

UNIVERSITY OF TARTU
INSTITUTE OF PHILOSOPHY AND SEMIOTICS

Erik Jürmann

Thomas Kuhn: Theory of Progress or Theory of
Change?

Bachelor's Thesis in Philosophy

Supervisor: Endla Lõhkivi (PhD)

Tartu 2016

Contents

Introduction	3
1. The Notion of Scientific Progress	4
2. Is Kuhn a Relativist?	6
2.1 Relativism of the Strong Program	6
2.2 Shapere's Accusations of Relativism	9
2.3 Kuhn's Defense against Relativism and His Early Theory of Scientific Progress.....	12
3. Kuhn's Later Theory of Scientific Progress.....	14
3.1 Continuity of Scientific Progress in Later Kuhn	14
3.2 Incommensurability and Scientific Progress in Later Kuhn.....	16
3.3 Puzzle-Solving as Criterion of Progress.....	19
4. Evaluating Kuhn's Notion of Scientific Progress	20
Conclusion.....	22
Thomas Kuhn: Theory of Progress or Theory of Change?	25
Thomas Kuhn: muutuse või progressi teooria?	26
Lihtlitsents lõputöö reprodutseerimiseks ja lõputöö üldsusele kättesaadavaks tegemiseks...	27

Introduction

Thomas Kuhn is widely considered to be one of the most influential historians and philosophers of science of the 20th century and requires little introduction. His influence on common views of scientific development has been enormous. His most famous work, *The Structure of Scientific Revolutions* is at the top list of cited academic books.¹ Arguably, one can also note Kuhn's cultural influence in the general use of such terms as 'paradigm shift' and 'incommensurability,' even if it is not always in line with Kuhn's own usage of these terms. An assessment of great influence, on the other hand, is not sufficient to judge the value of the position. Alexander Bird, who has researched Kuhn's work extensively, has pointed out that Kuhn's philosophical positions are not always systematic, and argued that he rarely engaged in the common philosophical practice of detailed analysis and comparison of the views of other philosophers.²

There are numerous of works that have provided this analysis in Kuhn's stead, that reconstruct his arguments and assess their value with regard to the work of other philosophers. In this work I wish to examine Kuhn's notion of scientific progress throughout his early and later work. I became interested in the relationship of Kuhn's description of the growth of scientific knowledge, as opposed to his values on how it should work. Specifically, I was interested in finding out how his view of scientific progress through paradigm-shifts retained continuity between the beliefs constituted by the original paradigm, and the one that replaces it. This led me to believe that Kuhn's account of scientific development might be one that is opposed to progress, since along with the paradigm shift; the values that are seen as constituting progress must change as well. In the first half of this work I will analyze the issue of Kuhn's relativism and how it relates to his theory of progress. In the second, I will discuss the changes he has proposed in his later works, which relate directly to the issue of continuity that I critically examine in his early work.

I will try to make it clear throughout the text, if it is his earlier or later views, which are being examined. Since many of his later views were formed as a response to criticism of his early views, I will try to give more emphasis and authority on the later opinions.

¹ Bird, Alexander. "Thomas Kuhn", <http://plato.stanford.edu/entries/thomas-kuhn/>. Last visited: 4.07.2016, 1.

² Bird, Alexander. „Thomas Kuhn.” Princeton, New Jersey: Princeton University Press, 2000, ix.

1. The Notion of Scientific Progress

The word ‘science’ is used to refer to a wide array of things. Niiniluoto, for example, points out that:

“The notion of science may refer to a social institution, the researchers, the research process, the method of inquiry, and scientific knowledge.”³

Certainly one could enlarge this list almost indefinitely and look at the development of science from such a large number of perspectives that describing the development of science becomes too difficult to grasp. This is why, in order to explain scientific progress, one must rely on a general definition of science, that is admittedly simplified, but captures, as much as possible the uses of the word.

In this work, when I use the term progress, I always refer to the progress of scientific knowledge, because its growth is commonly seen as the most obvious sign of scientific success. In order to explain how I use the term, I would again refer to Niiniluoto, who has argued that progress is always an axiological, normative term, since it implicitly advances a type of value that is taken to indicate progress. He contrasts it to value-neutral terms like change and development that describe without evaluation.⁴ Therefore, when talking about a theory of scientific progress, we are not simply providing a neutral description of how science works; we are implying a set of values that characterize improvement and enable us to measure progress in scientific knowledge.

The meaning of progress, Niiniluoto explains, is a philosophical issue that has to do with the values of communities or individuals. Since we are dealing with values, he argues that even the most exact account of scientific change is incapable of resolving the question of scientific progress, since the normative cannot be reduced to description.⁵ This point of Niiniluoto, and the preceding one will not be contested here, I assume that progress has a normative character, and that speaking of progress implicitly advances criteria that enable us to evaluate the success and growth of knowledge.

Niiniluoto views these criteria as the goals and aims of science, and in order to incorporate Kuhn’s view into this picture, he distinguishes between forward-looking and backward-

³ Niiniluoto, Ilkka. “Scientific Progress”. <http://plato.stanford.edu/entries/scientific-progress/> . Last visited: 21.07.2016.

⁴ *Ibid.*

⁵ *Ibid.*

looking goals, as either the beginning or the end of an activity that is to be evaluated.⁶ Kuhn's aims are seen as backward-looking, because he evaluates progress in the knowledge that we already possess, and calls for the abandonment of normative goals of what we should know as signs of progress in order to avoid problematic ways of thinking.⁷

I would argue that it is misleading in general to speak of Kuhn's notion of progress as goal-directed, since he evaluates progress only in what has been, and finds his view of progress and evolution meaningful explicitly without a set goal in mind.⁸ Furthermore, he tends to switch between the normative and descriptive modes without explicitly pointing this out.

He has described his work as an attempt to explain the nature of science, and as a consequence, he ends up proposing values that he views as leading to its success. These values arise from a description of progress that aims to describe scientists as they really behave, and does not necessarily lead to iron rules of success, but rather to shared values within the scientific community.⁹ It is a description of scientific progress that provides a theoretical basis for normative values. Generally progress is seen if and only if our scientific knowledge can be shown to increase in value. In Kuhn's theory, it will be demonstrated with respect to the knowledge we have gained so far, not in terms of the aims that scientists have for the future.

In my view there are two primary criteria that a theory of progress should satisfy. First, the theory has to promote a value or a number of values that are seen as contributing to progress. This criterion has the added condition, that the theory itself must not be a relativist theory, in the sense that all values are seen as equal with respect to promoting progress. Secondly, this value must enable the continuous growth of the enterprise that it is intended to promote. In what follows, I will look at Kuhn's theory of scientific progress with respect to these criteria.

If Kuhn's theory amounts to a description of the evolution or progress of current scientific knowledge and from it can be derived values that might be followed in the future, I will consider it a theory of progress. It would be theory of change, if there turned out to be such difficulties in Kuhn's description that it will turn out to be impossible to draw a clear line of historical progress of scientific knowledge. In other words, Kuhn's theory must enable us to rationally reconstruct the progress of scientific knowledge, not merely describe it as a historian in order to be considered a theory of progress.

⁶ *Ibid.*

⁷ Kuhn, S. Thomas. „The Structure of Scientific Revolutions“. Chicago: University of Chicago Press, 1970, 171.

⁸ *Ibid.*, 171-172.

⁹ *Ibid.*, lk 208.

