

## SCIENCE AND HUMANISM

(An analysis of Popper's view)

The central problem of epistemology according to Popper is the 'problem' of the growth of knowledge. The problems connected with the growth of our knowledge has to transcend any study which is confined to commonsense knowledge as opposed to Scientific Knowledge. Sir Karl Raimund Popper has tried to show that the most important of the traditional problems of epistemology—those connected with the 'growth of knowledge'—transcend the standard methods of linguistic analysis and require the analysis of Scientific Knowledge. If the picture of the world which modern science draws comes anywhere near to truth — in other words, if we have anything like 'Scientific Knowledge' — then the conditions obtaining almost everywhere in the universe make the discovery of structural laws of the kind we are seeking and thus the attainment of 'Scientific Knowledge', Popper thinks, almost impossible. For almost all regions of the universe are filled by chaotic radiation, and almost all the rest by matter in a similar chaotic state. In spite of this, Popper suggests that Science has been miraculously successful in proceeding towards what he regards as its aim.

A scientist, Popper says, whether theorist or experimenter, puts forward statements, or system of statements, and tests them step by step. In the field of the empirical sciences, more particularly, he constructs hypotheses, or system of theories, and test them against experience by observation and experiment. Popper suggests that it is the task of the logic of scientific discovery, or the logic of knowledge, to give a logical analysis of this procedure, that is, to analyse the method of the empirical sciences. But what are these 'methods of the empirical science'? And what do we call 'empirical science'?

Popper's aim is to stress the significance of one particular aspect of science —its need 'to grow' — or its need 'to progress' and the significance of this need is mainly intellectual. The continued growth is essential to the rational and empirical character of scientific knowledge. It is the way of its growth in which the scientists discriminate between available theories and choose the

better one or the way they give reasons for rejecting all the available theories, thereby suggesting some of the conditions with which a satisfactory theory should comply. It is not the accumulation of observations which Popper has in mind when he speaks of the growth of scientific knowledge, but the repeated over-throw of scientific theories and their replacement by better or more satisfactory ones.

D. T. Campbell writes<sup>1</sup> in his essay, "Evolutionary Epistemology" : An evolutionary epistemology would be at minimum an epistemology taking cognizance of and compatible with man's status as a product of biological and social evolution. Evolution—even in its biological aspects—is a knowledge-process, and the natural selection paradigm for such knowledge increments can be generalised to other epistemic activities, such as, learning, thought, and science. Such an epistemology has been neglected in the dominant philosophic traditions. It is primarily, Campbell claims that through the works of Karl Popper that a natural selection epistemology is available today. Popper's first contribution to an evolutionary epistemology is to recognise the process of the succession of theories in science as a similar selective elimination process.

Popper's intention is to try to solve some of the problems, old as well as new, which are connected with the notions of scientific progress and of discrimination among competing theories. The new problems are mainly those connected with the notion of objective truth, and of getting nearer to the truth-notions which seem to him of great help in analysing the growth of knowledge. At this point Popper strongly criticises 'the myth of public opinion' about 'truth'—that 'truth is manifest' A number of myths concerning public opinion' are often accepted uncritically.

Public opinion is very powerful, and owing to its anonymity it is an 'irresponsible form of power' and therefore particularly dangerous from the liberal point of view. Popper holds the view that the method of learning by 'trial and error'—of learning from our "mistakes"—seems to be fundamentally the same whether it is practised by lower or higher animals, by chimpanzees or by men of science. The method of trial and error is not, of course, simply identical with the scientific or critical approach — with the method of conjecture and refutation. Popper's interest is not merely in the theory of scientific knowledge, but in the theory of knowledge

in general, the growth of knowledge in which men and even animals acquire new factual knowledge about the world.

Is there any danger that our 'need to progress' will go unsatisfied, and that the growth of scientific knowledge will come to an end?

Among the real dangers to the progress of science is to think that 'it will come to an end'—that 'it will be completed'. The history of science, like the history of all human ideas, is a history of irresponsible dreams, of obstinacy, and of error. So in the field of science, a criterion of progress is to provide better and better theories passing through critical tests. Thus, we aim, in science, at a high informative content—the growth of knowledge—which means that we know more and that the content or information of our theories thus increases. It follows that a high degree of 'falsifiability', or 'refutability' or 'testability', is one of the aims of science—in fact, precisely the same aim as a high informative content. The criterion of potential progressiveness is thus 'testability' or 'improbability': only a highly testable or improbable theory is worth testing and is actually satisfactory if it withstands severe tests.

