COMMUNICATION AND SOLIDARITY WITHIN THE SCIENTIFIC COMMUNITIES FROM THE PERSPECTIVE OF THE PARADIGMATIC MODEL OF SCIENCE

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Rezumat: Acest studiu analizează teza incomensurabilității teoriilor ştiinţifice, teză specifică modelului paradigmatic al ştiinţei, precum şi influenţa pe care a avut-o aceasta în transformarea anumitor concepte fundamentale ale epistemologiei, cum ar fi cel de raționalitate, comunicare rațională, progres al ştiinţei, respectiv asupra posibilității stabilirii unui anumit tip de solidaritate între membrii comunităților ştiinţifice. Ne vom axa în special asupra contribuției pe care a adus-o Kuhn la fundamentare tezei incomensurabilității precum şi asupra consecințelor care decurg din această teză în ceea ce priveşte posibilitatea dezbaterilor raționale între adepții unor teorii ştiinţifice rivale, respectiv asupra sensului şi rolului progresului în ştiință.

Cuvinte cheie: raționalitate, comunicare rațională, incomensurabilitate, progres al ştiinţei, comunitate ştiinţifică, solidaritate.

Abstract: This study analyses the incommensurability thesis of the scientific theories, a thesis that is specific to the scientific paradigmatic model, as its influence concerning the change of certain fundamental epistemological concepts, such as rationality, rational communication, science progress, and upon the possibility of establishing a certain type of solidarity among the members of the scientific communities, respectively. We will only stop upon Kuhn's contribution to the substantiation of the incommensurability thesis and upon the consequences that arise from this thesis as concerning the possibility of the rational debates among the followers of certain rival scientific theories, as upon the meaning and role of the science progress.

Keywords: rationality, rational communication, incommensurability, progress of science, the scientific community, solidarity

In this study we would like to put forward one of the most important thesis occured within the epistemology in the second half of the 20th century, the incommensurability thesis of the scientific theories, a thesis that is specific to the scientific paradigmatic model, as its influence concerning the change of certain fundamental epistemological concepts, such as rationality, rational communication, science progress, and upon the possibility of establishing a certain type of solidarity among the members of the scientific communities, respectively.

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This thesis occurred for the first time in 1962, in the works of two authors, Thomas Kuhn[2] şi Paul Feyerabend[3], who contributed a great deal through their new historical and sociological approaching manner to the nature of the scientific activity, to the methods and techniques used within the research, to the settlement of a new image upon science and thus to the transition of the epistemology to a new phase, the so called post-positivist stage.

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We should state from the very beginning the fact that the image outlined by Kuhn on science is different in a fundamental manner from the traditional one, either a positivist and rationalist-critical approach, and that is because the fundamental cognitive content of science is no longer thought by Kuhn as being placed among the abstract scientific theories, but among the so called paradigms, exemplary scientific achivements, models of problems and solutions to these problems, that have a practical, tacit perspective that escapes conceptualization and theoretical generalizations. Taking into account that a research tradition is no longer established upon a fundamental theory, but based on one or more paradigms and consequently, the science changes will not be seen as transitions from one theory to a more evolved one, but to a substitution of certain paradigms by other ones.

The shift from one pradigm to another is called "scientific revolution". The science development is not a cumulative one, but a revolutionary one. A scientific revolution means a non-cumulative change. "The transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of the old paradigm"[4] It is about the transition from one paradigm to another that is incompatible with the former one. It is the same as in the political field where changes of the institutions emerge through ways different from these instiitions and the same within science, where changes occur through ways different from those concerning science.

The fundamental thesis, on which the scientific revolutions are based, is that the paradigms in connection to such a process are incommensurable[5], this means are not reductible one to another as it was asserted up to Kuhn. The succesive paradigms cannot be compared. There is not a supra-paradigm, a supra-language in which such a comparison can be made. The advocates of the rival paradigms see and describe the world through different languages and have different criteria for the scientific research.

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[2] T. Kuhn, *Structura revoluţiilor ştiinţifice*, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1976
[3] Paul K. Feyerabend, *Against Method*, London, Verso, 1978
[4] Thomas Kuhn, *op. cit*., p. 46
[5] Thomas Kuhn, *Tensiunea esenţială*, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1982, chap. XII

There are three levels of paradigm incommensurability:

1. the *ontological* level – the incommensurability of the worlds (scientists belonging to two different paradigms working in different worlds);
2. the semantic level – the language incommensurability (a radical change of the concept significances);
3. the methodological level – the incommensurability of the methodological standards that the paradigms bring out (the paradigm change lead to the change of the criteria upon which the respective science is defined).