2. Is Kuhn a Relativist?

2.1 Relativism of the Strong Program

In the previous section I claimed, that progress takes place if and only if the scientific knowledge we possess has increased in value. It clearly follows, that a relativist cannot believe in progress; for if all scientific knowledge is equal in value, then no new theory can be seen as an improvement on a previous one. So, if Kuhn's theory is to be considered a theory of scientific progress, not simply a theory of change, then it must not be a relativist theory.

I will begin to examine the question of Kuhn's relativism through a point of comparison. An all too commonly used rebuttal of a philosophical opponent is a sort of *reduction ad absurdum* where unessential parts of a theory are argued against, ridiculed, and taken to represent the work as a whole. This sort of reasoning, I would argue, is common to Kuhn's critics who dismiss his work as relativism and make it look more radical than it really is. To illustrate this point, I will analyze a philosophical movement in sociology that I consider to be radically relativist and at the same time influenced by Kuhn's ideas, the so-called "strong program" in the sociology of scientific knowledge. The later Kuhn explicitly condemned the strong program, but nevertheless he is sometimes credited as an important contributor to their ideas.¹⁰ In his later years, he planned to publish a book, that "[...] defends notions like truth and knowledge from, for example, the excesses of post-modernist movements like the strong program,"¹¹ The book was never published, but a general outline of Kuhn's position can be gleaned consistently from his early and later works.

I will base my description of the strong program on Barry Barnes's essay "Realism, Relativism and Finitism." I do not claim to refute their philosophical grounding in any complete way, but I will attempt to convince the reader that Kuhn and the radical relativists do not have a lot in common.

Barnes started out his essay by arguing that realism and relativism do not necessarily exclude each other. He claims that historically the central assertions of relativism are opposed to rationalism, but not to realism, which was opposed to idealism.¹² He points to the philosopher Roger Trigg, who has defined relativism as an "explicit denial of the philosophical doctrine of

¹⁰ Peter, T. Manicas, Alan Rosenberg. "Naturalism, Epistemological Individualism and "The Strong Programme" in the Sociology of Knowledge." "Journal for the Theory of Social Behaviour" 15:1 March 1985, 84,

¹¹ Kuhn, S. Thomas. "The Road Since Structure." PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association, vol. 1990, 3-4.

¹² Barnes, Barry, "Realism, Relativism and Finitism," "Cognitive Relativism and Social Science". New Jersey: Transaction Publishers, 1992, 131.

realism, which insists on the objectivity of reality as belief-independent reality.”¹³ Trigg argues that if a relativist sincerely believes that reality has no meaning apart from what is believed to be real by a collective, then the fact that a member of one culture can understand the member of another culture is an unexplained miracle. In order to reasonably explain this successful cross-cultural communication, he argued that it is common sense to presume the existence of a belief-independent external world that all cultures share.¹⁴

Barnes points out, however, that the commitment to realism tends to entail not only the belief in an external world, but also the view that knowledge about this external world is possible. Most realists, therefore, tend to commit to something like a correspondence theory of truth, the idea that truth is expressed in a copy relation to reality. His next move is to claim that the two commitments are not necessarily connected, because some of the theories of truth contradict each other and no conclusive result has been reached.¹⁵

He needs this distinction to show that relativism is consistent with the belief in an external world. In order to do this, he relies on an understanding of relativism that is different from that of Trigg. Relativists, he claims, concern themselves with the relation between knowledge and accepted beliefs. They notice that the beliefs of individuals or groups often contradict each other and unresolved conflicts persist. On this basis of uncertainty they assume that the alternatives of accepted beliefs are equal in value.¹⁶ To quote Barnes:

“[...] every body of accepted belief carries conviction as the established account of reality employed by a culture or community, [...] changes in such bodies always reflect the local, pragmatic requirements of culture or community. Those beliefs which count as knowledge are those sustained by custom”¹⁷

Barnes insists that these alternative accounts describe the same world and therefore considers his relativism a form of realism. What he objects to, is the position that knowledge can be classified as rational or irrational. For a radical relativist, all established accounts of reality are equally rational and equivalent in value.¹⁸ Thus a theory of progress is impossible for the radical relativist: Since all the alternative accounts of reality are equally real, they are also equal in value. Because they are equal in value, there can be no distinction between them.

Now, where is the similarity of Kuhn with the radical relativists? Alexander Bird, for example, has argued that Kuhn is a mild relativist, who, despite rejecting positions similar to the strong program, encouraged the line of thinking that reality is formed by the beliefs of the community.¹⁹ Indeed, early Kuhn has suggested, that practitioners from different paradigms, carry out their work in different worlds.²⁰ A case for this type of view can certainly be made,

¹³ Trigg, Roger, “Realism: An Essay in Interpretation and social Reality” in “Philosophy of the Social Sciences,” 15 (1):82, 1985, 22.

¹⁴ *Ibid.*

¹⁵ Barnes 132.

¹⁶ *Ibid.*

¹⁷ Barnes, 134.

¹⁸ Barnes, 134.

¹⁹ Bird 2000, 8-9.

²⁰ Kuhn 1970, 150.

as will be seen in the next subsection where I discuss Dudley Shapere's critical review of *The Structure of Scientific Revolutions*.

The second apparent similarity of Kuhn with this relativist position comes from Kuhn's early notion of incommensurability, the idea that scientists, as part of their education, internalize examples of scientific achievements into tacit knowledge, and should therefore be treated analogously to members of a language-speaking community. When communicating with practitioners from a different field, or attempting to understand theories which operated in a different paradigm, they will encounter a sort of untranslatability that cannot be resolved until the tacit knowledge that was assumed along with the theory is internalized. Similarly to the radical relativists, Kuhn has emphasized the value of theories outside the common paradigm by pointing out their incommensurable content.²¹

In no way does this imply, however, that all beliefs are equivalent, or that no criterion can be proposed to evaluate the progress of scientific theories. The relativism of the strong program, in so far as it intends to support itself with Kuhn, overemphasizes the subjective and social influences on knowledge, and turns a blind eye towards the influence of the real world, which has its influence not only in ontological issues, but in each particular aspect of knowledge also. This relationship between the external constraints posed by the environment, and the adaption of the species, I would argue, is well represented in Kuhn's theory of progress, due to his insistence on the evolutionary analogy, especially his later view of adaption, whereas the strong program puts too much emphasis on individual, subjective constraints.

It seems that the epistemology of the strong program might have been designed as a justification of their research agenda, and not so much as to explain the development of science. The contents of the sciences, they find, are not reducible to a common set of criteria and should therefore be studied neutrally, like an anthropologist studies the beliefs and convictions of different cultures.²² However, early Kuhn rejects precisely the point that this neutral description is possible. To quote Kuhn:

“The participants in a communication breakdown cannot [...] resort to a neutral language which both use in the same way and which is adequate to the statement of both their theories or even of both those theories' empirical consequences [...]. Part of the difference is prior to the application of the languages in which it is nevertheless reflected.”²³

Or to put it in another way: why should the sociologist *himself*, be outside the problem of incommensurability? According to Kuhn's theory, the sociologist should be implicitly following and promoting exemplars of his own, that make his approach radically different from that of, say a physicist. This would make this supposed neutral description of the sciences a description that is heavily influenced by the methods and values of the specific brand of sociology that is the strong program. In other words, the description would face translation issues with respect to other fields that may be incommensurable, as later Kuhn will suggest.

²¹ Kuhn 1970, 148-151.

²² Barnes, 134.

²³ Kuhn 1970, 201.

