

OBJECTIVITY An Epistemological Value

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ABSTRACT

The question addressed here is if there is something on which human beings in different cultures and disciplines can agree in their knowledge searches. We start with seeking a common method of research in natural sciences. Finding that common element even in natural sciences is not a method, we settle for a common human standard, namely objectivity (meaning the same knowledge compatible with experience and logic for all). But in contrast to both objectivism and relativism, we present objectivity as a *value* to be interpreted, like a moral value, by different persons in different styles. This view is hoped to care both for the demands of standardization as well as for the human dignity in knowledge evaluations. Not only that, a due respect is given to the role of tradition while checking if our Islamic tradition and its underlying beliefs are objectively valid for all the humanity.

The Universal Method or Only Human Standards?

Understanding the sources and means of knowledge is the fundamental question of the theory of knowledge (epistemology). This question can be posed in terms of the method, if

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any, of acquiring the knowledge and the criteria of knowledge: how do we know if a claim to knowledge is valid. This analysis of the validity of knowledge can then be specialized to evaluate known sources of knowledge, thus to find out what are really sources of knowledge. Practically, we want to know if there is a *method* that any inquiring mind or, at least, any researcher of any discipline and any culture has to follow to make such knowledge evaluations? Or, putting less demands on the method, is there a method that can be a useful guide to any researcher in any subject matter and any culture?

If there really is such a method, it must have been followed in the natural sciences where the process of inquiry and evaluation seems relatively intelligible. Is it really so? Is there a well-prescribed procedure for acquiring knowledge in natural sciences, along with a well-judged and well-understood source of knowledge, so that knowledge simply follows from the source through the method regardless of the presence or absence of a conscious agent — an inquiring mind? Or *all* the knowledge evaluations, including those in the natural sciences, are human activities, with the human nature reflected in one way in natural sciences and in another apparently different way in social sciences and humanities?

There have been descriptions of the ‘scientific method’ in the form that “a scientist collects data and builds hypothesis out of it. If the data verifies the hypothesis, it is accepted, otherwise rejected.” And then there has been a suggested procedure from hypothesis to theory and then to the ‘proved’ laws etc. But the two ingredients of this ‘method’ are clearly problematic:

- (1) If theories or laws are *proved* by observations and experiments, they cannot *become* wrong later. But there have been many well-established theories (termed ‘laws’) in science rejected or modified with time.¹ For example the fundamental principles of the Newtonian physics, that Immanuel Kant’s philosophical work² was aimed to prove, turned out in the 20th century to be non-applicable to the atomic physics etc.

- (2) Hypotheses do not result from data, observations and experiments but are conjectures³⁻⁴ resulting from what we call 'the human creativity.'

These arguments against 'the method' should *not* be taken to imply that "any thing goes," leading to what is termed as relativism.⁵ At least for natural sciences, Karl Popper and others have suggested revised versions of the scientific method that incorporate the above-mentioned lack of proof and lack of theory-generating procedure. Any description of this revised 'method' must start from considering the previous knowledge or tradition. Through observations and experiments, Popper says,⁶ scientists try to refute *existing* theories. If theories are refuted in this way, scientists go back to modify them. With time, they try to refute the new theories as well. (Our confidence in the theories not refused in this way gets developed, and this is the journey to laws etc.).

This Popperian description may be termed 'the scientific *method*', but actually it is not a procedure to be mechanically followed. It is actually a statement of the constraints on scientists: their theories should not be against human observations, experiments, logic and mathematics. Popper's own emphasis is on the demand that scientists should satisfy the demarcation criteria distinguishing science from non-science, particularly the criterion of refutability⁷ or testability. As far as scientific theories are concerned there is no denying that a non-refutable scientific theory is not related to any *particular* fact and thus can be termed empirically non-testable and unscientific. But here we are not concerned with peculiarities of scientific theories; we are considering science to be one of the human activities that can illustrate what an inquiring mind should care for in general. We want to learn a lesson from science useful for any evaluation of knowledge claims, and that lesson is that knowledge should *not be against* human observations, experiments, logic and mathematics. Further details, such as the Popper's refutability or testability, do not apply to for example historical analysis: Historical facts, such as the American Civil War, are not

reproducible and hence *not refutable*, testable or falsifiable, but still a very important part of our knowledge!

