KUHN'S "LINGUISTIC TURN", INCOMMENSURABILITY AND WEAK TAXONOMIC OBJECTIVITY

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Abstract. In his last works, after his own 'linguistic turn', Kuhn abandons the concept of paradigm, proposes a view based on taxonomic concepts and introduces other two concepts, such as conceptual network and lexicon. My aim in this paper is to analyse the impact of these new concepts on Kuhn's model of scientific theories and to explore their relation with the concept of paradigm and the idea of incommensurability. I argue that Kuhn tried to escape from the highly relativistic consequences of the early version of his theory and he was ready for a realistic approach at least in the case of the sciences that use tools in order to distinguish between the so-called "natural kinds". As a consequence, Kuhn proposes a new heuristic principle as a guide for his research: "The world is not invented or constructed."

Keywords: Thomas S. Kuhn; paradigm; incommensurability; lexicon; conceptual network; taxonomic objectivity.

THE CORE OF *SSR* AND THE STAKE OF THIS RESEARCH

It is well known that before Kuhn the development of science was understood as a heroic progress based of the work of great scientists who were able to add new truths to the old ones, to correct the errors and to increase the capacity of theories to give better explanations. Based on his research in the history of science, Kuhn proposed in *The Structure of Scientific Revolutions* an alternative to the standard view. He claimed that the development of science is not uniform and cumulative, but a sequence of qualitatively different phases of normal science and extraordinary (or revolutionary) science. Normal science is described as "puzzle-solving" and it is based on a research tradition which is learned as a set of exemplary cases inside the scientific community: "one of the things a scientific community acquires with a paradigm is a criterion for choosing problems that, while the paradigm is taken for

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granted, can be assumed to have solutions"[1]. Moreover, the members of a scientific community share in common a diversity of commitments structured in a "disciplinary matrix"[2] which is a pre-requisite for a successful normal science. On the contrary, revolutionary science involve a revision of existing scientific beliefs or practices, so that a sequence of discontinuity takes place in which "an older paradigm is replaced in whole or in part by an incompatible new one"[3]. A revolution begins as a crises caused by persistent anomalies and the technical breakdown of normal science to solve them. A revolution also brings with it a new paradigm, an increased capacity to solve the anomalies and all the previous puzzles, and leads to incommensurability, even in the original sense of the incomparable character of two successive paradigms profoundly and radically separated by a scientific revolution.

The concepts of incommensurability and world-change become the most significant from the perspective of the differences from the standard view of scientific theory. I think that in order to adequately capture Kuhn's theory and the way it develops, we have to distinguish between three approaches and meanings of incommensurability in Kuhn's works: methodological, perceptual, and semantical. Kuhn works from the beginning in *SSR* with all three types of incommensurability, sometimes he makes an explicit distinction between them, sometimes he mixes them, but in a certain order of priority, the first being the methodological one, correlated with the perceptual one in the case of the discussion about the world-change, the semantic one being derived from the first two and just forecasted.

The thesis of incommensurability leads to relativistic consequences that direct Kuhn to a reconsideration of his conception and to a change of philosophical emphasis materialized in his own "linguistic turn" and in bringing the semantic and linguistic aspects to the fore. At the same time, the world-change will no longer be conceived according to the model of perceptual *gestalt* change, but as a replacement of one vocabulary with another, Kuhn introducing the concepts of lexicon and conceptual network.

In this paper my aim is to analyse this change proposed by Kuhn which has important philosophical consequences, even regarding the traditional interpretation regarding the understanding of the phenomenal world from a Kantian perspective. I think it could be argued that there is a certain temptation to assume some realistic assumptions, such as that related with the supposed natural kinds, which would

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[1] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, Second Edition, Enlarged, Chicago, University of Chicago Press, 1970, p. 37.

[2] This expression was proposed by Kuhn in his "Postscript" to *SSR*: "'disciplinary' because it refers to the common possession of the practitioners of a particular discipline; 'matrix' because it is composed of ordered elements of various sorts, each requiring further specification." (Thomas S. Kuhn, "Postscript", in *The Structure of Scientific Revolutions*, p. 182).