Language analysts believe that there are no genuine philosophical problems, or that the problems of philosophy, if any, are problems of linguistic usage, or of the meaning of the words. Popper believes that there is at least one philosophical problem in which all thinking men are interested. "It is the problem of cosmology": the problem of understanding the world—including ourselves, and our knowledge, as part of the world. Popper holds "All science is cosmology" and for him the interest of philosophy as well as of science lies solely in the contributions which they have made to it. He believes that both philosophy and science would lose all their attraction if they were to give up that pursuit. He thinks that philosophers are as free as others to use any method in searching for truth. There is no method peculiar to philosophy. Popper's analysis of science, that is, his 'philosophy of science' is to learn something about the riddle of this world in which we live, and the riddle of man's knowledge of the world. And only a revival of interest in these riddles can save the sciences and philosophy from narrow speculation and from an obscurantist faith. The old scientific ideal of epistemology, of absolutely certain, demonstrable knowledge—has proved to be an idol. The

demand for 'scientific objectivity' makes it inevitable that every scientific statement must remain 'tentative for ever'. It may be corroborated, but every corroboration is relative to other statements which, again are tentative. The wrong view of science betrays itself in the craving to be right; for it is not the 'possession' of knowledge of irrefutable truth that makes the man of science, but his persistent and recklessly critical 'quest' for truth.

Has our attitude, then, to be one of resignation? Have we to say that science can fulfil only its biological task; that it can, at best, merely prove its 'mettle' in practical applications which may corroborate it? Are its intellectual problems insoluble? Popper does not think so. Science never pursues the illusory aim of making its answers final, or even probable. Its advance is, rather, towards the infinite yet attainable aim of ever discovering new, deeper, and more general problems, and subjecting its ever tentative answers to ever renewed and ever more rigorous tests.

Popper's logic of scientific discovery or the logic of knowledge means mainly a criticism of the naturalistic view of scientific method. In elaborating the task of such a logic, Popper draws our attention to what may be called 'deductivism'. Such a logic is intended to offer strength to the empirical statements for ensuring future predictions. Popper's deduction should be regarded as stepping stones rather than as ends : as important stages on our way to richer, and better testable, scientific knowledge. Popper's logic of knowledge consists of negatively (a) the elimination of 'psychologism' and (b) elimination of 'inductivism'. Psychologism is eliminated because it may lead to subjectivism. Psychologism is concerned with the question 'how does it happen that a new idea occurs to a man'? The logic of knowledge is concerned with the question, 'how can a statement embodying a new idea be justified'? The question of justification leads on to the further question 'how can it be tested'?

Inductivism is eliminated because it leads to logical inconsistencies. Any attempt to justify inductive inference will lead to vicious regress. Most noteworthy, Popper is unusual among modern epistemologists in taking Hume's criticism of induction seriously, as more than an embarrassment, tautology, or definitional technicality. It is the logic of variation and selective

elimination which has made Popper accept Hume's contribution to analysis and go on to describe in which animal and scientific knowledge is yet possible.

In constructing such a logic of knowledge by way of logical deductions, Popper is careful enough to keep apart the rigid formal procedure adopted in symbolic logic, because it may be futile in the sense that it may prohibit the growth of knowledge. It would produce a body of statements which are only analytically true. Since Popper is interested in the growth of knowledge his construction of logic is thus different from tautological transformation of formal logic. Popper's logic of scientific discovery gives us a sort of 'deductivism' which rests on :

- (a) the denial of inductivism because it is faulty;
- (b) the denial of psychologism because it is fictitious; and
- (c) the denial of tautological transformation because it is futile.

What constitutes the uniqueness of Popper's logic of knowledge is :

- (a) the 'empirical basis' from which deductivism takes its start, and
- (b) the 'objectivity' in terms of successful predictions to which it leads.

The 'empirical contents' of scientific hypothesis and the much desired 'objectivity' of the claim of the scientists are both covered by what is usually regarded as Popper's original contribution to the philosophy of natural science—the criterion of 'falsifiability'. Popper's 'falsifiability' criterion is usually taken as an 'endurance test'. The more a hypothesis prohibits the more it says and thus helps the growth of knowledge.

In other words, a hypothesis is falsifiable if it has a class of potential falsifiers which is non-empty. In this connection Popper wants to demarcate metaphysics from science on the ground that metaphysical hypotheses, since they allegedly contain pure speculative ideas, are not falsifiable. The falsifiability criterion thus ultimately rests upon the empirical content of a given hypothesis.

Let us now elaborate the demarcation criterion, which appears to work in the background of Popper's falsifiability criterion.