How we manage to satisfy the demand of being not against experience and logic may differ from discipline to discipline. Popper has told us that in natural science, that demand has been met by efforts to refute the existing theories and replacing these with the new ones. This has the implication that the scientific theories must be refutable or testable. This condition would apply *only* to disciplines which progress by better summarizing the expanding human experience. But for the other subjects matters, like logic, mathematics, metaphysics⁸, historical analysis, interpretation of manuscripts, studying the perennial human feelings and values etc., that are not bound to progress, the only instruction to be cared for remains not to be against observation and logic and always opting for the best explanation of the human experience. That much basic instruction remains same whether it is a question of explaining some particular facts in natural sciences, of understanding the human decisions, judgments, demands and feelings in history and social sciences, or of properly understanding the general nature of the universe in the valid religious cosmology. The difference between valid natural sciences, social sciences and religious cosmology is not in putting completely different kind of conditions on knowledge but only in being less and less concerned with the details (particular and hard facts) of the universe. Whatever is valid in natural sciences, social sciences, mathematics, logic, metaphysics and religious cosmology is valid because of satisfying the same demand of being the best explanation compatible with the human experience and logic, though *for different questions about the universe* in accordingly different styles.

A Perennial Human Ideal: Objectivity

Can we describe these constraints and demands on knowledge as the demand of searching for and accepting only objective statements? Literally, objective means the knowledge of the objects having existence outside the mind, the objects that can be observed. But restricting knowledge to the knowledge of

such visible items means reducing it to almost nothing: even I have not *observed* yet the future of the table in front of me. And in any branch of knowledge most of the terms are invisible items like force, energy, illness, atoms and subatomic particles.

This narrow sense of objectivity can be given a human flavour by declaring that the only source of knowledge is the *human* experience. Strictly speaking, human experience means human *past* experience (no one has experienced his future) and as such reducing knowledge to experience would again amount to reduce it to almost nothing, at least to nothing useful. (If knowledge does not give me even an idea of what will happen in future it is obviously useless.) So, knowledge is something more general than just knowledge of objects, knowledge of human experience or a way of avoiding clashes with human experience etc. It is also more than just mechanical manipulations like logical analysis and empirical generalizations that human beings do but computer can do as well; the crucial element of knowledge is the explanations of the human experience. The way these explanations are revealed to the human beings is termed the 'human creativity'. The human desire to get and/or evaluate the explanations of the experience can be termed as the human *explanatory interest*, like the technical interest and social interest that Habermas⁹ indicates. Explanations of experience are improving explanations of particular hard facts in natural sciences, a blend of fact-explanations and human *interpretations* in social sciences, un-improvable principles in logic and mathematics, and rational beliefs about the whole universe/being in the religious cosmology. (Any demand that the explanations of experience should *themselves* be some human experience or be logically inferred from the experience cannot be met. In science it is almost impossible to deduce the explanation (cause) from the experience (effect): the Newton's second law of motion cannot be derived from the daily life or scientific observations and experiments using only logic and mathematics. So, most of the times we have no other way than to simply test whatever are the *available* explanations, without thinking necessary to know in detail their origin. We can check only whether the explanation is *compatible* with logic and experience, if it is not inferred from

experience. And rarely, if ever, an explanation is inferred or derived from the experience.)

So, knowledge cannot be limited to knowledge of objects only or knowledge logically inferred from objects. But it can be practically demanded that the knowledge has to be *like* the knowledge of objects; knowledge should contain only those statements that are universal and neutral, like observations of objects, and not influenced by the personal feelings or opinions of the researcher. Items of knowledge should have properties and characteristics that transcend the beliefs and states of awareness of the individuals who devise and contemplate them; that is, these should be independent of the attitudes, beliefs or other subjective states of the persons, and thus be the same for any creature or object in the universe. In simple terms, objectivism means "what is said" in contrast to "who says it." This is the sense of objectivity normally meant and this is the sense meant in this article.

