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The Sciences and the Humanities: Building a Bridge between the "Two Cultures" through Rhetoric

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Abstract

The sciences and the humanities are treated as two incompatible discourses and the former enjoys a superior status both within and outside the academic society. This dominance of science as a discourse synonymous with knowledge while humanities and its methods are devaluated come from the assumption that scientific domain is a linear progression of facts discovered using a rational methodology. Thus, it's worthwhile to lay bare the ruptures and the remedial rhetoric that lie behind the façade of 'objectivity' and 'rationality' in science in order to revise the existing academic framework. My attempt here is to re-articulate the discourse of science as shaped and subject to elements traditionally thought to be extra-scientific or even anti-scientific in the positivist notion of science. Drawing from the post-positivist philosophy of science put forth by Michael Polanyi, Thomas Kuhn and Paul Feyerabend which dismisses an objective methodology in science, this paper argues that rhetoric plays a constitutive role in scientific knowledge by making scientific progress possible. By establishing rhetoric rather than methodology as the decisive element in the advancement of science, the boundaries between science and non-science begin to blur.

Keywords: Two Cultures, Rhetoric, Post-Positivism, Sciences, Humanities.

Introduction: Problematizing the Epistemological Privilege of Science

"I have tried lately to read Shakespeare, and found it so intolerably dull that it nauseated me"— wrote Charles Darwin (1887) in his autobiography in 1876 about the loss of his aesthetic powers (p. 81). He further commented that his mind had become a kind of machine for grinding general laws out of large collections of facts and "that part of the brain alone", receptive to artistic stimuli, weakened (p. 81). Here, he juxtaposes the loss of his aesthetic abilities with the sophistication his mind has achieved in working with a large collection of data, a development favorable to a man of science, as if one would naturally come at the expense of the other. This compartmentalization hints at the rift between science and literature that has been maintained in the epistemic terrain as a legacy of Western intellectualism. In fact, the bifurcation between science and literature reflects a major divorce that exists between the Sciences and the Humanities, something that prompted C.P Snow (1961) to describe the two discourses as the "two cultures" (p. 2) in intellectual society.

The rift between them does not end with treating the two as mutually exclusive discourses; instead, there is explicit supremacy of the scientific discourse where science becomes synonymous with knowledge. In the "Discourse of Language", Michel Foucault emphasized that the course of western thought, dating back to the Greek antiquity, has sought an "elision of the reality of the discourse", in its "pursuit of what Foucault labels 'true knowledge'" (Bono, 1990, p. 59). Hence, 'reason' and 'objectivity' came to be privileged as the only reliable components in the production of knowledge and scientific discourse came to be conceived as a domain of absolute facts, exempt from epistemological limitations. The consequent de-privileging of subjective experiences and metaphysical speculations as a valid source of knowledge, in turn, resulted in conferring inferior status on the Humanities and Social Sciences. Hence, it is essential to rewrite the existing academic fabric by unmasking the reality of the discourse of science which will in turn contribute to blurring the boundaries between science and non-science. This paper seeks to achieve that by emphasizing the epistemic role of rhetoric in the construction of a scientific text.

Several questions arise from such a proposal, the most important being: what's the role of rhetoric in science? Does rhetoric ever mean anything more than persuasion? Why is persuasion needed in science if science is a domain of objective knowledge which should unequivocally and universally appeal to the rationality of fellow scientists? Doesn't the methodology of science speak for the credibility of the science that a scientist is articulating? In other words, isn't the 'scientific method' itself the persuasiveness of science? The rest of the paper draws mainly from the post-positivist philosophy of science to delve into each of these questions while suggesting that rhetoric replaces methodology during a paradigm shift and that science advances through rhetoric.

