

On Cognitive Authority and its Establishment

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요 약

이 논문은 실증주의적 과학철학의 주요한 두 기본개념, 즉 보편적 합리성과 독립적 실재를 새 조망에 비추어 검토하려 한다. 두 개념은 새 과학철학에서 전통의 개념으로 통합된다. 쿤, 풀러, 매킨타이어는 어떤 점에서 꽤 다르기는 하지만 모두 과학의 전통적 성격을 논한다. 나는 문화의 구성적 및 상호작용적 부분으로서의 과학의 새 이미지를 제시하기 위해 그들의 명제들을 상보적 방법으로 종합하려 한다. 그 다음 서로 다른 문화들을 서술하는 인류학자들의 도구들이 주어진 역사적 기간에서의 과학적 실행의 전체성을 서술하는 방법으로서 도입될 것이다.

I

Philosophers of science have cherished an ideal of science as objective and rational study of the 'things' in the pursuit of permanent truth. This has certain implications concerning the nature of cognitive authority and its establishment. First of all, they assume that the authority by which scientific statements are evaluated is perfectly impersonal.

A fundamental feature of science is its ideal of objectivity, an ideal that subjects all scientific statements to the test of independent and impartial criteria; recognizing no authority of persons in the realm of cognition.¹⁾

As Gutting points out, this claim presupposes that scientific authority has to be impersonal in order to be rational. They endeavour to invent a set of methodological rules that conform to their standard of rational cognitive authority. Secondly, cognition is understood as a direct relationship between the observer and the observed without any personal influence. The meaning of the observed 'reality' is, therefore, permanently fixed. A scientific

* Received November 11, 1985; accepted December 18, 1985.

1) Israel Scheffler, *Science and Subjectivity*(Indianapolis: Bobbs Merrill, 1967), p. 1.

'fact' is such a 'true' representation of reality. Theories are, on the other hand, transient and their fate is determined by observations and experiments that yield invariable scientific 'facts'. Scientific development, as a corollary, consists in the accumulation of such 'facts'.

Scientists helped this philosophical attitude by writing textbooks. Science textbooks typically depict an unhistorical and atomistic image of science as constellation of facts, theories, and methods collected in current texts. Scientific development then consists of an ever-growing stockpile to which these items have been added.

Those texts have, for example, often seemed to imply that the *content* of science is *uniquely* exemplified by the observations, laws, and theories described in their pages,... scientific methods are simply the ones illustrated by the manipulative techniques used in gathering textbook data, together with the *logical* operations employed when relating those data to the textbook's theoretical generalizations. The result has been a concept of science with profound implications about its nature and development.²⁾

Kuhn criticizes the textbook image of science: though of pedagogic utility and abstract plausibility, it does not fit the scientific enterprise that historical study displays. He proposes a new image that can be obtained by a new historiography. A new historiography, according to Kuhn, displays the *historical integrity* of science in its own time rather than seeking the permanent contributions of an older science to our present vantage.

They ask, for example, not about the relation of Galileo's views to those of modern science, but rather about the relationship between his views and those of his group, i.e., his teachers, contemporaries, and immediate successors in the sciences. Furthermore, they insist upon studying the opinions of that group and other similar ones from the viewpoint that gives those opinions the maximum internal coherence and the closest possible fit to nature.³⁾

The new image of science, historical and holistic, implies a different understanding of scientific authority and its development. Firstly, the cognitive authority of science resides not in the rules, but in the scientific community or tradition. Therefore, the antithesis between tradition and science, the irrational and the rational, and the social and the natural has to be reformulated. Secondly, cognition is not only constrained by the natural world but also by the social or, in a broader sense, by cultural tradition. Scientific development then consists of the successive reconstructions of this tradition.

Once science is understood as a tradition-bound activity and as an integral part of culture, the attempts to describe a scientific tradition as a totality become a similar job to an anthropologist's task of understanding different cultures. The transition from the universalistic to relativistic understanding of culture in anthropology, in fact, required the transition from the 'old' to the 'new' philosophy of science. Both transitions entail the same kind of problem; philosophers will have to avoid both extreme skepticism and realism, and anthropologists, both universalism and cultural radicalism.

2) Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962), p. 1.

3) *Ibid.*, p. 3.

This essay will examine two basic concepts—universal rationality and independent reality—that are essential to the positivist philosophy of science in the light of new perspective. Both concepts merge into the concept of tradition in the new philosophy of science. Thomas Kuhn, Ludwig Fleck, and Alasdair MacIntyre all discuss the traditional character of science, though they differ significantly at certain points. I will try to bring their theses together in a complementary way in order to present the new image of science as a constitutive and interactive part of culture. Anthropologists' tools of describing different cultures will then be introduced as a way of describing the totality of scientific practice at a given historical period.

II

Philosophical idealization of the established sciences—especially physics and chemistry—precipitated a sharp demarcation between the rational and the irrational, the natural and the social, and science and non-science, thereby presenting an image of science as the true exemplar of rational and objective thinking. Positivists believe that rationality or logic is the ethos of science whereas the 'irrational' tradition dominates the social beliefs.

Positivism treats tradition and science as natural enemies. Traditional beliefs and practices exercise a magical power over men which protects them from the critical appraisal of common sense. Science demystifies tradition; it penetrates the enchanted defenses of tradition and exposes its cognitive and technical absurdities.⁴⁾

Consequently, sociology of science, defined as 'the relationship between scientific thought and the social context in which it arises', was stillborn. Merton broke down this science/tradition antithesis, but to a limited degree. He differentiated science as a system of ideas from science as an institutional system, and restricted sociological analysis exclusively to the latter. Sociologists were then able to deal with the non-logical element—the behavioral norms and values of the scientists—but not the cognitive aspect of science. In Mertonian sociology, for example, the priority dispute over a scientific discovery was accounted for purely as social behavior of scientists, which had nothing to do with intellectual authority.

It [priority dispute] is the case that the institutional order of science singles out originality as a supreme value and generously rewards it, for it is "through the cumulation of original contributions" that knowledge advances. So that scientists who pursue claims for priority of discovery..... are responding to normative pressures and acting out their social role.⁵⁾

Mertonian sociology, therefore, left intact the positivists' ideal that science develops through accumulation. Historians of science also accepted this separation between ideas and behaviors and restricted their concern to the former. They tried to provide an exact chronology of scientific discoveries that enabled them to construct a causal chain among scientific ideas. The 'internal' development of scientific ideas was immune from the 'external'

4) M.D. King, "Reason, Tradition, and the Progressiveness of Science," in *Paradigms and Revolutions*, ed. by Gary Gutting (Notre Dame: University of Notre Dame Press, 1980), p. 144.

influences.

According to King, Kuhn finally broke down the Mertonian 'divorce of convenience' by asserting that cognitive authority of science resides not in the rules but in 'local' tradition.

.....the practice of science is monitored not by universal rules but by "local" traditions of thought which define for a particular group of practitioners precisely what problems, methods, theories are to count as scientific, and where the boundaries of their scientific authority are to be drawn.⁵⁾

Kuhn rejects not only the idea of universal rationality but also that of objective reality. For Kuhn, rationality is subordinate to, and reality is constrained by, a given scientific tradition. What then is the nature of scientific tradition and how does it affect the development of science?

The concept of *paradigm* lies at the heart of Kuhn's characterization of a scientific tradition. The basic sense of the word is an exemplary past achievement.

By choosing it [paradigm], I mean to suggest that some accepted examples of actual scientific practice—examples which include law, theory, application, and instrumentation together—provide models from which spring particular coherent traditions of scientific research.⁷⁾

Paradigm, as a concrete achievement, serves as the focus of consensus for a scientific community, and continues to provide the framework for further research. Normal science is simply the extension and further articulation of the methods, theory, technique, etc. embodied in the paradigm, and in this sense springs from it.