The term objectivism might have been phrased recently, but the demand to which it refers to is perennial. Greeks differentiated *episteme* (the certain knowledge) from *doxa* (mere personal opinions). In his classification of knowledge, Ibn-e-Khuldun¹⁰ had a category of knowledge that to which one is guided by his/her mind or innate abilities. It is *not restricted to one group* of people, but rather it is common to everyone. The Muslim philosopher Ibn-e-Tufail and others have tried through the different versions of the story of *Hai-bin-Yaqzan* that any person *free from cultural biases* can discover the truth of the Islamic beliefs through his reason.

Is Strict Objectivism Possible?

Objectivism has not been without opposition and misuses. The practical problems in achieving objectivity are fundamental: it is always a person that obtains knowledge and it may well be impossible for any person to free him or herself from private opinions; knowledge starts with human experience and human experience cannot be 'out there'. Absolute neutrality and objectivity are beyond human capacity. Scientists and scholars

are first of all human beings and thus have their own limitations as regards their pursuit to perceive, identify, understand and explain what they are after. Furthermore, as human actors, scientists and scholars are bound to be socialized in the forms of family, society and educational institutions etc. It is unrealistic to claim that human knowledge and science could cope to achieve absolute neutrality, objectivity and universalism. Is it not true that all observations and experiments directly or indirectly depend upon theories? Can thus observations be used to test theories? These problems are obvious in social sciences, but are not absent in natural sciences as well.¹¹ There are lots of problems¹² in justifying the descriptive statement "if a scientific theory is against an experiment *independent of theory*, the theory is wrong." For example how can you guarantee that an experiment to check a theory was not itself dependent on the very theory it was meant to test?

Beyond Objectivism and Relativism: Objectivity as a *Value*

The basic problem with objectivism is that we cannot neglect the role played by the *person* seeking knowledge. The person, the scientist, makes opinions and thus complete neutrality is not possible. Agreed. The person may not be able to achieve complete neutrality. But *should* not he or she try to achieve such neutrality? Is there any thing wrong with an effort to achieve such neutrality? Is trying to achieve neutrality condemnable or praiseworthy? The same questions could be asked about a *moral* value like telling the truth. Peoples do not always tell the truth. It may be argued that in the present age everyone tells a lie at some stage of life or other. So, the 'complete truth' may not be possible. But does that mean peoples should not tell the truth? It is one thing to say that peoples *do not* tell the truth and it is a different statement to say that they *should not* tell the truth. Not only that: peoples can blame each other of telling lies and even courts can and do punish persons violating the *normative* statement, the ethical instruction, of telling the truth. The normative statement has all this importance even

though the corresponding *descriptive* statement that “peoples do tell the truth” remains largely unjustified.

The same is the situation with objectivity: objectivity may be argued to be impossible, but there is no denying that it is desirable; peoples can and do violate it, but they *should* not. No knowledge is possible if efforts to be objective are completely forgotten and a violation of objectivity is considered praiseworthy, as then everyone would have his or her ‘private knowledge’. There may well be many mutually contradictory statements in this collection of ‘private knowledge’ and these all cannot be right.

But the importance of objectivity should not be used to present it as a logical condition on knowledge having a clear-cut meaning even in absence of human consciousness; you always need a person to judge for himself or herself what is an objective statement. Then others have to make their own *opinions* if they also consider these statements as objective. So, there is an unavoidable role of personal opinions, of subjectivity, of values and ethics,¹³ in the knowledge search and evaluations. But what saves knowledge from becoming useless and contradictory collection of mere ‘personal knowledge’ is that all the persons giving *opinions* on knowledge should use *the same criteria*: objectivity, not being against the human experience, logic and mathematics, consistency and being the best explanation of the relevant human experience.

This is a view of objectivity beyond both objectivism and relativism. It differs from objectivism in accepting that different persons may have slightly different concepts of what is objective and what is not, as the above-mentioned criteria have to be personally interpreted. Thus it is wrong, for example, for scientists or philosophers like Immanuel Kant² to insist that all the human knowledge has to satisfy *precisely* the same conditions on knowledge that are used in science and are now elucidated by for example Karl Popper; the conditions on knowledge or on the nature of causes and effects that scientists use are their interpretations that have worked for their *own* subject matter but may have to be somewhat relaxed in

understanding the human thoughts, feelings, judgments or the ultimate explanation of the universe.