The Inseparability of Method and Knowledge until the Twentieth Century

It is the continuing obsession with the method of knowing that gradually led to the privileged status of science as the only valid source of truth. Since the classical period, there has been an emphasis on a single methodology of epistemological inquiry, and investigations into the modes of knowing remained the chief preoccupation of thinkers in the subsequent ages. Aristotle's ideas of constructing intellectual judgments based on our sensory perception of physical things dominated Western and Islamic science until the fifteenth century. These ideas got dismissed during the scientific revolution which began in the sixteenth century. However, the leading figures of the scientific movement had their differences regarding the correct methodology of a rational pursuit. For example, Descartes supported the method of deduction where the general axioms are used to determine the truth about the particulars. Conversely, Francis Bacon and Isaac Newton followed an inductivist approach in which an examination of the particulars led to inferences that further led to theoretical formulations. (However, Bacon's ideas were less mathematical than Newton's and failed to incorporate the scientific relevance of mathematical reasoning which was to become central to the scientific pedagogy after Newton's and Galileo's works in terrestrial and celestial mechanics). The inductivist logic was replaced by the hypothetico-deductive method in the middle of the eighteenth century since the hypotheses built on inferences alone couldn't be conclusively established. As opposed to Newton's dictum "...hypotheses non fingo" [I frame no hypothesis] (Newton, 1848, p. 506), scientific logic, from the middle of the 18th century onwards, consisted of the introduction of a hypothesis followed by the experimental verification of the observable phenomena related to the hypothesis.

The eighteenth century, still a part of the Enlightenment era, was ironically quite dormant in its relative contributions to theories of method (Laudan, 1968, p. 24). A significant turn happened only in the nineteenth century when the philosophy of science itself was taking shape as a discipline specializing in the theories of the scientific method. Two movements - empiricism and positivism - which were pivotal to the solidification of the experiment-based pedagogy of science and of the epistemological privilege of the scientific method as the

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yardstick to assess all truth claims became more intensified during this period. Empiricism regarded the possibility of observational or experimental justification as the defining condition for a scientific claim. Accordingly, only the sensory realities that could be verified physically mattered in science. Logical Positivism, which evolved from the seventeenth-century positivistic writings of Auguste Comte, remained dogmatic until the late twentieth century. Comte advocated that the 'positive' turn in our intellectual development would release science from the religious and metaphysical grip that had been delaying the progress in science and that the 'positive' criterion could further be extended to social thought, with the methods of physics reigning as the ultimate paradigm for not only scientific pursuits but for any intellectual inquiry (Ray, 2001, p. 246). Such an approach was essentially reductivist and invalidated other human sciences as less accurate as long as these disciplines did not adopt the methods of physics. However, the post-positivist philosophy of science has challenged the absolutist view of science and hence enables a re-articulation of the discourse of science.

Changing Notion of Science in the Post-Positivist Philosophy

We have seen above that the long tradition of theorization about the tools and methods of academic inquiry culminated in the observational evidence-based scientific pedagogy at the beginning of the twentieth century. But, the twentieth-century scientific breakthroughs like relativity and quantum mechanics exposed epistemological depths inaccessible by common sense and by the traditional logic of scientific investigations. This realization led to the decline of logical positivism. For example, Albert Einstein was initially delighted with Ernst Mach's empiricist polemic that viewed any metaphysical conception of space as unscientific (Ray, 2001, p. 245). However, by 1922, Einstein took a directly opposite stance when his own theorizations about curved space-time surpassed the test of sensory experience. Such conceptual leaps that went beyond the familiar tools of scientific inquiry made practitioners like Neils Bohr emphasize the pragmatic dimension of scientific activity: scientists should try whatever method available to them in order to solve the mystery, without feeling confined by the method.