The indefinite use of the word paradigm, however, caused Kuhn a great deal of trouble. Subsequently, he differentiated the sociological sense of the word from that of an exemplar. The former sense, referred to as a 'disciplinary matrix', comprises the entire constellation of beliefs, values, techniques, etc. shared by the members of a given community. Though Kuhn suggests the main components of 'disciplinary matrix', such as symbolic generalizations, metaphysical parts, values, and concrete problem-solutions, it would be intrinsically impossible to provide an exhaustive list of such components considering the complex nature of a tradition. Rather than trying to give paradigm an analytical definition, I think it is necessary to understand paradigm in a symbolic sense as well as a concrete scientific achievement, as the true embodiment of a scientific tradition.

Once a tradition is established, it exerts influence on perception so that it can force nature into the "preformed and relatively inflexible box" that the paradigm supplies—vision itself is restricted. Therefore, cognition cannot be a mere recognition of the natural world, but is also restricted by a given tradition or the individual variety of it.

Observation and experience can and must drastically restrict the range of admissible scientific belief, else there would be no science. But they cannot alone determine a particular body of such belief. An apparently arbitrary element, compounded of personal and historical accident, is always a

5) *Ibid.*, p. 100.

6) *Ibid.*, p. 104.

7) Kuhn, *op. cit.*, p. 10.

formative ingredient of the beliefs espoused by a given scientific community at a given time.⁸⁾

In other words, cognition involves the observer's ways of seeing the world. In the priority dispute over oxygen, for example, the reason why it is difficult to locate the discoverer of oxygen, according to Kuhn, is that a discovery consists not only in 'that something is' but also in 'what it is'. The value of 'something out there' depends on the interpretation of 'what it is'. This is particularly true for a period of paradigm transition. Neither 'dephlogisticated air' nor 'oxygen' was the unique or right expression of the reality at the transitional period. Both were correct within their own frame of thinking. Furthermore, 'dephlogisticated air' was just as real to phlogiston theorists as 'oxygen' is to us. Therefore, it does not work for Kuhn that the scientific 'interpretation' or 'theory' changes, but not scientific 'facts'. Facts themselves changed with theories.

Fleck suggests an even more dynamic picture of a scientific tradition. Cognition, for him, is not the direct relationship between the observer and the observed, but an interactive process among the observed, observer and the collective. This dynamic interaction of the cognitive process depicts an image of science as an ever-changing holistic unit. Thought style then embodies such an ever-changing tradition that is shared by the thought collective.

If we define 'thought collective' as a community of persons mutually exchanging ideas or maintaining intellectual interaction, we will find by implication that it also provides the special 'carrier' for the historical development of any field of thought, as well as for the given stock of knowledge and level of culture. This we have designated 'thought style'.⁹⁾

The constraint of a given thought style is such that any explanation, in order to survive, has to be stylized in conformity with the prevailing thought style. A scientific fact is such a stylized conceptual relation that is, of course, constrained by the physical reality. Since facts are as much historical and cultural construction as theories, the positivistic theory/fact separation cannot obtain. Also the idea of pure observation and experiment becomes nothing but a myth; perception itself is stylized.

Observation and experiment are subject to a very popular myth. The knower is seen as a kind of conquerer, like Julius Caesar winning his battles according to the formula "I came, I saw, I conquered". ...this situation does not obtain...until tradition, education, and familiarity have produced a readiness for stylized (that is, directed and restricted) perception and action.¹⁰⁾

Being logical, Fleck contends, is nothing but being true to style. Even the perception of physical reality is stylized. Therefore, cognition is the most socially-conditioned activity and knowledge is a paramount social creation. The whole system is self-contained and is ensured a harmony within itself.

Both Kuhn and Fleck acknowledges the personal or cultural constraint in the realm of cognition. Cognition is constrained not only by the natural world but also by the prevailing

8) *Ibid.*, p. 4.

9) Ludwik Fleck, *Genesis and Development of a Scientific Fact*, ed. by Thaddeus J. Trenn and Robert K. Merton (Chicago: University of Chicago Press, 1979), p. 39.