[3] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, p. 92.

explain the possibility of a lexical taxonomy that is not just a construction, but reflects similarities and differences identifiable to the level of reality as such, having a stronger epistemic status than that of knowledge of a purely phenomenal world.

INCOMMENSURABILITY AND WORLD-CHANGE

A detailed research on the thesis of incommensurability already leads to the awareness of the semantic-linguistic dimension assumed by the comparison of paradigms and the shifting of the world vision. Let's take a look at the three types of incommensurability (methodological, perceptual, and semantic), the relationships between them, as well as their prioritization by Kuhn before and after his own "linguistic turn".

First of all, based on exemplary cases from the history of science, Kuhn argues that the methodological rules aren't permanent and universal, but dependent and changeable. Therefore, we can't judge we cannot judge and evaluate theories from a so-called neutral Archimedean point, independent of any commitments and assumptions, on which we can place ourselves so that to compare theories or their various empirical or theoretical components, but we always do it within the paradigm understood as a disciplinary matrix, that is, in a particularistic way. The standards of assessment aren't universal rules because they are relative to the paradigm that guides the way the world is seen. Following Kuhn, we'll claim that theories are incommensurable because they don't share any common methodological measure. In his "Postscript" to *SSR* Kuhn makes a categorical statement in this regard: "There is no neutral algorithm for theory-choice, no systematic decision procedure which, properly applied, must lead each individual in the group to the same decision."[4] The choices are made starting from the interaction between the values and experiences shared in common, all of which have a constraining role in relation to the preferences and argumentative constructions made by the members of the scientific community.

But even if two scientists agree on the method used for inference and interpretation, incommensurability could arise from the fact that the scientists will disagree regarding their observations. The idea of perceptual incommensurability overturns the traditional thesis of the theory's dependence on observation and consists in the contrary assertion that perceptual experience is theory-dependent and that observational evidence isn't a neutral basis for theory-choice. For example, when a Galilean physicist and an Aristotelian one look at a pendulum, they will different things, which is equivalent to the statement that the two live in different worlds Kuhn express an idea that could be associated with a strong constructivism: "In a sense (…) proponents of competing paradigms practice their trades in different

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[4] *Ibidem*, p. 200.

worlds. One contains constrained bodies that fall slowly, the other pendulums that repeat their motion. (…) Practicing in different worlds, the two groups of scientists see different things when they look from the same point in the same direction."[5] As a consequence, changing one paradigm to another is similar to a *gestalt* switch that occur when the same imagine is seen as representing a rabbit and then as representing a duck.

The third dimension of incommensurability is related with language. Kuhn considers that the language associated with different paradigms makes the respective vocabularies mutually untranslatable, which leads to a "communication breakdown". Therefore, also in *SSR* Kuhn takes into account the semantic aspects of incommensurability, so that we can also talk about a semantic meaning of incommensurability right from the beginning. Kuhn asserts that a scientific revolution is associated with radical shifts in the meanings of the key terms used by two different paradigms, so that we cannot understand one theory in terms of another, but we are actually facing a challenge that aims at the possibility of translation, even partial. In such a case of paradigm shift in science we need to change the meaning of established concepts. Kuhn's preferred example is that the meanings of terms in Newtonian and Einsteinian theories: "To make the transition to Einstein's universe, the whole conceptual web whose strands are space, time, matter, force, and so on, had to be shifted and laid down again on nature whole."[6]

It is easy to see from this presentation on the three dimensions of the incommensurability thesis that the semantic aspects are taken into account and we can talk about an initial version of incommensurability in the semantic sense. Moreover, apart from the fact that Kuhn seems to accept a holistic vision as long as he talks about the "conceptual web", if we consider the problem of world change, then we can correctly introduce the hypothesis that, according to Kuhn's initial version of semantic incommensurability, what it is changed it is the image of the phenomenal world, not the world as such. Two scientists who accept different paradigms live in different worlds and see things differently, but "That is not to say that they can see anything they please. Both are looking at the world, and what they look at has not changed."[7]