Kuhn's advice on the matter might be gleaned from this quote from the *Structure of Scientific Revolutions*: "what the participants in a communication breakdown can do is recognize each other as members of different language communities and then become translators. [...] each will have learned to translate the other's theory and its consequences into his own language and simultaneously to describe in his language the world to which that theory applies."²⁴ Perhaps the sociologist, especially a relativist one, should—in order to examine and compare the different fields of science—recognize the translation issue emanating from the paradigmatic habits of their own field, and recognize the limits of this description, instead of assuming an agenda-supporting premise that the assertions of the sciences are on an equal footing and of equal value.

2.2 Shapere's Accusations of Relativism

Now we should examine the arguments that point towards Kuhn's relativism. He has argued against the relativist interpretation of his work, especially since this interpretation was prevalent in the initial reaction to *The Structure of Scientific Revolutions*. This initial wave of criticism that Kuhn faced, prompted him to publish his 1969 Postscript, where he reasons against some of the criticism targeted against his ideas. The relativist interpretation was argued for, notably in Dudley Shapere's review, that Kuhn recommends as an especially clear critique of his ideas in the postscript.²⁵ Some of the arguments presented in the review will be examined here, in order to see what the causes for Shapere's interpretation were, and to see how successful Kuhn was in his answer to his critics.

Shapere sees Kuhn as anti-positivist—and on this point, in camp with Feyerabend, Hanson and Toulmin—all part of a reactionary movement against positivism.²⁶ In the specific case of Kuhn, Shapere argues that his "[...] argument is directed against the "positivistic" view that science is cumulative, and that therefore earlier sciences are derivable from the later."²⁷ Indeed, Kuhn has argued throughout his career, that some aspects of abandoned theories in the history of science become incommensurable with respect to the contemporary scientific theories. His arguments for rejecting the cumulative picture, as I will argue in the next subsection, do not exclude progress.

Shapere's critique of the *Structure of Scientific Revolutions*, I would divide into two primary issues: ambiguities with Kuhn's concepts and Kuhn's notion of scientific progress that Shapere sees as too relativistic, as change not progress. Regarding the conceptual ambiguities, he finds the term 'paradigm' to be particularly vague and suggests that Kuhn has inflated the term to make it appear a better explanatory tool than it actually is.²⁸ To quote Shapere:

²⁴ *Ibid*, 202.

²⁵ *Ibid*, 174.

²⁶ Shapere, Dudley. "Structure of Scientific Revolutions". Durham, North California: Duke University Press, 1964, 383.

²⁷ Shapere, 389.

²⁸ Shapere 358-359.

“[...] his [Kuhn’s] view is made to appear convincing only by inflating the definition of “paradigm” until that term becomes so vague and ambiguous that it cannot easily be withheld, so general that it cannot be easily applied, so mysterious that it cannot help explain, and so misleading that it is a positive hindrance to the understanding of some central aspects of science; and then, finally, the excesses must be counterbalanced by qualifications that simply contradict them.”²⁹

Indeed, in Margaret Masterman’s reading of Kuhn’s work, she concludes that the term ‘paradigm’ was used in the *Structure of Scientific Revolutions* in at least twenty two different meanings, if not more ³⁰. Kuhn, reacting to her reading has suggested that most of these uses resulted from inconsistencies in his style of writing and proposed some changes in this conceptual apparatus.³¹

On the other hand, regardless of the conceptual difficulties, Shapere finds value in Kuhn’s opinions and thinks they were to be expected due to the contemporary results in the history of science, particularly those of Duhem, whom Shapere credits as demonstrating the value of abandoned scientific theories. He argues that Kuhn made a stand against the excesses of the cumulative view of scientific progress, but in his reaction, created excesses of his own that could be described as relativistic.³² One is tempted to think that scientific progress is explained best by something in between the positivist view of rationality—inferring theories from the sensory experience of natural phenomena—and the relativist view that stresses the social causes, that constrain and mold the processes of science into something quite unlike the positivists ideal.

But let us examine Kuhn’s supposed excesses. The main indications of them for Shapere are as follows. First, Kuhn’s statement:

“We may have to relinquish the notion, explicit or implicit, that changes of paradigm carry scientists and those who learn from them closer to the truth.”³³

I will argue in the next subsection, that Kuhn does not necessarily require a notion of truth to explain scientific progress; Shapere, however, finds this prospect frightening and connects the ambiguities of Kuhn’s terms to the inherent relativism in his theory. He points out that the notion of progress is easy to analyze within a paradigm, but if it is assumed that the differences between the paradigms are incommensurable, then it is no longer possible to see cumulative growth. The progress of science through scientific revolutions, he argues, is change without progress.³⁴

Shapere is clearly bothered by this trend, as he remarks on the opinions of Kuhn and Duhem on the overlooked value of neglected scientific theories:

“perhaps that deep impression has effected too great a reaction; for that there is more to those theories, than was once thought does not mean that they are immune to criticism—that there are not *good* reasons for their abandonment and replacement by others.”³⁵

²⁹ Shapere, 393.

³⁰ Masterman, Margaret, “The Nature of a Paradigm” in Lakatos, Imre; Musgrave, Alan, “Criticism and the Growth of Knowledge.” Cambridge: Cambridge University Press, 1970, lk 61.

³¹ Kuhn 1970, 181-182

³² Shapere, 392.

³³ Kuhn 1970, 170.

³⁴ Shapere, 391

³⁵ *Ibid.*

It has been argued then, that by over-emphasizing the irrational aspects of theory selection, Kuhn is underemphasizing and obscuring the fact that perfectly legitimate reasons for abandoning scientific theories exist and are routinely employed. To quote Shapere:

“The decision of a scientific group to adopt a new paradigm is not based on good reasons; on the contrary what counts as a good reason is determined by the decision.”³⁶

This precisely describes Barry Barnes and the radical relativists, but I find it to be unfair with regard to both early and later Kuhn. It is possible to rationally evaluate theories both within the normal science of early Kuhn, and within the specialized lexical taxonomies of later Kuhn. What is different from the positivists is that this is to be done only retrospectively.

Shapere’s second issue relates directly to the thesis of this work: he claims that in Kuhn’s theory progress is either impossible or reduced to mere change. He points out that it is unproblematic for Kuhn to explain scientific progress within a paradigm tradition, as it is shown to be cumulative and linear. Between any two paradigms, however, one can disagree even on the nature of facts, and on the standards of a scientific theory. He argues that if paradigms work as Kuhn thinks they do, then progress is impossible.³⁷ As shown by his attack on Kuhn’s notion of paradigms in general, he leans towards the conclusion that there confusion is produced by mistakes in Kuhn’s theory, not by the cumulative view of progress.

In my opinion, this problem of discontinuity between paradigms is the result of a mistaken position at least seemingly taken by early Kuhn. Whereas the notion of paradigm was indeed frustratingly unclear, it was obvious to everyone, that it is intended to account for the knowledge possessed by paradigmatic scientists in a general, overarching way.³⁸ This naturally leads one to view scientific history as a succession of paradigm shifts; and naturally to the concern that if these paradigms lack continuity, then there really cannot be any progress as well, unless this incommensurability is only partial, as early Kuhn indeed assumes.³⁹

He argued that through a process of translation one can translate or reduce the content of another paradigm—such as the content of abandoned scientific theories—onto that of another paradigm.⁴⁰ It seems to me that this move, along with overemphasizing the importance of the incommensurabilities faced by the individual scientist, as opposed to the community of scientists, is what led to the ambiguities that Shapere noted with the usage of the term paradigm and their relationship to progress. Later, in section 3.2, I will try to show, how later Kuhn replaced this ambiguous version of incommensurability with a clear notion of untranslatability between specialized sciences that share a common taxonomy. On this view, we need not be concerned with the nature of facts or standards between paradigms, because sciences develop from primitive origins and develop untranslatabilities as a natural part of this process. Nevertheless, in this view it is wholly possible to sketch out how knowledge gets

³⁶ *Ibid.*

³⁷ Shapere, 391.