Thus, strengthened by the twentieth-century scientific breakthroughs, philosophers like Paul Feyerabend criticized the positivist methodology of science in his seminal work, Against Method: Outline of an Anarchistic Theory (1978). His celebrated quote, "science is an essentially anarchic enterprise: theoretical anarchism is more humanitarian and more likely to encourage progress than its law-and-order alternatives" (Feyerabend, 1993, p. 9) sums up the anti-methodological postulate of post-positivist philosophy. As Feyerabend lucidly illustrates, the history of science doesn't present itself as a neat array of 'facts' but as a muddle of intuitions, hypotheses, myths and metaphysics all of which have equally been conducive to making sense of the world we inhabit. His proposition is remarkably simple and radical: "anything goes" (p. 14) in science since strict adherence to one methodology is dogmatism and makes the scientists oblivious to the alternative sets of knowledge claims arrived at using the other methodologies. Such a methodology-bound pursuit is limiting and impedes us from accessing all the possible ways of knowing. Emphasizing the worth of methodological opportunism for a wholesome human endeavor, he notes, "the attempt to increase liberty, to lead a full and rewarding life, and the corresponding attempt to discover the secrets of nature and of man, entails, therefore, the rejection of all universal standards and of all rigid traditions" (p. 12). This approach to knowledge which Feyerabend wittily calls the 'irrational' view of science results in a disruption of the categories and the distinction between science and non-science blurs.

Plural Truth(s) and Scientific Progress

The multiplicity of equally valid methods of knowing entails a diverse array of truth(s) that could be possibly reached through these methods. Truth(s), thus, becomes an unstable, methodology-dependent construct and stops being a fixed, predetermined point of pursuit. This plurality of truth subverts the predominant view of scientific progress as the advancement towards a goal, typically understood to be truth reached through an objective method of inquiry. The conceptualization of progress in science as proximity to truth achieved by strict adherence to a rational methodology was so central to the epistemological superiority of science that the historian of science, George Sarton (1957) argued that "the acquisition and systematization of positive knowledge are the only human activities which are truly cumulative and progressive," and "progress has no definite and unquestionable meaning in other fields than the field of science" (p. 5). These concepts, i.e.., the goal of science and the progress in science, fundamental to the positive notion of science, warranted major revisions in the latter half of the twentieth century. Even before the post-positivist de-centering of methodology as the decisive element in an epistemological enquiry, there has not been much clarity regarding what constitutes the goal of science. The arbitrary candidates included coherence, explanatory power, simplicity (Shapere, 2001, pp. 413-418), and verisimilitude (Popper, 1979, p. 46). However, a noteworthy contribution came from Larry Laudan (1977) who propounded in his book Progress and Its Problems (1977) that science was essentially a problem-solving activity and the goal of science is question-answering (p. 11). Accordingly, "problem-solving adequacy" (p. 107) becomes the hallmark of scientific progress and the criterion for the acceptance of a new theory.

But, the history of science often contradicts the principles laid out by the philosophers, as Feyerabend already illustrated in his book about the non-linear development of scientific knowledge. Thomas Kuhn pointed out that each new theory has answered fewer puzzles than the previous ones; hence the advancement in science is not really based on the new addition's potential to solve more mysteries. Also, Laudan himself has clarified that the present problem-solving adequacy of a new theory is not the mark of progressiveness and that it has to be watched over time, comparing it with the number of problems (both empirical and conceptual) that the previous theories solved. Then, commending on the relative problem-solving capacity of a new theory becomes the task of a historian of science and it cannot be the criterion scientists adopt for determining the acceptability of a new addition. This situation contradicts Laudan's dictum that scientists "choose the theory with the highest problem-solving adequacy" (Laudan, 1977, p. 107). The challenge then was to re-articulate the notion of scientific progress in a way that is both consistent with the post-positivist ideology of science and with the history of actual scientific practices.

Paradigm-shifts as the Unit of Scientific Progress

Thomas Kuhn proposed the idea of paradigm shift which is the most enduring account of scientific progress that suits the non-cumulative view of science. His exposition is based on his analysis of the revolutionary episodes in the history of science; say the Copernican revolution or the Einsteinian revolution, in which a pre-existing paradigm is replaced by a new one. Though various commentators have observed multifarious meanings of his central concept of 'paradigm', the word could be consistently used to mean "…universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners" (Kuhn, 1962, p. viii). Accordingly, scientific activity develops through three phases: (1) a period of normal science which is the practice of science using the same conceptual and methodological framework as suggested by the paradigm, (2) a crisis period resulting from the discovery of a natural phenomenon that cannot be explained by the existing paradigm which in turn calls for the invention of new theories to account for the anomalous