Therefore, the terms of our theories refer to something, they describe a world that we try to know as it is starting from its phenomenal appearances. This reality of the world beyond appearances has a constraining character in relation to our theoretical choices. In a commentary from *SSR* on Wittgenstein, Kuhn shows that he is aware of the fact that natural kinds are not only the result of a perceptual interaction with the phenomenal world, but of a certain way of being of the world beyond the appearances, namely, the family resemblances being a symptom of this state of affairs: "For Wittgenstein, in short, games, and chairs, and leaves are

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[5] *Ibidem*, p. 150.
[6] *Ibidem*, p. 149.
[7] *Ibidem*, p. 150.

natural families, each constituted by a network of overlapping and crisscross resemblances. The existence of such a network sufficiently accounts for our success in identifying the corresponding object or activity. Only if the families we named overlapped and merged gradually into one another – only, that is, were no natural families – would our success in identifying and naming provide evidence for a set of common corresponding to each of the class names we employ."[8]

Semantic incommensurability is mentioned and implicitly used in *SSR*, and in the "Postscript", but the heart of original thesis is methodological and observational incommensurability. Then, starting with his "Reflections on my Critics", where Kuhn proposes a parallel with Quine's thesis of the indeterminacy of translation[9]. he remarks that some translations are impossible and develops this form of incommensurability. According to Quine, there are many ways to give a translation of a language into another with the condition of an adequacy of translation to the behaviour of the speaker. According to Kuhn, incommensurability is something different from the impossibility of translation in Quine's sense because their visions about meanings of terms are different, and, moreover, their ideas of a semantic holism are also incompatible. Kuhn will develop the idea of so-called taxonomic incommensurability based on the thesis that the source of incommensurability are the differences in classificatory schemes. A taxonomy is associated with a lexical network of related terms which divide the domain under scrutiny into (natural) kinds.

An interpretation of the incommensurability thesis that became a standard one was proposed from the neo-Kantian perspective by Paul Hoyningen-Huene[10] who considered that the meaning of incommensurability is primarily an epistemological one and perception and world-change. Corresponding to the Kantian distinction between noumena and phenomena, Hoyningen-Huene thinks that it is legitimate to attribute to Kuhn the supposed distinction between the world-in-itself and the phenomenal world (the world of perceptual experiences). The difference between the two philosophers is that if Kant claimed that the general form of phenomena is a fixed one, Kuhn argued that it is changeable because a shift in paradigm is followed by a change in the way the world is given to us in our experience, therefore, by a change in our own phenomenal world. This change in phenomenal world is a world change and it is related with the incommensurability thesis of two different paradigms and with that about the theory-dependence of observation.

This neo-Kantian interpretation proposed by Hoyningen-Huene is a redoubtable one and is strongly supported by many of Kuhn's assertions from *SSR*. However, I

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[8] *Ibidem*, p. 45.

[9] Thomas S. Kuhn, "Reflections on my Critics", in I. Lakatos and A. Musgrave (eds.), *Criticism and the Growth of Knowledge*, London, Cambridge University Press, 1970, p. 268.

[10] See Paul Hoyningen-Huene, *Reconstructing Scientific Revolutions. Thomas S. Kuhn's Philosophy of Science*, translated by Alexander T. Levine, with o foreword by Thomas S. Kuhn, Chicago and London, The Universityy of Chicago Press, 1993, and also Paul Hoyningen-Huene, "Kuhn's Development Before and After Structure" in William J. Devlin and Alisa Bokulich (eds.), *Kuhn's Structure of Scientific Revolutions-50Years On*, Heidelberg, NewYork, Dordrecht, London, Springer, 2015, pp. 185–196.

believe that his own "linguistic turn" led Kuhn to a rethinking of the philosophical framework of his theory of science development, so that Kantian presuppositional commitments must also be re-evaluated, especially from the perspective of relating the domain of transcendental subjectivity, generator of objectivity in the weak sense, with what Kuhn understands by lexical network and taxonomy.