10) *Ibid.*, p. 84.

tradition. A paradigm, shared by a scientific community, symbolizes the tradition of normal science for Kuhn, whereas the thought style carries on the tradition, which is shared by the thought collective for Fleck. A tradition is a self-contained system and forces nature into the framework that it provides. The tenacity of an existing system is such that any contradiction to the system appears unthinkable; anomalies will not be even noticed and if it is, numerous articulations and *ad hoc* modifications will be devised in order to eliminate any apparent contradiction.

Obviously, this tradition-bound character and the 'irrational' resistance of a scientific tradition cannot be reconciled with the positivist's ideal that science develops by rational and impersonal confirmation or falsification or that knowledge simply increases.

Fleck's understanding of a tradition shows a built-in mechanism for change. He describes knowledge as essentially historical. The existing body of knowledge, the collective, and the individual interact with one another incessantly so that knowledge as a totality not only increases but also changes. Therefore any scientific knowledge or even a single concept is the way it is because of just this particular history. Knowledge is ever-growing and ever-changing. The harmony of the whole system emerges in the way which an on-going conversation crystallizes a consensus.

...it is as if we wanted to record in writing the natural course of an excited conversation among several persons all speaking simultaneously among themselves and each clamoring to make himself heard, yet which nevertheless permitted a consensus to crystallize.¹¹⁾

Whereas Fleck understands scientific development as a continuous process, Kuhn suggests a discontinuous development. He distinguishes two kinds of development, one in the tradition of normal science and the other, paradigm transition.

The development within normal science is highly cumulative. It consists of puzzle-solving. Puzzles are legitimate problems for which the existence of a solution is assured. They serve to test the ingenuity or skill of a scientist because he has to solve the anticipated in a new way. The purpose of puzzle-solving is largely to add to the scope and precision with which the paradigm can be applied. Though development within normal science is a cumulative process, it does not precisely conform to the positivist account since it presupposes a strong commitment to a given tradition. Puzzle-solving activity requires the existence of a paradigm since, to be classified as a puzzle, a problem must be assured not only the existence of solution but also the rules that limit both the nature of acceptable solutions and the steps by which they are to be obtained. The rules are derived from a paradigm. Therefore, the puzzle-solving activity is not a direct confrontation with nature as positivists would like, but a tacking of problem which is defined within a tradition in order to find a solution that is agreeable to the tradition.

The strong commitment to a given paradigm, on the hand, makes any novelties inconceivable. On the other hand, it allows the occasions for radical paradigm changes. According to Kuhn, normal science is a particularly effective way of inducing a paradigm change

11) *Ibid.*, pp. 14-15.

because it concentrates on a narrowly-defined range of problems so that its precision serves as an extremely sensitive indicator of anomaly. Normal science, in this sense, possesses a built-in mechanism for paradigm change.

Anomalies, however, are not treated as counter-instances. For a scientific theory, once declared as a paradigm, is not confirmed or falsified by direct confrontation with nature, but is rejected or accepted in competition with another paradigm by a scientific community.

They do not, that is, treat anomalies as counter-instances, though in the vocabulary of philosophy of science that is what they are...No process yet disclosed by the historical study of scientific development at all resembles the methodological stereotype of falsification by direct comparison with nature...The decision to reject one paradigm is always simultaneously the decision to accept another, and the judgement leading to that decision involves the comparison of both paradigms with nature *and* with each other.¹²⁾

Paradigm choice is analogous to a political revolution because it is a choice between *incompatible* modes of community life. The world itself changes with paradigm change, and scientists are responding to a different world after revolution. "What were ducks in the scientist's world before the revolution are rabbits afterwards."¹³⁾ Kuhn phrased this experience in terms like "conversion experience" or "gestalt switch".

The *incommensurability* of the two competing paradigms, and consequently of the two traditions, entails the problem of rational continuity in the paradigm transition.