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details, and (3) a period of revolutionary science in which a new paradigm developed by the extra-ordinary research of a scientific genius emerges and becomes institutionalized as the praxis for routine science. Kuhn argues that normal science is just repetitive and paradigm re-affirming. Thus, finding solutions to a problem chosen by normal science is like getting the results that had already been anticipated, which resists the generation of anything novel that has epistemic worth. Hence, Kuhn locates scientific progress in the switch to the new paradigm rather than in the routine scientific activities that preserve the existing paradigm.

Inter-Paradigm Conflicts and Resistance to the 'New'

Even before Kuhn, the transition from one scientific tradition to another has been brought to the center of epistemological discussions by the philosopher Michael Polanyi. Though his works didn't really concern with scientific progress or scientific revolutions, he did substantial work at emphasizing the rigidity of conventions in scientific knowledge-making. He pointed out the resistance to a new framework because of the orthodoxy in science and challenged the role of logic, rational observations, verifications, etc. in choosing a new paradigm. He argued that due to the emotional commitment practitioners feel toward an existing paradigm, something he referred to by the oxymoron "intellectual passion" (Polanyi, 2005, p. 141), they don't feel compelled to reject the paradigm if it cannot account for the anomalous detail. They rather set aside the details inconsistent with the paradigm expecting that the framework would someday be able to either accommodate them or explain them away as irrelevant or illusory. He quotes how the French Academy of Science refused to accept the proof for the fall of meteorites because it was inconsistent with the traditional superstitious theories regarding heavenly bodies (p. 146). Thus, the evidence does not always ensure the advancement towards a 'truer' framework and the traditional evidence-based ideology of scientific knowledge once again collapses in Polanyi's account of science.

In addition to the scientists' conscious resistance to an alternative framework, the language of science already constrains the conception of new knowledge. Polanyi argued that the existing framework gets embedded in the language forming an "idiom of belief" (p. 304). This language which manifests a particular worldview or belief already forestalls the articulation of a theory inconsistent with the existing one. In Patterns of Discovery (1958), Norwood Hanson (1958) coined the word "theory-laden" (p. 19) to refer to scientific terminology that already comes with certain basic premises inherent in them or prior commitments to a particular theoretical framework. One instance of semantic theory-ladenness is the meaning of the word 'planet' in Ptolemy's astronomical system. In the Ptolemaic system, 'planet', derived from the Greek verb 'planasthai' (to wander), refers to the wandering stars in the heavens. This included even the sun and the moon which are not recognized as planets in the Copernican theory of the planetary system. But, the earth was understood to be the fixed center, not part of the heavens, from which the observers can see the celestial bodies wandering around them. The possibility of earth being a planet lay outside the semantic realms of the word 'planet' since the "earth was not in the heavens at all" (Harris, 2005, p. 40). Thus, the meaning of 'planet' in the Ptolemaic system, in a sense, already suppresses the emergence of a heliocentric worldview in which the earth is a planet, a body in motion. Polanyi shows that new knowledge or the advancement of the principles of science is not possible within the same interpretive framework. Existing tradition always already constrains the conception of new knowledge, and the epistemic merit of paradigm shifts lies in the liberation it brings forth to conceive the hitherto inconceivable. It's in the broad sense of opening up new epistemological possibilities, even if it involves violating some principles of the existing paradigm, that paradigm shifts become the mark of scientific progress.