SEMANTIC INCOMMENSURABILITY
AND KUHN'S "LINGUISTIC TURN"

Kuhn writes a "Foreword" to the English edition of Hoyningen-Huene book in which he develops some remarks about the neo-Kantian interpretation of his work and hints at the different direction in which he believed it should be followed. I think that in this "Foreword", Kuhn already looks at *SSR* from the perspective of his new preferred concepts of his own "linguistic turn". Thereby, Kuhn conceives scientific communities as "language – or discourse – communities, sets of individual bound together by the shared vocabulary"[11]. In this debate about the community that shares a certain vocabulary, Kuhn identifies the source of specific further developments of his conception. He recognizes that *SSR* talks more about the changes of visual *gestalt* or the changes in ways of seeing the world, but he emphasizes that he did not neglect the aspects of changing the meaning of words when a scientific revolution occurs. But "meaning change was the more fundamental, for the central concepts of incommensurability and partial communication were based primarily upon it"[12]. Unfortunately, according to Kuhn, the theories of meaning, whether traditional or newer, which reduce meaning to reference, were not able to elucidate these last concepts. As a result, incommensurability became the main philosophical problem that *SSR* generated: what it is for a word to have a meaning and how to understand the ways in which the words with meaning are fitted to the world described by them? Kuhn claims that the key role in giving the answers is played by primitive similarity/ difference relations acquired during scientific education, relations that offer what Kuhn calls "the taxonomy shared by a field's practitioners, their professional ontology"[13]. The knowledge held by a scientific community at a given time is embedded into the taxonomy used, and during a scientific revolution changes occur that lead to the retirement of certain taxonomic categories.

Another new development mentioned by Kuhn is that if in *SSR* the idea of *gestalt* switches like duck-rabbit was also applicable to the scientific community, he removes now the mistake and separates between concepts that are applicable at the individual level and concepts that are applicable at the group level, concluding

[11] Thomas S. Kuhn, "Foreword", in Paul Hoyningen Huene, *Reconstructing Scientific Revolutions. Thomas S. Kuhn's Philosophy of Science*, p. xii.
[12] *Idem.*
[13] *Idem.*

that the *gestalt* switch is applicable only to individuals. Kuhn thinks that to use the *gestalt* switch as a model for what happens to a group is a mistake: "Groups do not have experiences except insofar as all their members do. And there are no experiences, *gestalt* switches or other that all the members of a scientific community must share in the course of a revolution. Revolutions should be described not in terms of group experience but in terms of the varied experiences of individual group members."[14] This explains the reorientation of Kuhn's interest towards the conceptual networks and lexicons, *i.e.*, what, unlike *gestalt* switches, have a public character. This separation between concepts applicable to groups and concepts applicable to individuals is considered by Kuhn as "a powerful tool for eliminating the solipsist character of traditional methodology. Science becomes intrinsically a group activity, no longer even idealizable as a one-person game."[15] The same separation is crucial for the case of word meaning: "Different individuals may pick out the referents of terms in different ways: what all must share, if communication is to succeed, is not the criteria by which members of a category are identified but rather the patterns of similarity/difference relations which those criteria provide."[16] These patterns make up the shared taxonomy structure that binds the members of the community together.

This "Foreword" from 1993 is the milestone with which Kuhn himself marks the development of his ideas. Later, in *The Road since Structure*[17] he will enter into the details. Before discussing the step-by-step development of his ideas, as Kuhn himself presents it, I think it is interesting to take a look at how Hoyningen-Huene comments on this change toward a "linguistic turn".

Hoyningen-Huene mentions that after the second and enlarged edition of *SSR* published in the year 1970, there was an interval of silence in which Kuhn does not add anything on this topic, but he has returned to it after almost ten years, in the year 1979, in his paper about "Metaphor in Science"[18] where he suggests at least two important changes.

The first, Kuhn adopts in his commentary about Boyd's idea about the relation between metaphor and theory change a position that he claims to be a realistic one and he explicitly removes the world-in itself hypothesis: "the world to which Boyd refers is the one real world, still unknown but toward which science

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[14] *Ibidem*, p. xiii.

[15] *Idem.*

[16] *Idem.*

[17] Thomas S. Kuhn, *The Road since Structure: Philosophical Essays, 1970-1993, With an Autobiographical Interview*, edited by James Conant and John Haugeland, Chicago, University of Chicago Press, 2000.