The view of objectivity-as-a-value also differs from relativism⁵ in *denying* that different views about an issue are mutually incomparable or incommensurable. The presence of at least some of the common human standards often suggests each of the persons taking part in a debate what is valid and what is not. The peoples uttering invalid statements can be blamed for being not objective, inconsistent or against logic or experience, and everyone can make rational judgments about the validity or otherwise of these blames. And while defending, a person knows what kind of claim (being consistent, objective or giving the best explanation of the experience) has to be made and what kind of arguments are to be presented for it. What other than objectivity can be that every researcher should claim and every critic should demand?

It may be argued that such communications, or at least knowledge standardizations, are very difficult across different cultures. But even if it is impossible for persons in two cultures to agree on what is knowledge, it remains possible for them to understand what is *not* knowledge. For example, peoples in different cultures may differ in their ultimate explanations of the universe, but no one would be justified in denying that there has to be *some* explanation of the universe that is not a natural one. (A natural explanation would require a further explanation and this series could never terminate.) Everyone can appreciate that it is not necessary to know all the details of views like 'some explanation' before believing in it. This is because every person in his or her own life believes in lots of statements whose details remain unknown; even the best scientists believe in subatomic particles like electrons about which they cannot answer many questions¹⁴. Peoples in different cultures may find it difficult to understand each others mathematics, and may have even different opinions about mathematics being knowledge or mere tautology, but they can all easily judge if the number one is equal to the number three or not.

The Practical Considerations: Paradigms

Knowing just these two *norms* (1) do not contradict experience and (2) aim for objectivity rarely suffices for a researcher. In a particular research project, a researcher has to work in the context of the knowledge prevailing in the group of researcher to which he or she is attached, or of the established/traditional/tacit knowledge in the society in which he acts. Most of the research projects remain concerned with solving some puzzle in the existing research traditions. This is not only in social sciences. The philosopher/historian of science Thomas Kuhn⁵ has described well what *practically* happens in natural sciences. He says that *normally* (normal science is a very important term in the Kuhn's description) scientists remain solving puzzles in the existing research tradition. They share previous knowledge, preferences, models, symbols, techniques and purposes — in short, paradigms according to the much-used term he introduces. In this way, a failure to solve a puzzle is normally seen as a failure of the particular researcher and not a problem with the research tradition. But if many failures are reported, a crisis is developed in the tradition, eventually resulting in a revolution bringing in a new tradition with a new paradigm. So, in actual practice the ideal of refutation and falsification has to be mixed with some cautionary measure, as even admitted by Popper. (But Kuhn is the main person emphasizing that a theory is practically not rejected just because it is refuted by *an* experiment.) Thus the set of prepositions that defines the frame of reference of an investigation is normally assumed as unproblematic for the course of that investigation. And when it is considered problematic, it is not solely due to impartial observations and/or experiments.

Any description of the actual working of science has to pay attention to Kuhn, and he may well be quite accurate in telling us what *happens* in science. But it would be wrong to infer pure relativism from his writing, as he himself has clarified: Kuhn admits that there are standards of research; not everything goes here. He says⁵ that researchers judge according to certain *values* such as testability, universality, consistency, observational

adequacy, accuracy, fruitfulness, simplicity and predictive power etc. to decide if a theory or a frame of reference (a paradigm) is to be rejected. So, everyone claims to achieve the *same objectives*, though the results are not always exactly same. Objectivity is also such a *value* that is respected by everyone but everyone arrives at it in a different style. So, the research on a particular problem may at time apparently show what is termed multiple realities: the possibility of different statements about the same phenomenon being valid. But that should be taken as the freedom of research, appreciating works of different persons working on the problem with each of them trying to achieve the same aim but getting it differently. An *outsider* must respect these various efforts because much work is done in each of the efforts. But that does not mean that the actual situation to which all these solutions are addressed has multiple realities. There must be only one reality to which all are trying to approach, but maybe no one has actually achieved it. At least a researcher working on a problem cannot afford to think that there might be contradictory solutions to the same problem. Research normally means an academic discussion. In such a discussion, if the participants consider the others to be right as well, there would be no discussion, meaning no research. Only it is possible to consider the *possibility* that the other might turn out to be right later.