³⁸ For example, Kuhn 1970, 40.

³⁹ Kuhn 1970, 392.

⁴⁰ Kuhn 1970, 202.

passed on from one subject to the next, because one can learn untranslatable sciences like one could learn a number of different languages.

Along with rejecting the cumulative view, early Kuhn also opposed the teleological view of a rationally conceived end-goal for science. He proposed to replace this view, and the notion of progress based on it, with the criterion of increasing problem solving capacity of science. In the next subsection, I will examine his early attempt at establishing puzzle-solving as a criterion of progress, and his defense against relativism that relies on it.

2.3 Kuhn's Defense against Relativism and His Early Theory of Scientific Progress

What follows is what could be called a description of Kuhn's early theory of scientific progress. His theory of progress simultaneously acts as his defense against relativist accusations, because inversely to the point made above, a theory that can explain the progress of scientific knowledge cannot be a relativist theory. Kuhn argues in the postscript to *the Structure of Scientific Revolutions*, that his notion of incommensurability and its relation to problems of translation would indeed be relativistic, if it were applied to cultures, but is not so, when applied to the development of scientific knowledge.⁴¹ In this respect Kuhn clearly differs from the radical relativists. In his view, there are two primary criteria which are used to measure the progress in science.

The first is the puzzle solving capabilities of a theory. He applies an evolutionary analogy in order to explain his view of scientific progress and points out that rigorous puzzle-solving is a universally shared value in the sciences. He asks us to imagine an evolutionary tree that represents the evolution of scientific theories that have evolved from primitive prototypes. He points out that it is easy to come up with criteria that enable us to distinguish the earlier theories from the later ones and expresses his faith that such lists can be completed in the future. In general, he thinks that the ideas that prevail before others and constitute progress in science are those that are better at solving and predicting solutions to the puzzles that the scientist naturally deals with,⁴² analogously, I would add, to how an organism in nature is faced with the challenge of survival and competition.

He goes on to explain, that there is a second criterion of progress that is commonly seen as essential. To quote Kuhn:

„A scientific theory is usually felt to be better than its predecessors not only in the sense that it is a better instrument for discovering and solving puzzles, but also because it is somehow a better representation of what nature is really like. One often hears that successive theories grow ever closer to, or approximate more and more closely to, the truth. Apparently generalizations like that refer not to the puzzle-solutions and the concrete

⁴¹ Kuhn 1970, 205.

⁴² Kuhn 1970, 205-206.

predictions derived from a theory but rather to its ontology, to the match, that is, between the entities with which the theory populates nature and what is “really there.”⁴³

I think this view seems plausible, because there are numerous human endeavors that require puzzle solving, which are not commonly seen as scientific. Playing chess, for example, presents distinct problems for the players. It continues to pose new puzzles and becoming a better player consists of improving one’s puzzle solving capacity within the rules of chess. We do not, however, wish to call the chess player a scientist, and therefore we add to our notion of scientific progress, to exclude the examples of games and the like, the realist criterion, that the progress in puzzle solving must contribute to our understanding of nature.

Kuhn argues, however, that there is no way of talking about real existence, without postulating an ontological theory and finds this type of view historically problematic. He does not doubt that the mechanics of Newton is superior to that of Aristotle, and Einstein’s mechanics to that of Newton’s in puzzle solving capacity, but argues against the possibility of coherent ontological development that would correspond to this progress. In fact, he argues that the ontology derived from Einstein’s mechanics is in important respects closer to Aristotle, than to Newton.⁴⁴

In this view, the statement: “a sort of progress will inevitably characterize the scientific enterprise,”⁴⁵ that so bothered Shapere,⁴⁶ does not seem so opaque anymore. Kuhn had in mind a specific meaning of scientific progress which sees definitive growth in puzzle solving capacity and is skeptical about the notion of progress in an ontological representation of the world. Furthermore, the evolutionary analogy points to an approach that Kuhn intends to abandon in his theory. Namely, he rejects the teleological idea of a perfect representation of nature that one should strive towards, in favor of an evolution from the knowledge we already possess towards not a preset plan in particular, but towards goals that the scientists themselves define.⁴⁷

To sum up, my argument against Kuhn’s relativism is the following. Kuhn offers a general notion of progress through the criterion of puzzle solving capacity. This immense progress is visible in the extent to which modern civilization has transformed the natural environment we live in. It should be noted, that he is not explicitly a relativist in the sense of the ontological progress of scientific knowledge, he instead remains skeptical on the notion of ontological truth and argues that it is not necessary in order to explain the progress of science and suggests replacing the teleological view of progress with the evolutionary one.⁴⁸

However, a difficult problem remains to be solved in early Kuhn’s notion of progress. Even if the ontological notion of truth is abandoned and progress is seen as increase in puzzle solving capacity, it is still unexplained how the theories that solved the problems posed by one paradigm can pass on as knowledge to the next one. If the paradigms truly are

⁴³ *Ibid*, 206.

⁴⁴ Kuhn 1970, 206-207

⁴⁵ Kuhn 1970, 170

⁴⁶ Shapere, 392

⁴⁷ Kuhn 1970, 170-171.

⁴⁸ Kuhn 1970, 168, 170-173

incommensurable, then how is it possible to pass on knowledge, in the form of puzzle solving capacity and retain it continuously during a revolutionary episode in science? These are questions that the later Kuhn's notion of progress attempts to answer.

3. Kuhn's Later Theory of Scientific Progress

3.1 Continuity of Scientific Progress in Later Kuhn

One crucial aspect of Kuhn's theory of scientific progress remained problematic in his early work. Namely, how is it that scientific knowledge can be said to progress, if it is possible to interpret and understand its contents exclusively through the lens of a paradigm. If misunderstandings between the paradigms are caused by a fundamental issue of translation, i.e. incommensurability, and progress works through revolutionary paradigm shifts, then how exactly does puzzle solving capacity increase? In the terms of early Kuhn, the process in question is the revolutionary episode, that marks the transition from normal science to extraordinary science that concludes with a paradigm shift. In later Kuhn, however, this process of passing on knowledge is understood in a radically different way. In his early views, some readers may recall, Kuhn likened the process of acquiring scientific knowledge to a gestalt-switch or religious conversion, where new tacit assumptions are internalized by the aspiring scientist, thus replacing the ones he had internalized before. Through this process a scientist acquires a completely different way of understanding the world and its laws.

In his later work, Kuhn abandoned the gestalt-switch view as a tool for explaining scientific progress, because it stressed the experience of the individual, whereas scientific progress is a process carried out by a scientific community.⁴⁹

As discussed, it was important for Kuhn at the time to reject the common view of scientific progress that entails a preset forward-looking plan for the future. He argued against the teleological view of progress, and compared his transition to an evolutionary theory of progress, to the shift in the scientific worldview that was brought about by Darwin's theory of natural selection.⁵⁰ He wrote:

“The analogy that relates the evolution of organisms to the evolution of scientific ideas can easily be pushed too far. But with respect to the issues of this closing section it is very nearly perfect. The process described [...] as the resolution of revolutions is the selection by conflict within the scientific community of the fittest way to practice future science. The net result of a sequence of such revolutionary selections, separated by periods of normal research, is the wonderfully adapted set of instruments we call modern scientific knowledge. Successive stages in that developmental process are marked by an increase in articulation and specialization. And the entire process may have occurred, as we now suppose biological evolution did, without benefit of a set goal, a permanent fixed scientific truth, of which each stage in the development of scientific knowledge is a better exemplar.”⁵¹

⁴⁹ Kuhn 1990, 11.