[18] "Metaphor in Science" was a commentary on Richard Boyd's conference "Metaphor and Theory Change: What is Metaphor' a Metaphor For?" presented at University of Illinois at Urbana - Champaign in September 1977. Kuhn's commentary was initially published in the volume *Metaphor and Thought*, edited by Andrew Ortony, 1979, then in Thomas S. Kuhn, *The Road since Structure...*, pp. 196–207.

proceeds by successive approximation"[19]. Kuhn agrees that his new position is also Kantian, but without "things in themselves" and with categories of mind which could change in time as a result of their accommodation to experience. But, concludes Kuhn, such a point of view in which Kantianism, although diminished, remains present, "need not (…) make the world less real"[20]. It should be mentioned that the same kind of Kantianism of a priori transformable categories is proposed by Kuhn as an interpretation of Fleck's theory about collective thinking: "What the thought collective supplies its members is somehow like the Kantian categories, prerequisite to any thought at all."[21] Therefore, the authority of a thought collective is more logical than social, but it is pre-existing for an individual only to the extent that he or she is part of a certain group.

Regarding this first suggestion, Hoyningen-Huene raises two welcome questions for this kind of Kantianism without things in themselves and with changing categories proposed by Kuhn:

1. Does Kuhn thus avoid the solipsistic pitfalls which threatened his position in *SSR*?

2. What would be the meaning of this kind of realism suggested by Kuhn but never sufficiently explained?[22]

The second suggestion aims at understanding the phenomenal world not starting from the way it is given to us in perception, but from the way we describe it in a language. Although language is not neglected in *SSR*, and it is even associated with the meaning of the paradigm, however, what dominates are the references to the visual image or, later, to visual stimuli, as a model for the interaction of the epistemic subject with the phenomenal world. Therefore, in the first post-*SSR* decade, the visual image and ways of seeing the world are prioritized, even if Kuhn admits that they have linguistic consequences.

The change towards a vision that prioritizes and privileges language becomes obvious in the 1980s and is subsequently consolidated, becoming the dominant approach of scientific development through revolutions. Kuhn's assertion from 1982 marks this turning point: "If I were now rewriting *The Structure of Scientific Revolutions*, I would emphasize language change more."[23] If in *SSR* the phenomenal world is perceptually and conceptually divided, the new approach is based on the idea that the structure of the world is expressed by clusters of interrelated terms

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[19] Thomas S. Kuhn, *The Road since Structure: Philosophical Essays*, *1970-1993, With an Autobiographical Interview*, p. 206.

[20] *Ibidem*, p. 207.

[21] Thomas S. Kuhn, „Foreword", in Ludwik Fleck, *Genesis and Development of a Scientific Fact*, eds. T. J. Trenn and R. Merton, Chicago, University of Chicago Press, 1979, p. xi.

[22] Paul Hoyningen-Huene, *Reconstructing Scientific Revolutions. Thomas S. Kuhn's Philosophy of Science*, p. 60.

[23] Thomas S. Kuhn, "Response to Commentaries", in *PSA 1982. Proceedings of the 1982 Biennial Meeting of the Philosophy of Science Association*, eds. P. D. Asquith and T. Nickles, East Lansing: Philosophy of Science Association, 1983, p. 715.

that correspond to the network of similarities and differences between objects in the world. This so-called "language structure of the world" becomes one of the main topics from here on.

In *SSR*, when he explains the revolutions in science as changes of world view, Kuhn claims that the retinal imprints are previous to the so-called pure-observation language. As a consequence, any questions or laboratory manipulations about what a perceived phenomenon seems to be "presuppose a world already perceptually and conceptually subdivided in a certain way"[24] and in this sense they depend upon a paradigm. The answers will be different as a result of a paradigm change because the paradigm determines the experiences and the meaning of the word used. For example, a Copernican learns not only what the word "planet" meant and what the sun was, but, first of all, how the changed meaning of the word "planet" help him to make distinctions in the world of celestial bodies, because all of them "were seen differently from the way they had been seen before"[25].

Therefore, Kuhn does not exclude the role of language in understanding the world, only that priority is given to the neural programming of the way we see the world and interact with it perceptually. In other words, the phenomenal world is primarily as we see it. The paradigm is intrinsic to the way of seeing the world. In his latter essays, Kuhn will overturn the order of priority and give language the main role by directly attributing the epistemological function of the paradigm to the lexicon and by describing the scientific change as lexical change.