So scientific choices are only rational within the context of a single viewpoint of unquestioned authority; choice between alternative viewpoints, though constrained by logic and observation, necessarily involves "an element of arbitrariness," it is in the last resort a non-rational social act, an act of faith likened by Kuhn to religious conversion.¹⁴⁾

In fact, Kuhn tries to avoid this charge of irrationality by referring to the collective rationality of a scientific community. So in paradigm choice, "there is no standard higher than the assent of the relevant community".¹⁵⁾ The characteristics of a scientific community that provides the continuity between incommensurable traditions, however, remain to be clarified.

MacIntyre attempts to solve the rational discontinuity in Kuhn's tradition by putting the crisis itself in the context of the existing tradition. He proposes dramatic narrative as the embodiment of a tradition. Sharing a culture, in his opinion, is to share a schemata that provides the generalizations and interpretations of behavior of myself and others. Once this interpretation is put into doubt, one is trapped in the epistemological circularity, not knowing which one to accept first, schemata or evidence. Multiplicity of possible interpretations are now open to him, and he has to construct a new dramatic narrative, informed by truth and intelligibility, to resolve this epistemological crisis. Enlarged new narrative

12) Kuhn, *op. cit.*, p. 77.

13) *Ibid.*, p. 111.

14) King, *op. cit.*, p. 105.

15) Kuhn, *op. cit.*, p. 94.

enables one to become epistemologically self-conscious and therefore to acknowledge the historicity of the narrative; that his new forms of understanding can be put into question at any time and that one can never claim that he possesses the truth or that he is fully rational because it is the very criteria of truth, intelligibility, and rationality that are put into question at the time of crisis. Epistemological progress consists in the construction and reconstruction of more adequate, but not the right, narratives for which epistemological crises are the occasions.

Yet to raise the question of truth need not entail rejecting myth or story as the appropriate and perhaps the only appropriate form in which certain truths can be told.¹⁶⁾

MacIntyre understands Kuhn's crisis and paradigm transition in terms of the epistemological crisis and consequent reconstruction of the new narrative. However, he disagrees with Kuhn in understanding the nature of a tradition. He sees tradition as being constituted of different interpretations of that tradition—a conflict—instead of as being based on a consensus.

Notice that all three kinds of tradition—religious, political, intellectual—involve epistemological debate as a necessary feature of their conflicts. For it is not merely that different participants in a tradition disagree; they also disagree as to how to characterize their disagreements and as to how to resolve them. They disagree as to what constitutes appropriate reasoning, decisive evidence, conclusive proof.¹⁷⁾

It is this conflict built in the tradition that puts tradition in danger of lapsing into incoherence. Crisis develops within the existing tradition.

MacIntyre interprets Descartes's failure as ignoring the context of doubt. Descartes did not put in doubt, first of all, what he inherited with language—a way of ordering both thought and the world expressed in a set of meanings, and secondly, the tradition—especially the epistemological ideals concerning the conception of knowledge. As a result, he invented an unhistorical self-endorsed self-consciousness and described his epistemological crisis in terms of it.

MacIntyre then criticizes Kuhn's crisis as Cartesian. According to MacIntyre, Kuhn's three-fold incommensurability does not lead to the 'conversion experience' without further premise of total discontinuity of rationality.

It is not just that the adherents of rival paradigms disagree, but that *every* relevant area of rationality is invaded by that disagreement...It is that scientific revolutions are epistemological crises understood in a Cartesian way. Everything is put in question simultaneously. There is no rational continuity between the situation at the time immediately preceding the crisis and any situation following it. To such a crisis the language of evangelical conversion would indeed be appropriate.¹⁸⁾

16) Alasdair MacIntyre, "Epistemological Crises, Dramatic Narrative, and the Philosophy of Science," in *Paradigms and Revolutions*, p. 59.

17) *Ibid.*, p. 62.

18) *Ibid.*, p. 68.

It is not clear to me, however, that Kuhn's crisis is totally contextless. After all, as Kuhn acknowledges, it is normal scientific tradition that causes an anomaly to create a crisis, even though he seems to speak for a total discontinuity. Kuhn's crisis must develop within the given tradition.