Taking into account that the paradigm changes are conceived by Kuhn as non-cumulative, this means that most of the solutions and problems that had a meaning and could be formulated within the old paradigm are not reclaimed by the new paradigm, the one that substitutes it[6]. But as far as the standard epistemological view is concerned, the new theory that substituted the old one, involved the latter as a particular case, reclaimed and explained as well all the significant problems from the old theory[7]. Thus the changes were cumulative, that is all the knowledge concerning various fields of the real, once provided, were thought to definitely remain in the science patrimony. This cumulativity, the possibility to establish a reduction relationship among the old and the new theories, meant according to the science analytical philosophers, the very base of the science progress, due to the growing proximity to the unseemly structures that rule the reality, the the organisation of a more real (more appropriate) picture of the world. To deny cumulativity means to deny the science progress, to relativize the historical formation of the scientific knowledge, and its continuous proximity to truth.

Nevertheless Kuhn has strong arguments in order to support this characterization of the relationship established among the paradigms that substitute each others throughout the historical formation of a science, and the most important of all, as uttered, the incommensurability of the paradigms. This incommensurability is outlined when two rival paradigms from the history of a discipline cannot be compared among themselves in detail based on neutral criteria, even if they concern the same deeds and the same fields of reality. Therefore no reduction relationship is to be established among them, as two scientific theories used to do traditionally[8]. Even if the used theoretical terms are the same, they have though different meanings, acting differently as applied to reality; that is because they represent abstractizations of different practical experiences. We should never forget, as Kuhn emphasizes, that the practical experiences, finding solutions to concrete problems, are those that teach the

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[6] Thomas Kuhn, *Structura revoluţiilor ştiinţifice*, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1976, chap. IX

[7] A detailed presentation of this conception in Ilie Pârvu, *Teoria ştiinţifică*, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1981, p. 13 -31;

[8] Thomas Kuhn, *Tensiunea esenţială*, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1982, pp. 372-74

scientist, ever since his early professional training, the way the world he lives in looks like, which are the entities that make it up and how they can be identified and represented. The commitment to a paradigm means commitment to a way to see the world, and to a certain way to express what you see, to a certain theoretical language**.**

On the other hand, these ways to see the world can be entirely different, depending on the practical experiences that are built on, and thus the significance of the theoretical terms will be different too, even if they are expressed through the same words. Therefore, two scientists who found their work on different paradigms, speak in a certain sense, two different languages, representing two different worlds. Kuhn clearly asserts that "two scientists separated by a scientific revolution live in two different worlds"[9]. This does not mean that reality is not one and the same, but only that people have access to it if they have certain assumptions provided by various concrete ways of interacting with it. We never face "pure deeds", pure data about world, we do not live "in a world of stimuli", but in a world of sensations, of facts processed by our conscience and therefore they are shaped by it, altered by the way we are taught to see the world. Kuhn even speaks of a certain "neuronal programming"[10] interposing between the stimuli and the sensations, by a programming specific to every paradigm. The scientist is somehow the prisoner of his own paradigm, of his own neuronal programming. He will be able to understand and his work will be based only on his own paradigm language, and there will be a communication breakdown between him and another scientist who frames his work on another paradigm.

A new perspective on the rationality criteria arises from the incomemensurability of the paradigms. Those criteria are no longer seen as independent from the paradigms, as immutable and universal, but as emerging from the praradigm and dependent on it. "The fixed criteria of rationality are not those settled by a certain paradigm"[11], its change leading to their substitution. The criteria and the methodological rules valid within one paradigm are irrelevant within the framework of another paradigm. There are no more universal criteria to use in order to evaluate the theory appropriateness to the real world, and either general methodological rules, because we are not confronting a unique world and a unique truth about it, but a multitude of alternative representations, each one being characterized by requests suitable to rationality .

Seeking such criteria has engaged the efforts of generations of science philosophers. Their conviction that the eminence of the scientific knowledge consists in its universal validity has been entirely shattered by Kuhn's assertions concerning its noncumulativity and the incommensurability of the paradigms. It is just this lack of logical contact bridges among the rival paradigms that led to the characterization of

[9] Thomas Kuhn, *Structura revoluţiilor ştiinţifice*, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1976, p. 162
[10] *ibidem*, p. 163
[11] *ibidem*

Kuhn's views as irrational and relativistic. This lack of comparative evaluation criteria of two theories involves that the commitment to one or another is irrational, meaning it is not grounded on reasons (justifications) which can be accepted as justified by any scientist, any rational human being whatsoever, that only such universal valid reasons can ground the objective knowledge. It is true that during the process of achieving knowledge there are subjective factors that interfere, but as long as we can afterwards ground this knowledge on objective criteria, and express it in a logical manner that can be understood and accepted by everybody, those subjective factors have no relevance. The commitment to one theory over another will be consistent only to the degree in which the former manages to objectify and universalize the knowledge about nature, only to the extent in which the expression of this knowledge could reach the most accurate logical form. The logical and methodological criteria, such as accuracy, consistency, broad scope, simplicity, the fruitfulness of ideas and theoretical constructions, will be those to guide such a commitment. The elaboration of the most precise list containing such criteria, as well as identifying the effective ways of applying them, has represented the object of activity for most of the science analytical philosophers. And that because they believed that once this objective is achieved, the comparative evaluation of two rival theories will necessarily lead to the selection of the most rational of the two.