Kuhn's preference for the role of the lexical network in mapping the phenomenal world becomes symptomatic in his various writings starting with the end of the 1970s. Already in 1984 Kuhn has given to his Thalheimer Lectures the explicit title "Scientific Development and Lexical Change". This linguistic reformulation of incommensurability is for Conan and Haugeland the key to understanding Kuhn's later view: "Commensurability and incommensurability, as presented in Kuhn's later work, are terms that denote a relation obtaining between linguistic structures."[26]

Therefore, two new points have to be developed:

First, Kuhn is concerned with explaining the difference between commensurable and incommensurable languages (or parts of languages), not just with the problem of incommensurability. The translation is possible between pairs of commensurable languages: whatever can be said in one language can be also said in the other. But strict or radical translation is not possible between incommensurable languages, even if some paraphrases may assure an adequate communication and can ensure a transmission of a semantic content

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[24] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, p. 129.
[25] *Idem.*
[26] James Conant, John Haugeland, "Introduction", in Thomas S. Kuhn, *The Road since Structure: Philosophical Essays, 1970–1993, With an Autobiographical Interview*, p. 4.

It is well known the fact that the idea of incommensurability as it was described in *SSR* was criticized starting from the supposition that the scientists working under different paradigms were able to communicate each other across a revolutionary divide. Moreover, SSR would be self-contradictory because it explains the past paradigms in contemporary terms, an impossible fact according to the incommensurability thesis. We recognize here a strong objection, even if we take into account Kuhn's thesis according to which in such an explanation of an old paradigm in terms of a new one something is always irremediably lost.

Kuhn responds to these objections in *The Road from the Structure* pointing out the difference between language translation and language learning. If a foreign language is not translatable into another, this does not mean that it cannot be learned. A person can understand two different languages even if the two languages are not translatable one another. This process is named interpretation or hermeneutics, and it is different form radical interpretation proposed by Davidson. Therefore, we are able to explain Aristotelian "physics" or "phlogiston chemistry" as a hermeneutic interpretation and this help us to learn an incommensurable language.

Second, Kuhn explains how and why incommensurability occurs in two sorts of scientific context. I think that Kuhn asserts and explains that technical scientific terminology is always structured in relation with families of terms which are essentially caught in networks and depends from- let's use a Carnapian expression – linguistic frameworks.

The first case is of the terms that are kinds or terms or sortals or "taxonomic categories". These terms are arrayed to a strict hierarchy, namely, they are subject to a so-called "the no-overlap principle": "no two such categories or kinds can have any instances in common unless one of them entirely and necessarily subsumes the other"[27]. Any taxonomy which is adequate to describe scientifically is based on an implicit no-overlap principle. "The meanings of the terms depend on their respective subsumption and mutual exclusion relations (plus, of course, the learnable skills of recognizing members)."[28] This structure is a lexicon and it has an empirical content because there are always multiple criteria of recognizing membership in any given category. Distinct taxonomic structures with different subsumption and exclusion relations are inevitably incommensurable because these differences produce fundamentally disparate meanings.

The other case of terminological family is also a lexicon and involves those terms whose meanings are determined partially and crucially by scientific laws relating them. The examples are the quantitative variables that occur in laws expressed as equations, such as weight, force, and mass in Newtonian dynamics. The meanings of these terms are partially constituted through their occurrence in claims such as scientific laws that categorically exclude certain possibilities: "hence any changes in the understandings or formulations of the relevant laws must

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[27] *Ibidem*, p. 5.
[28] *Idem*.

result, according to Kuhn, in fundamental differences in the understandings (hence, meanings) of the corresponding terms, and thus incommensurability"[29].

The problem of incommensurability becomes an almost permanent topic in the various extensions of his research. In his essay "Commensurability, Comparability, Communicability", Kuhn defences his view about incommensurability against two charges made by Davidson, Kitcher, Putnam and others:

- incommensurability is impossible because intelligibility entails translatability, hence commensurability;

- if incommensurability were possible, then the major scientific changes cannot be judged on the same empirical basis, and they must be fundamentally irrational.