In understanding a tradition, MacIntyre's conflict and Kuhn's consensus could be brought together using Fleck's dynamic picture. Taking MacIntyre's example, I might have to recognize that the tradition of Judaism is constituted by a continuous argument over what it means to be a Jew, "if I am a Jew". Acknowledging that I am a Jew will be in this case a Kuhnian consensus. Similarly, when the phlogiston theory was prevalent, every chemist had different idea concerning the nature of phlogiston, material or immaterial, etc., but they agreed that phlogiston existed and it had something to do with the combustion phenomena. A tradition could spring from a focus of consensus; it is the dynamic nature of tradition that develops conflicts within itself. By admitting this dynamic of tradition, Kuhn's problem of rational discontinuity could be partly resolved in MacIntyre's formulation. Another possibility would be to extend the scope of tradition, which Kuhn restricts more or less to a scientific specialty, to the cultural dimension and to accept the rationality of social act itself.

III

Anthropologists have also been trying to change the image of science as something unique, apart, and different. Science as a system of ideas was, in the old philosophy of science, a self-regulating system governed by inner logic, immune from any external influence—social and cultural—, therefore was trans-cultural. The ideal of universal logic expressed in the grand scheme of cause and effect deeply affected social sciences, including anthropology. Traditionally, an anthropologist's job was to make the beliefs and practices of the "primitive" culture intelligible to himself and his readers. This meant presenting an account of a "primitive" culture that will somehow conform to the rationality of Western people, which was deeply influenced by the achievements and methods of the sciences. Belief in magic or the practice of consulting oracles is almost a paradigm of the irrational in Western culture, because it does not have any causal relationships implied in them. Describing the integrity of a "primitive" culture was prohibited.

Anthropologists, therefore, in their attempts to understand the integrity of a 'primitive' culture as a 'local universe', try to change the 'old' image of science and include science in their category of culture. In order to do that, they had to reify the concepts of reality and rationality, which were the hallmarks of Western science.

Peter Winch argues that neither rationality nor independent reality is monopolized by science. He agrees with Evans-Pritchard that the 'scientific' approach—causal explanations—is not evidence of any superior intelligence, but a cultural product. A western man merely accepts that everybody else in his society accepts, namely that rain is due to natural causes, and for the same reason a Zande refers to witchcraft.

He [a Zande] did not build up this belief from his own observations and inferences but adopted it in the same way as he adopted the rest of his cultural heritage, namely, by being born into it. He and I are both thinking in patterns of thought provided for us by the societies in which we live.¹⁹⁾

Magic in the Azande culture and in western culture have completely different meaning. Magic is the way in which Azande people explain the natural phenomena without contradiction, if science works in the same way for us. Rationality, understood as a grand scheme of cause and effect, is displaced and 'the logical thinking that conforms to the chosen framework' becomes the new sense of the word.

Evans-Pritchard, however, confirms the uniqueness of science still on the other ground—that of independent reality.

Scientific notions are those which accord with objective reality both with regard to the validity of their premises and to the inferences drawn from their propositions... Logical notions are those in which according to the rules of thought inferences would be true were the premises true, the truth of the premises being irrelevant...²⁰⁾

I have already shown that both Kuhn and Fleck agree that not only the representation but also the perception of reality are constrained by a given tradition. Truth, for Fleck, is nothing but a stylized solution which is unique *within* a thought style. Winch also argues that what is real depends on the tradition which is manifested in the use of language. In fact, any tradition has the notion of the independent real as a check. For example, God's reality is independent, but only within the religious use of language. Therefore, reality is not what gives language sense. What is real and what is unreal shows itself in the sense that language has.

In a nut shell, anthropologists advocate that knowledge, including scientific knowledge, conforms to *local* tradition and that language embodies the tradition. Consequently, their job becomes translation. Once one understands science as a dimension of culture, historian of science also have the same job as anthropologists do.