The Partial Objectivity: Tacit Knowledge and Tradition

In view of the practical considerations, one research project cannot undertake the big task of throwing away the tradition to which it belongs. (Though as a result of this investigation, the tradition may get damaged as Kuhn says.) So, a research project is normally judged from the point of view of a tradition, that is, *relative* to a tradition only. This is apparently what relativism advocates, maintaining that every intellectual position is right relative to itself and we cannot say more than this. But care is needed before jumping to the temptation of justifying the relativism through the practicalities of researches: it is one thing to work only relative to a tradition because of the *practical* human limitations of the research and another thing to assert that further inquiry is impossible *even in principle*. So, a wise

researcher should work relative to a tradition only, but accept that some other inquiry by some person might in principle check even the basis of the tradition as well.

Relativism is a self-denying philosophy: if nothing is true, as relativism maintains, relativism itself cannot be true. But still many persons respect it. There can be two ways of seeing that appraisal. One is the logically inconsistent one of asserting that the self-denying relativism is true. The other is that what peoples call relativism (judging with respect to a tradition only) actually incorporates a good deal of objectivity! Remember objectivism demand knowledge to be valid for *any* person. That is, only a view true for all the persons is valid. Hence, a *more objective* view would aim to command the assent of more participants or observers. Thus, a view *valid for all* the persons belonging to a tradition is certainly more objective than a view held by a single person only. Thus relativism is practically used to justify statements that are *more objective than* what is termed *subjectivism* (based on personal taste or opinion and existing in a mind only). Compared to subjectivism, the tradition-based-relativism normally demands a wider, more inclusive and more objective account of the world. It suffers from the problem of remaining within a tradition and not trying to check if the foundations of the tradition itself are objective. But a researcher may well live with that much, and leave the task of checking the foundations of the tradition to other researchers or to the later times. As long as the researcher sticks to a tradition *as a matter of practical necessity*, he or she may well take the Kuhn's remark "there is no standard higher than the assent of a relevant community" as *temporarily* true and regard¹⁵ "Objectivity (to) mean that in any domain of human inquiry, natural or social, there are inter-subjective standards of rationality or norms of inquiry by which we attempt to distinguish personal bias, superstition, or false beliefs from objective claims. If taken in this sense, adherence to objectivity governs any systematic inquiry."

Thus a tradition normally satisfies significant demands of objectivity by providing interpersonal standards in use and judgment, standards that cannot remain the property of one

person alone, and cannot be changed by a person according to his wishes only. An example of such standards is the grammar of any mature language, something objective-in-a-society but applied subjectively, by different persons, picking up personal styles and flavours. In general, human expressions are unpredictable even in the statistical sense, but are part of the basic experience of the world. And the human language is systematic, and thus in a way objective, though not algorithmic or deterministic. Uttered words understood by many persons (and accordingly well constrained so as to do this job properly) are *objective compared to* meanings and thoughts that are in minds of respective speakers only. It may be said that words give objective expression to subjective (personal) experience. Even matters of taste are not completely beyond arguments and hence are to a degree objective: poems can be compared in grammar, sound structure, imagery, rhythm etc.

Partial objectivity may also clarify the status of the tacit knowledge in a society, the knowledge that has *shared* meaning and has a high *functional value* in the society. The full objectivity of the tacit knowledge itself may be treated as a separate (research) problem, and need not disturb the research carried out in the society that takes the validity of the tacit knowledge as granted. For example, Muslims normally do research work within the Islamic tradition and most of the research projects carried out by Muslims are not meant to check the foundations of the Islamic beliefs.

But the foundations of the Islamic beliefs can be checked for objectivity; Islam does not demand a mere blind faith from its adherents. The Muslim scholarly tradition termed *Ilm-e-Kalam* has been giving arguments showing that the Islamic beliefs are objective. That is, every human being, regardless of his cultural background etc., may appreciate that the Islamic beliefs provide the best *ultimate* explanation of the universe in as much depth as the humanity needs for its moral guidance. They do this without interfering with and constraining the science in its effort to explain the *parts* of the universe and give the humanity a technical guidance. This practical and flexible comprehensive-

ness of the Islamic beliefs shows that, to the intellect of *each* human being of any talent and trend and in any age, the Islamic beliefs objectively provide a mental satisfaction that science is not meant to provide and no other source of knowledge can objectively provide.

