applicability of this principle – together with others that Kant discovered – by finding the origin that there should be neither in reason nor empirical, because it may not be valid. He did not consider that (Kant's) deduction was possible, but he was the only one who thought of it.

There is a firm idea throughout the *Critique* (and beyond, for we also find it in *Prolegomena*), and it is part of the very structure of Kant's reversal of the way of thinking: namely, the *discipline* of the employment of the types of theory elements in the area authorized by their deduction. This is Kant's novelty and, with respect to it, Hume also failed to see that the issue lies primarily not in investigating the a priori foundation of principles (of causation, for instance) treated as such (as a priori), and that refer to experience, but in "investigating the intellect as their place of origin" (of these principles). The reconstructed model of Hume's scepticism actually sends to the research of our capacity of knowing, to our way of thinking, considered as a condition of possibility for any knowledge in general.

Kant avows the influence of the Scottish philosopher as follows: "I freely admit that the remembrance of Hume was the very thing that many years ago first interrupted my dogmatic slumber and gave a completely different direction to my researches in the field of speculative philosophy"⁵¹. What we have argued above, together with this last remark summarize perfectly what we shall try to outline below. Namely, the analogy with the Copernican revolution of the *Preface B* reveals, within our approach, not the significance of Miles' paper of revolution as "reversal", but the sufficient elements for an analogy to a Kuhn-type revolution. Now, for the phrase "Copernican revolution" and its analogy with Kant's Copernican *hypothesis*, we consider, as already shown in our text, that we may outline three analogies, not one: the first would be that between Copernican revolution and Kantian reversal of the way of thinking (and thus of the Copernican *hypothesis*); the second would be the one that Miles refers to and envisages the preservation of the phrase itself (Kant's Copernican revolution), but reinterpreting its meaning and significance to avoid what Russell called the "anthropocentric fallacy"; finally, the third analogy represents one of the targets of this paper whereby we have tried to highlight, on the one hand, that what Miles says is justified but is not complete (Kant's Copernican revolution as a reversal etc.), and on the other hand, that this revolution conceived as a reversal of the way of thinking is not a Copernican, but a Kuhn-type revolution.

Thereupon, we shall try now to outline how the theory of *Critique* fits the Kuhnian structure of paradigm change. *Critique* contains the innovative idea – emerged from the crisis (Hume) of traditional epistemology – that, as we have

⁵¹ *Ibidem*.

already said, belongs to the context of discovery (this idea arises from an "awakening", from a *sudden* shift of the way of thinking – a kind of Kuhnian "conversion" – and is distinctive of the first edition of *Critique*). It is also present in the "context of justification" of the theory (particularly in the second edition, six years after the first one) where it is circumscribed by the paradigmatic formula of the experiment of pure reason. This experiment contains simultaneously elements from the context of discovery and from the context of justification – the structure of this *transcendental* experiment reclaims its belonging to both the new standpoint (*Gestalt*) whereby the view on the issues of classical epistemology shifted and, by anticipating a solution, to the proceeding of formulating and solving *puzzle type problems*, distinctive analogously to the "normal science".

Thus put it, the stakes of the Copernican hypothesis or revolution is directly related to the transition from the moment of crisis represented by Hume and his radical scepticism to the *Gestalt* type shift, corresponding to the moment of discovery of Kant's innovative idea that provides a solution to the fundamental transcendental question: "how are synthetic a priori propositions possible." Therefore, with the solution offered by the idea that by pure a priori forms (space and time) we can acquire necessary and universal knowledge of the world – but not as thing in itself but as a phenomenon – Kant overcomes the "crisis" and shifts the paradigm of traditional metaphysics by this modified vision *Gestalt* like – in our mode of designating the Kantian idea underlying the changing of the way of thinking. The experiment of pure reason, in our view, embraces the entire *Critique* and structurally circumscribes the underlying questions to the one above ("how is pure mathematics possible," "how is pure physics possible", "how is metaphysics as natural disposition possible", "how is metaphysics as a science possible"). The whole Kantian edifice so structured corresponds, in our interpretation, to the analogous moment of *the justification* of a new paradigm (or theory) and is determined by its distinctive type of problems: the problematization in the framework of the experiment of pure reason is mainly *puzzle* like (as the method of Kant's experiment is, as himself recognizes, "borrowed" from "chemists and physicists"). Only the idea as such, the fundamental novelty of the *Critique* sprung from Kant's *thought* – similar to Copernicus *thought* in astronomy – involves a *Gestalt* like view change. Terms of entry into the new theory or paradigm involves both a new arsenal of language elements, processes, methods and epistemological values and *already puzzle* like problematizations. The specific feature of the *Critique* is that both involves the *Gestalt* like shift, the items of absolute novelty distinctive of the revolutionary context (Kuhn), and proposes a structure that becomes paradigmatic in respect to problematization for subsequent issues of the Critique's theory.