⁵⁰ Kuhn 1970, 172.

⁵¹ *Ibid*, 172-173.

In his essay, “*The Road Since Structure*,” he further develops this evolutionary view and distinguishes between two types of evolutionary analogy that correspond to his early and late work.

First, the *diachronic* type which he adhered to in his earlier work. It is concerned with “the relation between older and more recent scientific beliefs about the same or overlapping ranges of natural phenomena.”⁵² In Kuukkanen’s view, the diachronic sense highlighted the need to reject cumulative and teleological views of scientific development that explain scientific progress as a series of approximations of truth.⁵³ In other words then, the diachronic evolutionary analogy points to two general patterns, that do not count as legitimate explanations of scientific history: *teleology*, and the *cumulative growth* of knowledge outside the bounds of commensurability.

The second point of the diachronic analogy was to give insight on the evolution of scientific ideas; there was hope that the selection of scientific beliefs could be likened to the biological selection of species.⁵⁴ Natural selection, however, is not meaningful through the eyes of the individual⁵⁵, as the gestalt-metaphor choice implies, and so we see later Kuhn turn towards explaining progress as a collective phenomenon. There is hope, that the process of theory choice, which becomes crucial once incommensurability is seen as operating between the specialized taxonomic communities, could be at least partially explained by recourse to the analogy of adaption.

The *synchronic* approach of later Kuhn goes further along this line and redefines the term scientific revolution. Whereas the earlier analogy could only describe normal science as cumulative and revolutionary science as noncumulative, in the later one, normal science takes place in a static taxonomy, and revolutionary stages happen when a part of the taxonomy needs to be redefined. Furthermore, the revolutionary changes are restricted in scope, and become local to the taxonomic unit that is experiencing change. The other taxonomies stay intact due to incommensurability. The scope of the analogy, however, widens, because the difference between revolutionary and normal science becomes a difference in the developmental stages of sciences. When a science experiences this revolutionary episode, its development is likened to biological speciation, resulting in the emergence of new specialties and lexicons.⁵⁶

Kuukkanen suggests that this later view of scientific revolutions as speciation seems to get rid of the problem of discontinuity that was prevalent in early Kuhn’s notion of progress. He claims that it left the impression of grand transformation through paradigm shifts, which lead to the abandonment of important research programs and bodies of knowledge.⁵⁷ Science seemed to progress in great leaps which leave important knowledge behind. This view, it

⁵² Kuhn 1990, 7.

⁵³ Kuukkanen, Juoni-Matti. “Revolution as Evolution: The Concept of Evolution in Kuhn’s Philosophy.” PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association, Vol. 1990, Volume Two: Symposia and Invited Papers, 136.

⁵⁴ Kuukkanen, 137.

⁵⁵ Kuhn 1990, 11

⁵⁶ Kuukkanen, 136-137.

⁵⁷ Kuukkanen 138.

seems to me, was supported by the gestalt-switch metaphor and Kuhn's excessive focus on the individual scientist, both of which were abandoned by the later Kuhn. The continuity of scientific progress cannot be demonstrated in the individual scientist, because in the individual scientist, it might very well be discontinuous, whereas the sciences as a whole are moving forward.

The paradigm-shift view of early Kuhn was therefore replaced by a gradual view of revolution that takes place in specialized scientific communities, which, as Kuukkanen points out, explains how some scientific revolutions can take a lot of time—more than the human lifespan—whereas the gestalt switch experienced by the individual happens, usually, at the time of life, when internal convictions and beliefs about the world are formed. Furthermore he explains that the scientific revolutions in later Kuhn become local to the communities, which means that there can be continuity between the pre-revolutionary and post-revolutionary stages, even within a discipline, since its subfields may carry on their research programs with the old methods.⁵⁸ In the next subsection, I will try to show how in Kuhn's later theory, the incommensurability that makes the progress of the individual discontinuous, is in fact a necessary part of scientific progress as a whole.

3.2 Incommensurability and Scientific Progress in Later Kuhn

According to early Kuhn's theory of progress, the linear growth of puzzle solving capacity can be shown empirically and thus if progress is to be understood in this way, it can be historically demonstrated.⁵⁹ I have argued so far, that this progress could be historically shown, but not shown to be continuous, since early Kuhn's description focused on the incommensurability experienced by the individual scientist, but remained ambiguous on the collective level.

The problem with the early individual perspective is this: if the incommensurability between paradigms should be overcome through translation, as early Kuhn claimed,⁶⁰ then we are left with a dilemma of conclusions. The first option is that there is no real inconsistency between the paradigms, incommensurability is removable and exists in appearance only, which would make Kuhn's theory redundant and contradicts the gestalt-metaphor view that something important is lost when new tacit assumptions are formed. The second option is assuming that in some sense the paradigms are untranslatable to each other's content. This option makes scientific progress discontinuous, because the individual scientist is doomed to shift between incomplete paradigms that cannot be compared against a unified standard.

Furthermore, one cannot empirically demonstrate that puzzle solving increases continuously throughout history, because, as Shapere pointed out in his review, incommensurable paradigms cannot be judged according to their ability to solve the same problems after a common standard.⁶¹ Whereas Shapere had in mind a notion of progress as cumulative

⁵⁸ Kuukkanen 138

⁵⁹ Kuhn 1970, 206

⁶⁰ Kuhn 1970, 202

⁶¹ Shapere, 391.

increase in representing reality, and Kuhn one of increase in puzzle solving capacity, the problem remains: how exactly is this progress demonstrated, if no unitary standard between paradigms exists. Later Kuhn admits that when he began his work, he overemphasized the empirical aspects of the work and argues that it must not be imagined to be an objective platform outside one's own historical context.⁶² These ambiguities were improved upon by later Kuhn. In this subsection I will try to show, how later Kuhn's notion of incommensurability enables scientific progress.

Later Kuhn argues that incommensurability, although problematic in some respects, also contributes to the progress of knowledge. He wrote:

"Incommensurability is far from being the threat to rational evaluation of truth claims that it has frequently seemed. Rather, it's what is needed, within a developmental perspective, to restore some badly needed bite to the whole notion of cognitive evaluation."⁶³

Kuhn's notion of incommensurability originally emerged from his attempts to understand the nonsensical statements in certain scientific texts that were taken to be errors by later historical interpretations, but were, in his view, misreadings of the text. He discovered that he could make sense of these statements by uncovering historical meanings of terms that differed from contemporary use. Whereas early Kuhn described this conflict through the analogy of different language communities and the work of the historian as language learning, the later Kuhn began to see the metaphor as too inclusive. The later Kuhn is concerned with taxonomic terms, which he describes as having two important properties.⁶⁴ First:

"[...] they are marked or labelled as kind terms by virtue of lexical characteristics like taking the indefinite article. Being a kind term is thus part of what the word means, part of what one must have in the head to use the word properly."⁶⁵

A kind term is such that groups similar things into sets, according to some principle. Kuhn, it seems, does not assume that our conceptual scheme of kinds necessarily reflects the natural world. Instead, there are various ways to classify the world into kinds, and these kind terms do not so much constitute a set of beliefs, but act as prerequisites for having any beliefs. "[The conceptual scheme of kind terms] at once supplies and bounds the set of beliefs it is possible to conceive."⁶⁶ This later notion of a conceptual scheme I find to be in one respect analogous to what early Kuhn had in mind with the gestalt-switch metaphor. Namely, that each individual internalizes a set of tacit assumptions about the world that shapes our attempts to describe or communicate aspects of the world to others.