REFERENCES AND END NOTES

- 1 A scientific theory is changeable (refutable) because it gets its validity from the observation of the particular parts of the universe. As the new parts of the universe may be seen, the theory can be refuted or altered if it is not compatible with the new observations. Or, the theory may be based on many logically independent assumptions, and hence can be replaced with time by a theory with a lesser number of independent assumptions. (For example, this was basically what the Newtonian theory achieved in the 17th century by showing that Kepler's laws, Galileo's work and a host of other experimental rules can be logically inferred from just a few independent assumptions, namely the Newton's three laws of motion and the formula for the gravitational force.)
- 2 Immanuel Kant's *Critique of Pure Reason*, abridged edition, translated by N. K. Smith 1934, published by McMillan and Co. London, pages 34, 43, 45, 120 and 131-2. Also note that Karl Popper quotes (in his ref. 3 below, p. 180) Kant's writing that Newtonian physics is *a priori* true!
- 3 Karl Popper, *Conjectures and Refutations*, published by Routledge, London, fourth edition, 1972. Also, note on p. 84 of *The Limits of Science* by (a Nobel laureate) Peter Medawar "The ability of scientists to come up with new theories is the same as the ability of poets to write poetry." This writer cannot understand either. The reputed mathematician Roger Penrose of Oxford University fails, in his book *Emperor's New Mind*, published by Vintage, 1989, to understand the human creativity in even apparently straightforward subject of mathematics. The argument is scattered in the whole book, especially in the chapter 1 (Can Computers have a Mind?) and chapter 9 (Real Brains and Model Brains). Introduction of the book, on the back page, tells that Penrose is arguing *against* artificial intelligence and exploring the mystery of the mind and consciousness. (He is actually against the claims of the Strong Artificial Intelligence that computers have the potential to fully simulate the human intelligence.)

- 4 Had human thoughts been totally logical (algorithmic) as well, these thoughts would have always been logically equivalent to the past knowledge and experience. Thus, the human knowledge would have never advanced and predicted new phenomena to be experimentally verified afterwards. Thus the marvelous nature of science is itself the biggest argument for the marvelous nature of the human creativity, clearly indicating that there is no mechanical process by which the human creativity works. This in turn tells that the human beings are not machines, though Darwinism and some other apparently science-based theories (like the Strong Artificial Intelligence) do imply a mechanical nature for the humans.

Many scientists and others deny the human free will and other distinct human particularities like the creativity etc. This mentality of scientists is a neglect of the very idea and purpose of science. Science is an activity meant to explain the human experience, and the human (unpredictable) free will is perhaps the most direct and important human experience: no matter how reasonable prediction about a certain action of a person is made, he or she can, at least in principle, do otherwise. Human expressions are unpredictable even in the statistical sense, but are part of the basic experience of the world. "The whole universe of science is built around the world as directly experienced, and if we want to subject science itself to rigorous scrutiny and arrive at a precise assessment of its meaning and scope, we must begin by reawakening the basic experience of the world of which science is the second-order expression. Science has not and never will have, by its very nature, the same significance *qua* form of being as the world which we perceive, for the simple reason that it is a rationale or explanation of that world. Scientific views of man are always both naïve and at the same time dishonest, because they take for granted, without actually mentioning it, the other point of view, namely that of consciousness, through which from the outset a world forms itself around me and begins to exist for me." (Merleau-Ponty, quoted in the book *Beyond Objectivism and Relativism* by Benstein, p.120) Everyday life-world is presupposed in all our scientific endeavours. (Husserl, quoted in *Beyond Objectivism and Relativism* by Benstein, p. 127, 129) Language, intelligence, thought, religious beliefs, knowledge, science, cultural values, and norms are sets of human symbols that make human beings quite distinct from all other creations.

Religiosity, and cultural and social values are the distinct characteristics of human individuals and groups.