There is also necessary to structure the moments of our account: the "crisis" (Hume), the "discovery" – *gestalt* - (the "*awakening* from dogmatic slumber" or the "*sudden* change in the way of thinking" that would accompany what Miles calls "transcendental turn"), the "justification of the new paradigm" – with the remark

that it involves both the paradigmatic *formulation* of the new hypothesis (the new theory or paradigm) and the *demonstration* of this (Kantian) hypothesis by *Critique* as experiment of pure reason. In the framework of this experiment – as we have already seen – we find the method borrowed from physicists and chemists, where elements of a new language (analytical, synthetic, a priori, transcendental unity of self-consciousness, etc.) are added and that becomes the “transcendental method-framework” of the whole theory of *Critique*, together with different methods (synthetic, analytical transcendently redesigned), new underlining and argumentative proceedings and strategies (the transcendental deduction, the metaphysical deduction, the analytics of the intellect, the dialectic of reason, etc.), different aims (determining the extent of the domain of understanding, of reason, the specificity of the concepts of understanding in the sense of conditions for the objects of experience and determining the possibility of our a priori knowledge – all related to the new paradigm). The latest two (the discovery and the justification of the paradigm) would belong to the Kuhn-type Kantian revolutionary context. As for the context of justification, there has to be added that, with the posing of the new theory of the *Critique*, within its demonstrative framework – *via* the form of the experiment of pure reason, etc. – it also develops the *puzzle* like problematization. Although it contains everything we said above, including the changed method of thinking – with Kant, the transcendental one – the justification context also implies the new way (*puzzle* like) of problematizing, specific for periods of normal science/metaphysics; however, such problems become *puzzle* like only with the widespread uptake, in Kant’s later philosophy, of the content and consequences of *Critique*: the general framework is that of reporting to phenomena, and not to the things in themselves. In epistemology this condition is confirmed and is equivalent to abandoning the conception of knowledge “as a reflection in the mirror” or, as Russell put it, the “bucket type” knowledge with the conception of knowledge as “reflector”, and to reporting in a fundamentally different way to causality.

By testing this hypothesis we establish including the fact that Kuhn’s ideas were, and are rather misunderstood than exaggerated.⁵² Kuhn’s conclusion arises from his research on the practice and history of science; Kant’s conclusion arises

⁵² We notice here what we said in the first part with respect to Laudan’s assumption that Copernicus and Newton belong to the paradigm where rules of enumerative induction constitute the method of sciences, their time lacking any revolution. With respect to the discussion in the last part, we argue that: not the fact that the topic emerged from the phrase Copernican *revolution* induces, implicitly, the presence of this revolution in the history of science; both Copernicus and especially Newton, at least in our interpretation, not only for having been an inspiration for Kant regarding reform in metaphysics – the first inspired him with the “reversal” of the way of thinking by analogy with the *hypothesis* in astronomy, and Newton, by introducing the mathematical method in science – had a significant contribution in building the structure of the experiment of pure reason of *Critique* on the transcendently signified model of the *analytical* and *synthetic* methods; but both the hypothesis of earth revolving around the sun and the law of universal gravitation are grounded in the hypothetic-deductive model and not in the direct observing of entities on whose properties and qualities subsequently are asserted rules and objective laws – neither the movement of revolution, nor the law of universal gravitation are subject to any direct observation.