The second property of taxonomic terms is the no-overlap principle which states that there can be no overlap in referents between two kind terms, unless they are joined in a conceptual scheme analogously to the relation of species to genus in biological classification. Kuhn brings an example: in our taxonomy there are no cats that are also dogs, so if we would

⁶² Kuhn 1990, 6.

⁶³ Kuhn 1990, 4.

⁶⁴ *Ibid.*

⁶⁵ Kuhn 1990, 5.

⁶⁶ Kuhn 1990, 5.

encounter such a creature, then we could not add another kind term into our taxonomy, but we were forced to redesign a part of it.⁶⁷

These shared taxonomic categories are necessary to communicate, and more importantly, to evaluate truth claims. Incommensurability in later Kuhn is a problem of untranslatability. The translation difficulties that produce it, later Kuhn suggests, tend to be those that violate either the no-overlap condition, or some unknown restriction on hierarchical relations. As with early Kuhn, these difficulties can be partially overcome if a community (not the individual scientist) acquires the taxonomy that was used by the community that produced the untranslatable text, but instead of translating its contents into one's own taxonomy, one is forced to become a bilingual. The bilingual, however, cannot join the taxonomies of two communities into a whole, but is forced to move between the two and change her medium of communication accordingly.⁶⁸

It follows, I argue, that different lexical taxonomies have different powers of communication; one taxonomy can be used to develop theories that are impossible in another taxonomy and vice versa.

But what is the effect of this untranslatability on scientific progress? We discussed that later Kuhn saw the difference between normal science and revolutionary science, in that the first requires a local taxonomy and the second does not. Foundationalism⁶⁹ and teleology rejected, the historian must either adapt with the local taxonomy, or look backwards and encounter the problems of untranslatability. Progress, also, develops from the matter of earlier accomplishments. Whereas in the postscript of "*The Structure of Scientific Revolutions*," Kuhn asked us to imagine a tree of scientific progress that traces a line of development from primitive beginnings, he develops the analogy further in his "*The road Since Structure*" essay:

"After a revolution there are usually (perhaps always) more cognitive specialties or fields of knowledge than there were before. Either a new branch has split off from the parent trunk, as scientific specialties have repeatedly split off in the past from philosophy and from medicine.[...]. As time goes on, however, one notices that the new shoot seldom or never gets assimilated to either of its parents. Instead, it becomes one more separate specialty, gradually acquiring its own new specialists' journals, a new professional society, and often also new university chairs, laboratories, and even departments. Over time a diagram of the evolution of scientific fields, specialties, and sub-specialties. This comes to look strikingly like a layman's diagram for a biological evolutionary tree. Each of these fields has a distinct lexicon, though the differences are local, occurring only here and there. There is no *lingua franca* capable of expressing, in its entirety, the content of them all or even of any pair."⁷⁰

The process of specialization is necessary for swift scientific progress; in Kuhn's view, it is the "necessary price of increasingly powerful cognitive tools."⁷¹ Just as industrialization allowed explosive growth in the production of necessities through separating each particular step of production into a simpler problem of mass production, so the specialties in science

⁶⁷ Kuhn 1990, 4.

⁶⁸ Kuhn 1990, 5.

⁶⁹ Kuhn 1990, 6.

⁷⁰ Kuhn 1990, 7-8.

⁷¹ Kuhn 1990, 8.

allow greater focus on one aspect of a complicated problem, and individually contribute to progress, even if the knowledge derived through this practice is not generalizable into a complete taxonomy.

3.3 Puzzle-Solving as Criterion of Progress

I have shown that in later Kuhn's theory of progress, incommensurability is a necessary price of scientific progress that does not produce discontinuities in the progress of scientific knowledge. In section 2.3, I argued that Kuhn's criterion of progress is the increase puzzle solving capacity; later Kuhn confirms this view.⁷² Whereas the puzzle-solver of early Kuhn was encouraged to translate and reduce the content of other paradigms into one's own terms⁷³, later Kuhn realized that the isolation of lexical communities should be encouraged, in favor of progress, since the range of puzzles that a specialist can solve is contingent on their taxonomy. The resulting limitations in communication, he pointed out, are beneficial to the development of scientific knowledge as a whole.⁷⁴

So, to be precise, the value that Kuhn prescribes to scientists is not simply puzzle solving, but puzzle-solving within an isolated, specialized science that is in the midst of solving unique problems, approachable through their shared taxonomy. Furthermore, it should be stressed, that this value is mainly a historical generalization, an answer to the question: what is it that scientists do? Coupled with a suggestion on: what should a scientist do, in order to be successful? All specific values within the specialized scientist, however, are necessarily left to the judgment of the community of scientists, because they are most competent, and there is no *lingua franca* that would enable one to compare them in an intelligible way.⁷⁵

I would argue that in later Kuhn values can be normative only in reference to the taxonomy that was tacitly assumed when the necessary inference that led to the criteria was made. It follows that the conflicts of values between the specialized sciences are unavoidable, and attempts at normative standards might in fact be opposed to progress. Indeed, later Kuhn argued that attempts to unite the specialized sciences through general criteria are utopian and opposed to progress.⁷⁶

For example, the values of one specialist might seem irrational to a specialist from a different taxonomy, but due to the untranslatable nature of both disciplines, or rather the absence of an objective perspective, the conflicts are in fact false applications of a lexical taxonomy in a no-overlap area. This realization should lead us into a different understanding of both progress and relativism.

Namely, it seems that there is no way of stating a forward-looking notion of progress, because no such notion exists that would be general for all the specialized sciences. The scientist as

⁷² Kuhn 1990, 6, 8.

⁷³ Kuhn 1970, 202.

⁷⁴ Kuhn 1990, 8.

⁷⁵ Kuhn 1990, 8.

⁷⁶ Kuhn 1990, 8.

essentially a puzzle solver is simply a historical generalization on the success of scientific theories. If one, for example, compares the positive attitudes of say Bohr, Einstein and Schrödinger towards wider philosophical problems, to the dismissive attitude of modern scientists like Hawking or Feynman, then it seems to me that the growth of specialization in modern science, or at least in modern physics, makes it increasingly more useful to focus on solvable puzzles, rather than on futile miscommunications between scientific fields.

4. Evaluating Kuhn's Notion of Scientific Progress

Kuhn's early notion of scientific progress suffered from overemphasizing the role of the individual scientist in a process that is essentially collective. Kuhn relies strongly on the use of analogies in his writings, sometimes as an attempt to make his position clear by explaining the unfamiliar through similarity with the familiar, at other times; he uses it as an investigatory tool. This seems to me as somewhat of a hit-and-miss strategy, as is seen, for example, from his revision of the evolutionary analogy in *The Road after Structure*, in which he abandons his previous view of progress as analogous to mutation in favor of speciation.⁷⁷

I would argue that this evolutionary analogy started out as an explanatory tool in the *The Structure of Scientific Revolutions*, where Kuhn used it to explain the growth of knowledge, as analogous to the evolution of species from primitive origins without relying on a teleological goal. The analogy became a tool for investigation in Kuhn's later development. He realized that his notion of scientific progress, through the development of specialized fields with distinct, untranslatable taxonomies, could be conveniently compared to that of speciation and tied in with the improved notion of incommensurability. Just as the reproductive capabilities of species limit their offspring, so the lexical taxonomies of specialized fields act as a limit and an enabler of progress at the same time.