Kuhn does not actually deny that such criteria are used in the comparative evaluation of theories. He just outlines that in many concrete situations, those criteria are understood and applied in different manners, leading to non-converging evaluations. And that because, they are in fact *values* of scientific activity and not *criteria*: „I am suggesting, of course, that the criteria of choice with which I began function not as rules, which determine choice, but as values, which influence it." [12]. The scientists separated by a scientific revolution may mutually acknowledge them, but the different cognitive patterns comprised in the paradigms on which they base their activity will lead to very different concrete uses of these criteria: „When scientists must choose between competing theories, two men fully committed to the same list of criteria for choice may nevertheless reach different conclusions."[13] Theses different uses are also due to the fact that individually considered those criteria/values prove to be unaccurate. In addition, when considered altogether, they prove to be contradictory one to another. For example, accuracy may lead to the commitiment to one theory, and the extension commits to the latter one. Choosing between rival paradigms can be done differently by scientists who mutually agree on the same set of values. This means that these values are not sufficient to determine the decisions a scientist take, as they are differently implemented by any individual scientist. Some of these different uses of values can come from the previous individual experience, others depend on extra-

[12] Thomas Kuhn, *Tensiunea esențială*, Editura Ştiințifică şi Enciclopedică, Bucureşti, 1982, p. 322
[13] *ibidem*

scientifical factors, such as the personal philosophical beliefs, and others rely on the personality features of every scientist. The differences in applying such values to evaluate two rival theories primarily depend on every scientist's individual features, but there are also variations in the proper meaning of these values due to the shift of the paradigm, as Kuhn illustrates in the most convincing way. The conclusion that he does not avoid to formulate is that the possibility of a rational debate in which compelling arguments for both sides interfere, is essentially limited in the case of the scientists' controversies relying on different paradigms. The competence, good faith and the scientific values mutually shared do not prove in such situations to provide a solid ground in order to achieve the unanimity of the professional judgement. As a result of some debates in which they compared their opinions, the members belonging to two groups working on the basis of rival paradigms could maintain judgements and evaluations mutually incompatible, and that does not mean that one or another would stop being a scientist, or that their decisions would oppose the general acknowledged scientific values. This is due to the fact that the criteria and assumptions on which they found their judgements are largely of a tacit nature, therefore they cannot be evaluated on such values.

The analytic philosophers have searched for such theory selection criteria, because they believed that identifying a mutual and compulsory set of criteria would also lead to a solution for the problem of induction (problem that was constantly addressed by philosophers since Hume) and would thus contribute to explain and optimize the science success, its progress, and the fact that it repeatedly produced and produces new strong techniques for prediction and control. On the contrary, Kuhn demonstrates that the absence of such a compulsory algorythm, of a set of criteria to dictate the selection, does not represent an irrational, undesirable aspect of science, but a beneficial one that actually allows the occurrence of novelty in science, and thus its progress. And for this reason, Kuhn resorts to aa argument that Feyerabend largely argued and debated upon in his well kown work "Against Method".[14]

The argument consists in the fact that, if the scientists followed a mutual algorythm for the theory evaluation, then no new theory would be allowed to occur in science. That is why, in advance that a theory could generate a largely accepted belief, a lot of thoretical and experimental work is needed in order to improve its accuracy and extension. Before being accepted by the group, the new theory is tested through research and evaluations of a great number of people, most of the scientists continuing their work on the grounds of the old rival one. But such a development way involves a decision process that allows rational people to disagree, and such a disagreement would be rejected by the mutually accepted algorythm that the philosophers have generally searched for. If this was within reach, then all the scientists complying with it (because they are rational) would adopt the same decision at a certain time. But this would also mean that neither of them would justly be in charge with the new theory,

[14] *ibidem*, p. 372

not enough tested and developed. Therefore, Kuhn considered that "what from a point of view could seem the weakness and imperfection of the selection criteria conceived as rules can – when the same criteria are seen as values – occur as an indispensable way to equally assign the risks involved by the novelty introduction or support" [15].