Incommensurability

As we have seen, paradigm changes do not really bring us closer to 'truth' (Kuhn, 1962, p. 169), it only makes a change in perspective happen in order to accommodate an anomalous detail. However, this doesn't mean the new paradigm can account for more details than the previous paradigm, nor does it mean the new paradigm can explain more important problems than the previous ones. Since a paradigm is "the source of methods, problem-fields, standards of solution" (p. 103), each paradigm recognizes a different problem to be the most important. Here, Kuhn introduces the term "incommensurable" (p. 103) to express the fact that rival paradigms often select different problems as the most important to solve and employ different standards for the success of the solution. The word 'incommensurable' was originally used in mathematics to refer to the incongruence between the measures of the side of a square and the diagonal of a square. The side of a square gives a whole number whereas the diagonal gives an irrational number which cannot at any point be expressed as a whole number or as ratios of a whole number. Thus, these numbers which do not have a common measure form an incommensurable pair (Harris, 2005, pp. 5-6). Kuhn used this word metaphorically to refer to the incongruence between two successive paradigms, with a "neutral algorithm" (Kuhn, 1962, p. 200) to 'theory' being a scientific counterpart of 'common measure' to 'number'.

In the same year as Kuhn discussed incommensurability in the Structure of Scientific Revolutions, Feyerabend (1981) used the term in his essay "Explanation, Reduction and Empiricism" to refer to the lack of logical connectedness between the scientific theories developed throughout the history of science (pp. 47). Though both of them coincidentally used the same term to refer to some kind of a recurring incongruence in the history of science, there are differences in terms of the scope, range, and domains of their applicability. While Kuhn used incommensurability in the context of two successive scientific traditions existing before and after a scientific revolution, Feyerabend applied incommensurability to the case of two successive scientific theories. Both these philosophers kept modifying the concepts throughout their careers to resemble each other at some points and differ at some others. Kuhn's initial explanations of incommensurability included inconsistencies in the problem-fields, methods and procedures, worldviews etc. whereas, for Feyerabend, incommensurability existed only in the theories and the ontological implications of the framework. But later, Kuhn focused only on conceptual incommensurability whereas Feyerabend expanded the domain of incommensurability to include aspects of perception and problem-sets. Furthermore, Feyerabend's notion of incommensurability applied only to major transitions like the change from the impetus theory to classical mechanics, from geometrical optics to wave optics, from phenomenological thermodynamics to statistical mechanics, from classical mechanics to the special theory of relativity, from Newton's theory of gravitation to general relativity theory, and from classical mechanics to quantum theory, but, Kuhn incorporated even the small episodes of accidental discoveries as incommensurable with the existing framework if a meaning-shift is necessitated (as cited in Harris, 2005, pp. 159-160). However, despite the apparent lack of coherence and homogeneity in the application of the word, both Kuhn and Feyerabend knew they were referring to some rupture in discourse or "something which was in some sense the same thing". (Kuhn, 2000, pp. 298).

Incommensurability as a Problem and Rhetoric as the Remedy

Incommensurability is a hindrance in discourse, a disturbance in the effective transfer of ideas. That's why in the 1983 essay, Kuhn wrote "incommensurability thus equals untranslatability" (1990, p. 299). The lack of a common 'idiom' resists the articulation of the alternative paradigms in the same set of linguistic terms. The problem which thus arises in science is the impossibility of direct interaction between the rival theories. The practitioners who work with

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the existing paradigm are not able to decipher the claims of the practitioners of a different paradigm because as Polanyi (1958) noted, the opponents "think differently, speak a different language, live in a different world" (p. 159). A successful inter-paradigm communication, therefore, requires the propounders from both sides to grasp the major conceptual changes that accompany a paradigm-shifting contribution or revolutionary science. In the absence of that, discourse is impossible. Kuhn gives the example of the idea of space in Newtonian and Einsteinian cosmology. When Einstein said space is curved, it was not penetrable by the practitioners because space itself was construed to be flat and homogenous, in the absence of such a conceptualization of space, Newton's science wouldn't have made sense. Thus, the whole conceptual network consisting of inter-defined elements like force, time, matter etc. had to be redefined (Kuhn, 1962, p. 149). About the inevitability of conceptual changes in the construction of new knowledge, Kuhn writes: "this need to change the meaning of established and familiar concepts is central to the revolutionary impact of Einstein's science" (p. 102). In fact, Feyerabend's explanation more aptly describes the complete changes in the central concept and the associated terms that were necessitated in the transition from Newtonian to Einsteinian mechanics:

What does happen is, rather, a complete replacement of the ontology (and perhaps even of the formalism) of T' by the ontology (and the formalism) of T and a corresponding change of the meanings of the descriptive elements of the formalism of T' (provided these elements and this formalism are still used). This replacement affects not only the theoretical terms of T' but also at least some of the observational terms which occurred in its test. (Feyerabend, 1981, p. 45).