.....we can claim that the typical historical quest for understanding different periods in our own western culture, the typical anthropological task of understanding other cultures and the psychologists' aim of understanding the different stages of cognitive, moral or emotional developments are all basically one and the same question, and the tool for dealing with them is *translation*.²¹⁾

Translation in relativistic anthropology employs "hermeneutic" approach. Hermeneutics, according to Geertz, treats cultural phenomena as significative systems and try to show how a cultural system makes sense to itself. In his study of the concepts of selfhood, he intends to present a credible, fleshed-out picture of a human form of life by 'tacking' between increasingly fine-comb observations (of how Javanese distinguish feelings, Balinese

19) Peter Winch, "Understanding a Primitive Society," *American Philosophical Quarterly*, Vol. I, No. 4, Oct. 1964, p. 308.

20) *Ibid.*, p. 308.

21) Yehuda Elkana, "A Programmatic Attempt at an Anthropology of Knowledge," *Sociology of the Sciences*, Vol. V, 1981, p. 3.

name children, etc.) and increasingly synoptic characterizations ("quietism", "dramatism", "contextualism") so that

"Translation", here, is not a simple recasting of others' ways of putting things in terms of our own ways of putting them... but displaying the logic of their ways of putting them in the locutions of ours;²²⁾

Geertz is suggesting that one can perceive the integrity of a culture by "hopping back and forth between the whole conceived through the parts that actualize it and the parts conceived through the whole that motivates them,..."²³⁾ Geertz is, therefore, depicting an holistic picture of culture. Parts are not the analytical subdivision of culture, but are the interacting dimensions through which the whole can be conceived and the whole is not the sum of its dimension but has a separate reality and different meaning attached to it.

Yehuda Elkana is in the same line with Geertz. He advocates that various dimensions of culture are correlates, all cultural systems. In order to describe the totality of a culture, one can employ each dimension as a "totalizing" prism. The resulting multiplication of the points of view, in his opinion, allows a "richer" understanding of culture. This multi-layer description is "thick description", which allows to describe the complexity of thinking. Elkana identifies thick description with hermeneutic circle.

Elkana then suggests that history of science should be thick description in which multiplicity of complex conceptual structures, image, body and sources of knowledge are superimposed upon each other. They are all context-dependent. History of science, therefore, should be also a history of culture in which science is used as the totalizing prism.

Yet there is no history of science which pretends to be also a history of culture. Depending on the onlooker's image of knowledge, science is almost always upgraded or downgraded to be in a class by itself—different. Science is rarely considered as much of a totality of human culture as is art or religion, because it is seen as something different, unique, apart.²⁴⁾

Hermeneutics, applied in history of science, will be also a movement away from causal explanation. Instead it will try to place a scientific tradition in its cultural tradition and describe the former as an interactive part of the latter. Language, as the embodiment of cultural tradition, will be given the utmost importance and analogy will serve as the most effective way of describing the complex relationships within a given culture.

IV

The 'new' image of science, as opposed to the positivist one, has been presented. By breaking down the dichotomy between science and tradition, the new image invalidates the positivist ideal that the cognitive authority of science lies in the invariable facts and universal rules. Sociologists and historians of science as well as anthropologists identify

22) Clifford Geertz, *Local Knowledge*, New York: Basic Books, 1983, p. 10.

23) *Ibid.*, p. 69.

24) Elkana, *op. cit.*, p. 6.

the traditional character of science and try to demonstrate the integrity or totality of a tradition, instead of defining its analytical parts and seeking the causal relationships among them. Since language embodies the whole tradition, translation becomes their major concern and analogy serves their purpose.

So far, realism and relativism have been discussed as two antagonistic philosophical trends. They suggest completely different research directives in the sociology and history of science as well as in anthropology. Cultural relativists, however, intend to avoid cultural radicalism or, in philosophical term, extreme skepticism. Geertz, therefore, comments that cultural phenomena, such as, art, religion, law, or science, is neither some transcendent phenomena variously disguised in different cultures nor a notion so thoroughly culture-bound as to be useless beyond Europe. The truth of cultural relativism, he argues, is not that we can never comprehend other cultures at all but that we can never apprehend them as though they were our own. Accordingly, Elkana also concludes that the choice between realism and relativism is not unavoidable, but that they are held simultaneously by most people on most issues. He proposes, therefore, "two-tier thinking".