It is obvious, on the other hand, that an analogy is not a description of two identical cases, but an observation of similarity, that can help explain a previously vague problem by leading us into familiar conclusions. Throughout Kuhn's use of the analogy it seems clear to me, that he finds that the growth of scientific knowledge has a real biological basis, as he is consistently drawing insight from comparisons and analogies with the evolution of the natural world. Unfortunately, he is not very clear on the limits of the use of the analogy, but instead remains cautious for two reasons, because, the analogy can be taken too far⁷⁸ and biological knowledge was and is in the process of transformation itself which Kuhn was closely following.⁷⁹

But to sum up on the conclusions reached with the help of this tool, and Kuhn's notion of progress in general, I would like to make a few critical remarks. I find the later Kuhn's notion of progress to be clearly superior to that of his earlier one, because he managed to solve the problems of discontinuity involved his early notion and consider it unfortunate that the

⁷⁷ Kuhn 1990, 8.

⁷⁸ Kuhn, S. Thomas, "Objectivity, Value Judgment, and Theory Choice," In "The Essential Tension," 172.

⁷⁹ Kuhn 1990, 6.

primary focus in introducing Kuhn to the uninitiated is, in my impression, almost always through his early ideas.

This improvement was related to Kuhn's changed notion of incommensurability. Shapere was correct in pointing out the doubtful and unclear remarks of early Kuhn that made the exact workings of incommensurability sufficiently unclear to almost dismiss it as relativism. However, once the analogy of speciation is carried over to the specialized scientists, the limits of untranslatability become clear, and the notion of incommensurability is shown to be an indispensable part of scientific progress. On this point, I find Kuhn's arguments very convincing and feel that the persistent miscommunication between specialized fields is an urgent issue in contemporary academia. General recognition of these limits of communication would greatly benefit the sciences.

A second improved aspect of later Kuhn's notion of progress is his rejection of the gestalt-switch analogy and the resulting notion of scientific progress that was derived from the experience of the individuals. The problems of discontinuity seemed insurmountable for the individual scientist as long as the goal was the translation of the contents of the foreign paradigm into the unfamiliar one. Later Kuhn managed solve this issue by redefining the limits of incommensurability as the necessary isolation mechanism for the specialized sciences, and by suggesting the alternative of learning the knowledge based on multiple taxonomies, as a bilingual would. In my view, he demonstrated convincingly, how this approach contributes to the progress of science as a whole.

Thus, I would argue that Kuhn's later theory of progress successfully satisfies the two conditions for a theory of progress which I laid out in the first chapter of this thesis. It promotes a specific value—problem-solving capacity, as expressed in the work of specialized sciences, and in the proliferation of further specialties that occurs in revolutionary episodes where the lexical taxonomies are redesigned. His early notion of progress failed with respect to the second criterion: the individual scientist that experiences a paradigm-shift may not experience its puzzle solving capacity as continuous, due to the incommensurable nature of the two paradigms and the gestalt-switch view assumes that one can only perceive one, or the other. Later Kuhn, however convincingly explains how problem solving capacity can continuously increase through scientific communities that share a lexical taxonomy. The individual can learn the tacit assumptions of both communities, but cannot reduce one of them to the content of the other.

However, the schematic nature of later Kuhn's ideas, make them seem somewhat incomplete and raise important questions. In the first chapter I also laid out the condition that Kuhn should not be a relativist. He most certainly is not one, in the sense that he believes that all values are equal with respect to scientific progress. On the other hand, an argument concerning Kuhn's relativism could be made with respect to his notion of truth. Such investigation, do not, however, fit the scope of this work.

In general Kuhn's provides illuminating view of scientific progress that remains essentially consistent throughout his works. Progress is seen in the increase in puzzle-solving capacity, whereas the way in which this is most effectively achieved changes between his early and

later work. His later notion of incommensurable specialized sciences, based on a tacitly assumed taxonomy, seems to me a crucial notion for explaining modern scientific progress and the evolutionary analogy of speciation captures a good balance between the effect of social constraints and rational pursuits in the growth of scientific knowledge.

Conclusion

As a starting point for my thesis, I looked at the position of the strong program in the sociology of knowledge, due to their reliance on Kuhn's ideas and their explicit relativism. By examining the views of one of the strong program's most prominent authors, Barry Barnes, I reached the conclusion that radical relativists define all accounts of reality as equally valuable accounts of nature on the grounds that each account of reality, reflects the pragmatic needs of the community that establishes it as general knowledge.

Due to the radical relativist notion of the equal value of all knowledge claims, I concluded that a relativist cannot believe in progress, because no knowledge claim can be thought of as an improvement on another. I argued, basing my view on Alexander Bird's work and Kuhn's early statements that the apparent similarity of Kuhn's view with this position comes from his insistence that the individual scientist's conception of reality is in some way constituted by the community. I found a second similarity in Kuhn's early notion of incommensurability, because it led Kuhn to appreciate scientific theories that have been abandoned as false, whereas Kuhn claimed that there is more to those theories than can be immediately perceived, due to the incommensurabilities between paradigms.

I argued, however, that it would be a gross misinterpretation to argue that in Kuhn's view, all beliefs are equally valuable and that no criterion of progress can be gleaned from Kuhn's work that he considers to be essential to scientific progress. I argued that Kuhn's analogy of evolutionary scientific progress is an attempt at describing the relationship of the individual scientist to the community of scientists that he is engaged with. I suggested that perhaps the strong program's radical relativism could be seen as a convenient justification of their research-paradigm, and demonstrated that Kuhn has rejected the possibility of the type of neutral position that such a description, as Barry Barnes suggested for the sociology of scientific knowledge, would require.

After the strong program, I turned to a prominent critic of Kuhn who has argued in favor of Kuhn the relativist. Dudley Shapere has argued that Kuhn's notion of scientific development is change without progress, on the grounds that what counts as a good reason for theory selection in Kuhn's theory, is the decision of the scientific community. He argues that Kuhn abandons the notion of truth in favor of the decision of the community. Secondly, he attempted to show, that the development of knowledge between two paradigms is discontinuous, which makes progress impossible, and causes ambiguities in Kuhn's early terminology. I suggested that this problem of discontinuity is unresolved within Kuhn's earlier theory of progress.

Kuhn's argument against relativism was based on his notion of scientific progress, which sets as the essential value the increase in problem-solving capacity, analogously, to how an organism in nature is engaged in the challenge of survival. A theory remains scientific canon as per its ability to solve the puzzles of science. Kuhn argued in favor of an evolutionary view of progress, as opposed to a teleological view of progress, and claims that a notion of truth is not necessary for such a notion of progress, which requires only historical description.

I reached the conclusion that in early Kuhn, scientific progress is indeed discontinuous, since even puzzle-solving capacity could be seen as such, if one takes the gestalt-switch view of Kuhn seriously, since between paradigms one could even disagree on what the facts, or legitimate problems for science are, as Shapere had pointed out in his review.