The major conceptual changes that accompany revolutionary science suggest that one theory is not derived from the other. For example, Newton's mass (which is conserved) is not derivable from Einstein's mass which is convertible with energy (Kuhn, 1962, p. 102). This break in continuity has been phrased differently by different philosophers. Polanyi's "logical gap" (1958, p. 130), Kuhn's "paradigm shift" (1962, p. 150), the French philosopher Gaston Bachelard's notions of "epistemological break" (as cited in Gutting, 1989, p. 14) all refer to the split where a new concept doesn't rationally follow the previous one. Thus, the transition from one paradigm to another is not a step by step process, it is a complete switch. There are no logical exchanges, give and take or negotiations possible between them. There is no synthesis; the old paradigm is rejected in total. Thus, the change from one paradigm to another, Polanyi (1958) said, is like a conversion process (p. 159). Later Kuhn re-affirmed,

> Equally, it is why, before they can hope to communicate fully, one group or the other must experience the conversion that we have been calling a paradigm shift. Just because it is a transition between incommensurables, the transition between competing paradigms cannot be made a step at a time, forced by logic and neutral experience. Like the gestalt switch, it must occur all at once (though not necessarily in an instant) or not at all. (Kuhn, 1962, p. 150).

The two paradigms are logically independent. Thus, science is re-articulated as progressive but discontinuous discourse. In the face of this logical discontinuity, what causes scientists to intellectually transpose from one paradigm to another? Polanyi (1958) answers: 'by exciting an "emotional response which can never be dispassionately defined" (p. 143). The role of rhetoric in science in bridging the logical gap first appears in the post-positivist philosophy of science through what Polanyi calls "persuasive passion." (p. 159). Later, Kuhn gives rhetoric a more methodically framed place in scientific practice.

Kuhn brings forth the consensus of the scientific community as the source of rationality in science. With the rival paradigms being incommensurable, scientific judgments on their relative merits are not just a matter of applying rules that could prove one paradigm superior to another. An appeal to external factors becomes imperative for comparing and evaluating the merit of one paradigm over another. And that external criterion is the consensus among the scientific community. Thus, the incommensurability of rival paradigms entails that the ultimate word concerning their merit will depend on the scientific community's judgment. Given that scientists are specifically trained to make fair and informed judgments of this sort, Kuhn asks, "What better criterion than the decision of the scientific group could there be?" (1962, p. 170). This emphasis on the scientific community's judgment as the ultimate source of science's rational authority is the most fundamental feature of his account of science. Both Polanyi and Kuhn were referring to the importance of consensus facilitated through rhetoric in scientific progress. Incommensurability "disables progress" (Harris, 2005, p. 3) and this "epistemological obstacle" (Bacherald, 1953, as cited in Gutting, 1989, p. 14) is overcome through rhetoric. Hence, Feyerabend argues, "there is no distinction between logic and rhetoric" (1981, p. 6).

Conclusion

Logical positivism entails that there's some algorithm rooted in the methodology that generates objective data which can lead to rational choice among the alternatives. The logic of that model is the possibility of a neutral language in which the tenets of the alternative theories could be expressed, compared, and assessed to reach an objective conclusion. But, the incommensurability between alternative frameworks resists an objective evaluation or the emergence of a 'rational choice' so crucial to the traditional notion of scientific progress. Hence, in the post-positivist philosophy of science, the acceptance of a new paradigm is not based on its relative merit in terms of the proximity to truth or the problem-solving potential. It is the persuasiveness of a theory which secures the consensus of the scientific community that leads to its incorporation into the discourse. The consensus facilitated through rhetoric enables advancement in science. Thus, science, in a sense, advances through rhetoric.