If the reports between the two paradigms cannot be definitely and unequivocally characterized through a comparison process in great detail between them and with nature on the basis of neutral criteria, then the transition from one to the other can no longer be described as a "choice", but as a "conversion". This "conversion" consists in a sudden shift of the way to see the object and the problems of the research, in the transformation of the "neuronal programming" which makes us see the world the way we do. The conversion brings about a change in relation to the criteria of the scientific judgment, a change that is hard to be explained through methodological patterns and general values.

This lack of some logically and empirically compelling proofs in order to select the paradigm, and also the fact that the transition from one paradigm to another is largely carried out under the dominance of personal factors was thought by Kuhn's critics as an unacceptable subjectivity of the terms framing the science progress. But, as debated, in Kuhn's opinion it is this personal and group variation in applying the scientific values, this subjective commitment to one point of view or to another, that allows an optimal assessment of the research risks and this is the reason to be proved as being rational.

We do not have to understand through the subjectivity of the paradigm selection that this is only a matter of taste, because there is always an evaluation to be carried out. The only difference consists in that this evaluation cannot be fulfilled in relation to some compelling reasons, and thus, even if the scientists explain the reasons for their choice, there is the possibility that not everybody would be persuaded by their explanation.

In spite of the incompleteness of their communication, incompleteness due to the fact that in a sense they speak two different languages, the followers of different paradigms can introduce to each other (not always a simple task) the concerete technical outcomes that can be achieved as a result of using their own paradigm. At least few of the mutual value criteria can easily enough apply to this type of outcomes. However incomprehensible as the new theory may seem for the tradition advocates, the introduction of some substantial concrete outcomes will persuade at least few of them that they should find out the way some of them were achieved. In order to fulfil them they will look for the basic texts of the new theory, or, more efficiently, will consider effectively its followers' work, and they will learn to turn the new theory into the language of the old one, of course with major difficulty. At this level, of concrete technical achivements, it is possible to achieve communication and progress, which firstly involves the fact that the outcomes fulfilled as a result of the new paradigm are a

[15] *ibidem*

matter of interest and draw new scientists to that paradigm, only if it will provide better and new solutions to the concrete problems of the old paradigm. Thus, although there is a movement of the problems during the transition from one paradigm to another, Kuhn agrees that "neither the list of the problems solved out by science, nor the precision of the individual solutions will ever cease to increase".[16] But, only at this level, of concrete scientific outcomes, that are even more obvious and efficient in manipulating reality, meaning in the case of the scientific practice, we are able to speak about progress. As far as the theory is concerned, we do not have a direction towards which to progress, to come close, because there is no absolute truth about nature that we could reach. There are only more efficient means to interact with nature, means that in turns could generate different theoretical perspectives upon it.

Kuhn's conclusions entirely justify the idea that the perspective upon nature and science rationality that he brings about means a "separation" from the modern ways to organize the epistemological discourse, a postmodern transformation, a relativization of it. The novelty firstly originates in different methodology adopted by Kuhn in order to outline his pattern of science, giving up the logical formalization in favor of the historical-critical reconstruction, as well as in the analysed thematic aspects, Kuhn being mainly interested in the dynamic and historical aspects and not in the logical and structural ones belonging to science. He is concerned with the descriptive theory appropriateness to science as it is, and not with the idea of what should it be, as speaking about conditions and ideals.

Not noticing these methodological and thematic differences determined very hard reactions from the modern science philosophers. He was accused to promote irrationalism, subjectivism and relativism in science. This is mainly due to the fact that Kuhn rejects the existence of those criteria that lead science, from the outside, to a determined goal, the appropriate knowledge of nature. He also emphasized the dependence of every criterion that could lay the foundation to test the objectivity and universality of the science truths on the concrete means to practice the scientific reasearch that could lead to the achivement of these truths. This integration of the criteria that should function from the outside as selection grounds for the theories in the effective practice of science, it is true that weakens, relativizing the idea of rationality, but only that one that considered rationality as being solidary to logic reasoning. But, the study of the current scientific practice has revealed to Kuhn that it is not the logic that leads the research, but certain tacit cognitive structures, made up through the solving out the standard problems, structures that vary from one epoch to another, from a scientific group to another, in relation to the formulated and solved problems.

Thus in Kuhn's work it is made the transition towards a perspective upon rationality that could be called „pragmatic". Rational is generally believed a well done thing, the one that allows the achievement of a goal. But the goal in the case of the

[16] Thomas Kuhn, *Structura revoluţiilor ştiinţifice*, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1976, p.168

scientific research is no longer considered by Kuhn as that to build up theories that would become more appropriate reflections of nature, but the one to effectively solve certain concrete problems. The efficiency in finding solutions to concrete problems becomes for him a criterion in evaluating the rationality of a way to practice science and the only foundation to explain its progress.

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