- 5 Relativism means that every intellectual position is right relative to itself and we cannot say more than this. A recent version of it can be found in one of the interpretations of Thomas Kuhn, especially of his famous book *The Structure of Scientific Revolutions*, published by the University of Chicago, 1970. For a detailed criticism of relativism, see for example pages 15 to 24 of *From Facts to Values* by Mehran Banaei and Nadeem Haque, Optagon Publications Limited, 1995. Also note the section entitled "Partial Objectivity" below in the present article.
- 6 Karl Popper, *Logic of Scientific Discovery*, published by Basic Books Inc., New York, 1959, p. 36.
- 7 Refutable means that the theory should tell at least one kind of observation or experiment (*i.e.* a prediction) which could potentially not agree to it; it should *not* be (made to be?) of a nature to agree to *every* possible outcome of every possible experiment. A refutable theory of heat for example would agree to the fact of water boiling at 100 degree centigrade, but would be refuted if water boils at some other temperature or does not boil at all. In simple words, a refutable statement is a statement making at least one empirical prediction that can be tested. See *Ibid*, p. 269, for the importance Popper gives to the criterion of refutability: "A theory can be better corroborated the better testable it is." Also see on p. 40 of the same "falsification as a criterion of demarcation." Moreover, note on p. 78 there "my proposal to adopt falsification as a test of whether the statement belongs to the empirical sciences or not." On p. 83 he says, "if the degree of falsification of a theory is increased, the theory is strengthened."
- 8 It is interesting that, in contrast to the positivists, Popper does *not* regard all the metaphysical statements as meaningless. (According to his demarcation criterion, scientific theories are refutable and hence testable. Thus, any statement that is not refutable is metaphysical.) He says (ref. 6, p. 312) that he is discussing the demarcation of scientific statements from perfectly *meaningful* systems of metaphysical statements. Also (ref. 6, p. 36) "Positivists in their anxiety to annihilate metaphysics, annihilate natural science along with it" whereas (ref. 6, p.206n) "some metaphysical doctrines (are) rationally arguable and, in spite of

being irrefutable, criticizable.” (Ibid, p. 206n) The examples of such metaphysical statements Popper mentions are the law of cause and effect, the law of uniformity of nature, the law of induction (ref. 6, pp. 252-4), probability (chance) statements (ref. 6, p. 204) and, most interestingly, strictly existential statements (ref. 6, p. 69). In the list of strictly existential statements are some (like “there are black crows”) which are verified and some (like “there are white crows”) which are not. But none of them can be refuted and they are all metaphysical. (To refute a statement that “there are white crows” we will have to search the whole universe *simultaneously* to make sure that there are no white crows, and that is impossible.) Please note that all these metaphysical statements are not (devoid of information) analytic statements or tautologies. Negations of strictly existential statements are universal statements, like “there are not black crows.” These can be only refuted and not verified. Popper says that all the scientific laws are of this type (ref. 6, p. 68). He says that whenever it is found that something exists here or there, a strictly existential statement may therefore be verified, or a universal (scientific) statement be falsified. With respect to the singular (empirical) statements, universals are falsifiable only and existential statements verifiable only (ref. 6, p. 70n).

- 9 Jürgen Habermas, *Knowledge and Human Interests*, translation by J. J. Shapiro published by Heinemann, London, 1972.
- 10 A. M. Al-Najjar in the *American Journal of Islamic Social Sciences*, Volume 13, No. 1.
- 11 See, for example, Thomas Kuhn, *The Structure of Scientific Revolutions*, published by the University of Chicago, 1970.
- 12 See, for example, Imre Lakatos and Alan Musgrave, *Criticism and the Growth of Knowledge*, published by the Cambridge University Press, London, 1999.
- 13 It is interesting to note here that in his famous book *The Limits of Science*, the Nobel laureate Peter Medawar quotes Karl Popper saying, “The fact that science cannot make any pronouncements about ethical principles has been misunderstood as indicating that there are no such principles, while in fact the search of truth presupposes ethics.”
- 14 Read on page 84 of I. J. R. Aitchison and A. J. G. Hey, *Introduction to Gauge Field Theories*, published by Adam Hilger,

second edition, 1989, the incidence of (the Nobel laureate) Feynman not being able to answer a simple question about the emission of light particles from excited atoms. The reason is that science cannot answer the sort of questions put to Feynman. (The report here is in turn taken from R. P. Feynman, *The Physics Teacher*, vol. 7, No. 6, September 1969.)

- 15 Schutz quoted in Bernstein's *Beyond Objectivism and Relativism*, p.137.