The academic scenario opened up where knowledge advances through rhetoric challenges the superior status of science based on its methodology. The implications of methodical pluralism and the role of rhetoric in knowledge-making inspire questions favorable for a project aimed at bridging the gap between the Sciences and the Humanities. For example, are the sciences and the humanities alike and subject to the same kind of epistemological limitations? Should science be considered synonymous with knowledge? Can we think of the rational and the irrational as two equally valid ways of seeking knowledge? Contemplations along these lines as well as further explorations into the rhetorical transactions between scientific incommensurables are definitely fruitful for the total re-fashioning of the academic fabric.

References

Bono, J. J. (1990). Science, Discourse and Literature: The Role/Rule of Metaphor in Science. In S. Peterfreund (Ed.), *Literature and Science: Theory and Practice* (pp. 59-77). Northeastern University Press.

Darwin, C. R. (1887). The Autobiography of Charles Darwin. In F. Darwin (Ed.), *The Life and Letters of Charles Darwin* (pp. 25-87). D Appleton and Company.

Feyerabend, P. K. (1981). Explanation, Reduction and Empiricism. *Realism, Rationalism and Scientific Method, Philosophical Papers* (Vol.5, pp. 44-96). Cambridge University Press.

.

Feyerabend, P. K. (1981). Historical Background. *Problems of Empiricism, Philosophical Papers* (Vol.2, pp. 1-33), Cambridge University Press.

Feyerabend, P. K. (1993). *Against Method: Outline of an Anarchistic Theory* (3rd ed.). Verso.

Gutting, M. G. (1989). *Michel Foucault's Archaeology of Scientific Reason*. Cambridge University Press.

Hanson, N. R. (1958). *Patterns of Discovery: An Inquiry into the Conceptual Foundations of Science*. Cambridge University Press.

Harris, R. A. (2005). "Introduction". *Rhetoric and Incommensurability (*pp. 3-149). Parlor Press.

Kuhn, T. S. (1962). *The Structure of Scientific Revolutions (*2nd ed.). University of Chicago.

Kuhn, T. S. (1990). Dubbing and Redubbing: the Vulnerability of Rigid Designation. In C. W. Savage (Ed.), *Scientific Theories* (pp. 298-318). University of Minnesota Press.

Kuhn, T. S. (2000). A Discussion with Thomas Kuhn. In James Conant and John Haugeland (Eds.), *The Road since Structure: Philosophical Essays, 1970—1993, with an Autobiographical Interview* (pp. 253-324). University of Chicago Press.

Laudan, L. (1968). Theories of Scientific Method from Plato to Mach: A Bibliographical Review. *History of Science 7*(1), 1-63. doi: 10.1177/007327536800700101.

Laudan, L. (1977). *Progress and its Problems: Towards a Theory of Scientific Growth*. Routledge & K. Paul.

Newton, I. (1848). *Newton's Principia: The Mathematical Principles of Natural Philosophy*. Trans. A. Motte. New York: Daniel Adee.

Peterfreund, S. (1990). *Literature and Science: Theory and Practice*. Northeastern University Press.

Polanyi, M. (1958). *Personal Knowledge: Towards a Post-Critical Philosophy.* University of Chicago Press.

Popper, K. R. (1972). *Objective Knowledge: An Evolutionary Approach.* Oxford: Clarendon Press.

Ray, C. (2001). Logical Positivism. In W. H. Newton-Smith (Ed.*), Blackwell Companions to Philosophy* (pp. 243-245). Blackwell.

Sarton, G. (1957). *The Study of the History of Mathematics and the Study of the History of Science*. Dover Publications.

Shapere, D. (2001). Scientific Change. In W. H. Newton-Smith (Ed.), *Blackwell Companions to Philosophy* (pp. 413-422). Blackwell.

Snow, C.P. (1961). *The Two Cultures and the Scientific Revolution.* Cambridge University Press.

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