from his observing the crisis of sciences also in respect to aims and values of regulating. We have seen that the Kantian model justifies the ideas of *The Structure...*, and likewise what Kuhn says about science and its dynamics is compatible with the conclusion of Kant's achievement: namely, that we are only reporting to the phenomenon, and not to the thing in itself. This conclusion may also constitute the solution for understanding the very theoretical core of *The Structure...* – as shown in our article, the dispute around *The Structure...* occurs mainly in a scientific context represented either by the analytic epistemology, or by more nuanced standpoints of authors such as Laudan. Likewise, the misunderstanding of Kant's transcendental philosophy is rooted in the context of the classical model of gnoseology – the empiricist and rationalist tradition of the seventeenth century – that targeted even then, the same scientific aims. The Kantian change (*Gestalt*) within the metaphysics of reporting to the object⁵³ is similar to the Kuhnian deed in the history of science – both worldviews supporting each other (only *analogously*), and together finding coherence and significance in a model of science necessity and objectivity grounded in our way of knowing, thinking and experiencing (including with the tools provided by mathematics and mathematical sciences).

Kuhn's idea arises from a prolonged observation, but also from a conversion with respect to the philosophy of science (scientific change): what Kuhn accomplishes looks like a real revolution in respect with scientific certainty. With Kant, there happens something similar, but with respect to metaphysics: both the types of rationality match, and the object is somehow the same (the dynamics of science, its changing in the context of resketching the concept of science). One of them does it within science, and also with respect to its history – let's not forget that Kuhn is primarily a scientist. The other one does it from a grounding philosophical standpoint, that of putting these issues in the area of their *possibility* and in close contact with the proper status of the evidences provided by the results of science; Kant's hypothesis follows the Copernican hypothesis from science aiming to accommodate the results provided by science with scepticism and the dilemma of the empiricist-rationalist tradition on the theoretical status of these results (they could not be a priori sure). With Kant, they proved sure and a priori by the possibility of the necessary structure provided by the categorical scheme, and not in relation to the foundation of the empirical content of these concepts that changes. This way is preserved the scientific character of sciences results that agrees with the rationality of our competence in the module of elaborating the new paradigm (also) as a scientific meta-theory by the means of the "context of justification"; and also (our) underlining that rationality and scientific certainty are

⁵³ We mention that, in the Kantian program, we not find *primarily* just a meta-theory, a philosophy of knowledge, or a philosophy of scientific knowledge, or a philosophy of science, but – that is more than each one and all together – a second order theory as reporting to *object* – *Gegenstand* – (without confining to specifications according to *certain* object, including reason or intellect, but of course these, too).

relative to our categorical structure, for the context of discovery is subjected to requirements escaping the austere system of scientific criteria specific to the *working* scientific theory: we are referring to the fact that the inspiring nature of any novelty related to scientific change, but not only, is an extremely important element showing that certainty, truth, etc. required by the values, the aims and the exigencies established in textbook theories are adjustable with respect to what the “context of discovery” provides. The fact that there is a sort of unknown, of mystery related to the source, and the process of the “discovery” – aspect less taken into account – indicates that we cannot control the “spring” of the major scientific knowledge (embedded in the significant discoveries that guarantee the progress of science in general), that it is irreducible to a formal logic algorithm or to a mathematical model; what we can say for sure is that we do not know neither the process, nor the source. The process of *discovery* is broader and more complex than the one of the module of the new theory *justification*.

Accordingly, we argue not only that, with Kant, we find analogously the Kuhn-type model of revolution, and that the results of his revolutionary hypothesis on how reporting to the object coincide not only with the results provided by science and with their scientific status (only within the system of categories – as reporting to the *phenomenon*, and not to the thing in itself); but also that it is consistent with the model provided by Kuhn in the following sense: scientific revolutions, for example, do not deny the rigorous scientific status of the theories etc., but expresses the core of science specificity – namely, the reporting to phenomena, while maintaining both rationality and necessity of the results within the Kantian system of categories: the contents may change along with the new revolutions that complement, extend, or even correct the old paradigm, that was also a corrective one when it occurred, but rationality and the necessity are preserved because they belong to our way of thinking (Kant), to our way of practicing science (Kuhn).