I then moved on to Kuhn's later work and focused on the parts of Kuhn's theory of progress, which remained problematic in early Kuhn: namely the discontinuity problem between paradigms. I argued, based on Kuhn's later statements and Kuukkanen's views, that Kuhn abandoned the gestalt-switch view in explaining scientific progress, because it describes the experience of the individual scientist, whereas the progress of science is best looked at as a collective activity. I argued that this switch of emphasis from the individual to the collective plays a part in Kuhn's solution to the problem of discontinuity in his early notion of progress.

Later Kuhn redesigns his understanding of scientific revolutions and most significantly his notion of incommensurabilities. In later Kuhn scientific revolutions become gradual changes in the lexical taxonomies of scientific communities and scientific revolutions are expressed in the redesigns of these taxonomic units, which tend to result in new subfields or specialties of science and represents progress in science, because different taxonomies have different powers of communication. Incommensurability in later Kuhn works to isolate these specialties from each other, analogous to how the isolation of biological species enables to pass on their individual genotype. I argued, that Kuhn views this process of specialization as a precondition for the successful progress of puzzle solving, which he still values as the criterion of progress in his later works.

As a result of this, later Kuhn's notion of collective scientific revolutions solves the early problem of discontinuity, because an individual may experience discontinuity due to the isolation of his field, but science as a whole benefits and moves forward as a result of this division of communication. From these assumptions I concluded that the later Kuhn's notion of progress satisfies the conditions of progress that I defined at the beginning of my thesis. The accusation of relativism seemed to have merit, but not in the sense that it would oppose progress, as Kuhn certainly believes that a number of values, and specifically that of puzzle-solving capacity, are instrumental in explaining the progress of science.

The value of puzzle-solving, as a criterion of progress, is however a historical generalization, and is not to be put forward as a normative teleological towards for the future. It is the conclusion reached through the specific standpoint of historical research.

References

- Barnes, Barry, “*Realism, Relativism and Finitism*,” in “*Cognitive Relativism and Social Science*,” Transaction Publishers, Revised edition, 1992.
- Bird, Alexander. “*Thomas Kuhn*.” *The Stanford Encyclopedia of Philosophy* (Fall 2013 Edition), URL = <<http://plato.stanford.edu/archives/fall2013/entries/thomas-kuhn/>>.
- Bird, Alexander, “*Thomas Kuhn*,” Princeton University Press, 2000.
- Kuukkanen, Juoni-Matti, “*Revolution as Evolution: The Concept of Evolution in Kuhn's Philosophy*,” In Vasō Kintē & Theodore Arabatzis (eds.), “*Kuhn's the Structure of Scientific Revolutions Revisited*.” Routledge 134, 2012.
- Kuhn, S. Thomas, “*The Structure of Scientific Revolutions*,” University of Chicago Press, 2nd edition, with postscript, 1970.
- Kuhn, S. Thomas, “*Objectivity, Value Judgment, and Theory Choice*,” In “*The Essential Tension*,” University of Chicago Press, 320-39, 1977.
- Kuhn, S. Thomas. “*The Road Since Structure*.” PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association, Vol. 1990, Volume Two: Symposia and Invited Papers, pp. 3-13, The University of Chicago Press, 1990.
- Masterman, Margaret, “The Nature of a Paradigm” in Lakatos, Imre; Musgrave, Alan, “*Criticism and the Growth of Knowledge*.” Cambridge University Press, 1970
- Niiniluoto, Ilkka, “*Scientific Progress*”, *The Stanford Encyclopedia of Philosophy* (Summer 2015 Edition), Edward N. Zalta (ed.), URL = <<http://plato.stanford.edu/archives/sum2015/entries/scientific-progress/>>.
- Rouse, Joseph. “*Kuhn's Philosophy of Scientific Practice*,” in Nickles, Thomas, “*Thomas Kuhn*,” Cambridge University Press, 2003.
- Shapere, Dudley. “*The Structure of Scientific Revolutions*”, *The Philosophical Review*, Vol 73, No. 3 (Jul., 1964), Duke University Press, pp. 383–394.
- Trigg, Roger, “*Realism: An Essay in Interpretation and social Reality*” in “*Philosophy of the Social Sciences*,” 15 (1):82, 1985.

Thomas Kuhn: Theory of Progress or Theory of Change?

Abstract

The topic of this thesis rose out of personal interest in Kuhn's description of the growth of scientific knowledge. I examine Thomas Kuhn's notion of scientific progress throughout his early and late works and evaluate if a theory of the progress of scientific knowledge can be gleaned from this investigation. I assume that a theory of progress must satisfy two primary conditions: it must promote a value, or a number of values that are seen as contributing to progress. Secondly, this value must enable the continuous growth of the enterprise it is intended to promote. I argue, that Kuhn is not a relativist, because he promotes a certain value—puzzle-solving capacity—as specifically characteristic of the growth of scientific knowledge. The second condition, I concluded, is unfulfilled and problematic in early Kuhn, but resolved in later Kuhn, due to his changed notion of incommensurability and his switch from explaining scientific progress from the standpoint of the individual scientist, to explaining it from the standpoint of the scientific community.

Thomas Kuhn: muutuse või progressi teooria?

Resüme

Käesoleva bakalaureuse töö teema sai alguse isiklikust huvist Thomas Kuhni teadusliku teadmiste kasvu teooria vastu. Käsitlen Thomas Kuhni kirjeldatud teadusliku teadmise kasvu kui progressi, toetudes tema varasematele ning hilisematele töödele. Töö käigus nimetan kaks tingimust, mida minu väitel üks progressi teooria täitma peaks. Esiteks, see peaks kinnitama mingi arvu näitajaid, mida nähakse väärtusena ja seega progressi kriteeriumina. Teiseks, teooria autor peab näitama, et see nimetatud kriteerium võimaldab järjepidevat kasvu. Väidan et Kuhn ei ole relativist seetõttu, et ta viitab kriteeriumile, mida ta näeb teadusliku teadmise kasvule iseäralikult omaseks. Nimelt probleemilahenduse võime kasvule. Väidan, et varajane Kuhn ei täida minu välja pakutud teist tingimust, ent lahendab selle probleemi oma hilistes töödes. Peamiselt tänu muutunud ühismõõdutuse mõistele ning muutunud fookuspunktile, mis liigub hilise Kuhni töödes üksikult teadlaselt teadlaste kommuunile.

Lihtlitsents lõputöö reprodutseerimiseks ja lõputöö üldsusele kättesaadavaks tegemiseks

Mina, Erik Jürmann

1. Annan Tartu Ülikoolile tasuta loa (lihtlitsentsi) enda loodud teose “Evolutionary Progress of Science in the Works of Thomas Kuhn”

mille juhendaja on Endla Lõhkivi

1.1. Reprodutseerimiseks säilitamise ja üldsusele kättesaadavaks tegemise eesmärgil, sealhulgas digitaalarhiivi DSpace-is lisamise eesmärgil kuni autoriõiguse kehtivuse tähtaja lõppemiseni;

1.2. Üldsusele kättesaadavaks tegemiseks Tartu Ülikooli veebikeskkonna kaudu, sealhulgas digitaalarhiivi DSpace'i kaudu kuni autoriõiguse kehtivuse tähtaja lõppemiseni.

2. Olen teadlik, et punktis 1 nimetatud õigused jäävad alles ka autorile.

3. Kinnitan, et lihtlitsentsi andmisega ei rikuta teiste isikute intellektuaalomandi ega isikuandmete kaitse seadusest tulenevaid õigusi.

Tartus 17.05.2016