Kuhn recognizes that most of the terms common to the two theories have the same semantical function in both and their meanings are preserved. He introduces the concept of "local incommensurability" and explains that "only for a small subgroup of (usually interdefined) terms and for sentences containing them do problems of translatability arise"[30].

As an another answer to these objections, Kuhn will develop the idea that incommensurable scientific languages (lexicons) give access to different sets of possible worlds, but he tries to find a way without possible-world semantics and the causal theory of reference[31]. He replicates a commentary which was proposed in "Metaphor in Science" as a reaction to Richard Boyd's idea about the analogies between scientific terminology and ordinary-language metaphors. Kuhn rejects the way in which Boyd extends the view so that to include the causal theory of reference with regard to natural-kind terms. Kuhn describes himself as, like Boyd, a Kantian, but "without things in themselves and with categories of the mind which could change with time as the accommodation of language and experience proceeded"[32]. Conant and Haugeland mention that Kuhn reiterated the same idea about him as a Kantian in a private conversation with them[33]. Moreover, in his paper "The Road since Structure", where the concept of incommensurability is associated with the big problem of realism and truth, Kuhn rejects the excesses and argues that incommensurability doesn't threat the scientific rationality. He describes his own position as "post-Darwinian Kantianism" and proposes a comparison: "like the Kantian categories, the lexicon supplies preconditions of possible experience.

[29] *Idem.*

[30] Thomas S. Kuhn, "Commensurability, Comparability, Communicability", in *The Road since Structure: Philosophical Essays, 1970–1993, With an Autobiographical Interview*, p. 36.

[31] See Thomas S. Kuhn, "Possible Worlds in History of Science", in *The Road since Structure: Philosophical Essays, 1970–1993, With an Autobiographical Interview*, pp. 58–89.

[32] Thomas S. Kuhn, "Metaphor in Science", in *The Road since Structure: Philosophical Essays, 1970–1993, With an Autobiographical Interview*, p. 107.

[33] James Conant and John Haugeland, "Introduction", in Thomas S. Kuhn, *The Road since Structure: Philosophical Essays, 1970–1993, With an Autobiographical Interview*, p. 7.

But lexical categories, unlike their Kantian forebears, can and do change, both with time and with the passage from one community to another." [34]

All these topics about taxonomic structures, incommensurability, the social character of scientific research, and the triple relation between truth, realism and rationality are combined by Kuhn in his "Afterwords"[35] where he also recognizes the importance of natural kinds and kind concepts for the problem of incommensurability. I think that after Kuhn's "linguistic turn" we can talk about a new version of semantic incommensurability, about successive different thesis of incommensurability or about a change of Kuhn's thesis of incommensurability. I agree with Shankey's idea that it is justifiable to distinguish between Kuhn's early position about incommensurability, a transition phase and a later position: "Originally, incommensurability methodological, observational and conceptual disparity between paradigms. Later Kuhn restricted the notion to the semantical sphere and assimilated it to the indeterminacy of translation. Recently he has developed an account of it as localized translation failure between subsets of terms employed."[36]

THE HEURISTIC POWER OF TAXONOMY

My thesis is that the concepts that resulted from the Kuhn's linguistic turn, those of the lexical network and taxonomy, must lead to a revision of the *SSR* vocabulary and have the heuristic force to configure a new vision on the development of scientific knowledge. It is not the case here to discuss whether Kuhn abandons or replaces the concept of paradigm with that of lexical network, but only to see how his theory works by assimilating these concepts. The bold and debatable part of my thesis is that the modest version of the incommensurability thesis and its correlation with the concepts prioritized by Kuhn after the linguistic turn leads to the rejection of a constructivist interpretation in favour of a taxonomic semantical quasi-realism in the sense that classification schemes are appropriate for natural kinds precisely because these taxonomies cut the world and become preconditions for its description. Taxonomies and the lexical network assure the balance between mind-dependence and objectivity in the weak sense. In other words, to the extent that a lexicon belongs to a linguistic community, it will be valid for all members of that community, even in that Kantian sense of transcendental subjectivity which can be equivalent to a weak sense of objectivity.

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[34] Thomas S. Kuhn, "The Road since Structure", in *The Road since Structure: Philosophical Essays, 1970–1993, With an Autobiographical Interview*, p. 104.

[35] Thomas S. Kuhn, "Afterwords", in *The Road since Structure: Philosophical Essays, 1970–1993, With an Autobiographical Interview*, pp. 224–252. This "Afterwords" was initially published in the volume *World Changes: Thomas Kuhn and the Nature of Science*, edited by Paul Horwich, Cambridge, MA, MIT Press, 1993.

[36] Howard Sankey, "Kuhn's changing concept of incommensurability", in *British Journal of the Philosophy of Science*, 44, 1993, p. 759.

Ian Hacking analyses the taxonomic solution and proposes a set of principles[37] regarding the classification of natural kinds:

1. *The no-overlap principle*: two kind-terms cannot refer to the same object, unless they are in a *k*-relation, that is unless one kind is "subsumed" by the other - *i.e.*, while every dog is a mammal, not every mammal is also a dog. This means that individuals belonging to two non-*k*-related kinds (for example, an individual which is both a dog and a cat) represent a violation of the no-overlap principle.

2. *The principle of infimae species*: kind-terms have *infimae species*, namely, they terminate with a "lowest level" of kinds which do not split in further sub-species.

3. *The principle of projectibility*: kind-terms are projectible in the sense that they allow us to make generalizations or to have expectations about the properties and behaviours of classified individuals.

Kuhn himself discusses about these properties of kind terms from the perspective of their learning and states that the "differences in the nature of the generalizations acquired in learning kind terms correspond to a necessary difference in the way the terms are learned"[38]. Most of the kind terms are learned as part of a network of contrasting relationships. Thus, the term "liquid" is learned by contrast with the terms "solid" and "gas", being related with natural states of matter, and the ability to referentially extract the characteristics that correspond to each term depends on direct observational contact with those states of matter in practical circumstances that correspond to forms of life Therefore, Kuhn concludes, although the logical status of a lexical structure is that of convention, it is obvious that a lexicon is "the long-term product of tribal experience in the natural and social worlds"[39].

This Kuhnian theory about taxonomies and kind-terms could be also understood as a theory about concepts and incommensurability, a theory that provides the basis for the conceptual structures that he calls kind-hierarchies. Barker, Chen and Anderson suggest that Kuhn's idea is related with Kant (the structure of concepts is previous to our experience) and Wittgenstein (the idea of family resemblance), but he ultimately advanced an account of concepts based on similarity rather than rules. Although this thesis seems to be a just a version of Wittgenstein's notion of family resemblance, the logical difference is important because the extension of a concept is fixed by the similarity of some exemplary case, and not by intension[40].

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[37] Ian Hacking, "Working in a New World: the Taxonomic Solution", in Paul Horwich (ed.), *World Changes: Thomas Kuhn and the Nature of Science*, Cambridge, MA, MIT Press, 1993.

[38] Thomas S. Kuhn, "Afterwods", in *The Road since Structure: Philosophical Essays, 1970–1993, With an Autobiographical Interview*, p. 230.

[39] *Idem*.

[40] Peter Barker, Xiang Chen, Hanne Anderson, "Kuhn on Concepts and Categorization", in Thomas Nickles (ed.), *Thomas Kuhn*, Cambridge, Cambridge University Press, 2003.

Finally, we can redefine even the concepts of *SSR* in terms of taxonomy[41]: "normal science" will be understood as a period of cumulative scientific research under the guidance of a conceptual taxonomy, a "revolution" will be explained as a rupture with the normal tradition, consisting in a change of classification criteria, and the "incommensurability" will be defined as the lack of a *lingua franca* for the comparison between pre- and post-revolution conceptual taxonomies. Incommensurability becomes again a sort of untranslatability.

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[41] Vicenzo Politi, "Taxonomies, Networks, and Lexicons: a Study of Kuhn's Post-'Linguistic Turn' Philosophy", in *International Studies in the Philosophy of Science*, vol. 33, issue 2, 2020, pp. 87–103.