Popper's thesis on a criterion on 'demarcation' in a nutshell amounts to this :

The repeated attempts made by Carnap to show that the demarcation between science and metaphysics coincides with that between 'sense' and 'nonsense' have failed. The reason is that the positivistic concept of 'meaning' or 'sense', or of 'verifiability', or of 'inductive confirmability' is inappropriate for achieving the demarcation—simply because metaphysics need not be meaningless even though it is not science. In all its variants demarcation by meaningfulness has tended to be at the same time too narrow and too wide : as against all intentions and all claims, it has tended to exclude scientific theories as meaningless while failing to exclude even that part of metaphysics which is known as 'rational theology.'

Popper points out that Carnap's original 'overthrow' of metaphysics was unsuccessful. The naturalistic theory of meaningfulness turned out to be baseless, and the total result was a doctrine which was just as destructive of science as it was of metaphysics. In Popper's opinion this was merely the consequence of an ill-advised attempt to destroy metaphysics wholesale, instead of trying to eliminate, piecemeal as it were, metaphysical elements from the various sciences whenever we can do this without endangering scientific progress by misplaced criticism. Admitting the great contribution of Carnap in the philosophical problems, Popper does not hesitate to remark that Carnap leaves the problem of demarcation between science and metaphysics where it was. And it leaves us without a hope of even constructing this problem on the basis of the reformed concept of meaningfulness, Carnap and his circle tried to solve the problem by constructing a 'language of science', a language in which every legitimate statement of science would be a well formed formula, while none of the metaphysical theories would be expressible in it—either because the terminology was not available, or because there was no well-formed formula to express it. Popper would reply that this is a gross over-simplification of the problem.

Popper continues that the criterion of demarcation inherent in inductive logic, i. e. the positivistic dogma of meaning is equivalent to the requirement that all the statements of empirical science must be capable of being finally decided, with respect to

their truth and falsity; we shall say that they must be 'conclusively decidable'. This means that their form must be such that to verify them and to falsify them must both be logically possible. But In Popper's view there is no such thing as 'induction', that is, the so-called 'inductive sciences'. This inference to theories, from singular statements which are 'verified by experience', is logically inadmissible. Theories are, therefore, 'never' empirically verifiable. If we wish to avoid the positivist's mistake of eliminating, by our criterion of demarcation, the theoretical systems of natural science, then we must choose a criterion which allows us to admit the domain of empirical sciences, even statements which cannot be verified. Popper admits a system as 'empirical' or 'scientific' only if it is capable of being 'tested' by experience. These considerations suggest that not the 'verifiability' but the 'falsifiability' of a system is to be taken as a criterion of 'demarcation', but 'not of meaning'. According to this view, a system is to be considered as scientific only if it makes assertions which may clash with observations; and a system is, in fact, tested by attempts to produce such clashes, that is to say, by attempts to refute it. Thus testability is the same as refutability, and can therefore, likewise be taken as a criterion of demarcation. A scientific system need not be capable of being singled out, once and for all, in a positive sense. What is required is that its logical form shall be such that it can be singled out, by means of empirical tests, in a negative sense. In other words, it must be possible for an empirical scientific system to be refuted by experience. Popper would add that a statement is falsifiable if it contains a non-empty class of potential falsifiers. He maintains that,

"A theory is to be called 'empirical' or 'falsifiable' if it divides the class of all possible basic statements unambiguously into the following two non-empty sub-classes. First, the class of all these basic statements with which it is inconsistent (or which it rules out, or prohibits): we call this the class of the 'potential falsifiers' of the theory; and secondly, the class of all those basic statements which it does not contradict (or which it 'permits')."<sup>2</sup>

This is the view of science which takes its 'critical approach' to be its most important characteristic. Thus a scientist should look upon a theory from the point of view whether it can be

critically discussed, whether it exposes itself to criticism of all kinds, and if it does whether it is able to stand up to it. It expose itself thereby to attempted empirical refutations whose failure meant the success of the theory and we can claim that it is confirmed or corroborated by experience.

Popper admits that there are 'degrees of testability'. Some theories expose themselves to possible refutations more boldly than others. A theory which is more precise and more easily refutable than another will also be the more interesting one. But it is better testable, for we can make our tests more precise and more severe. Thus confirmability<sup>3</sup> must increase with testability. This indicates that the criterion of demarcation cannot be an absolutely sharp one but will itself have degrees. This becomes clear if we remember that most of our scientific theories originate in myths.

Popper indicates that another argument turns out to be an important case viz. that a certain statement belongs to science since it is testable, while its 'negation' turns out 'not to be testable', so that it must be placed below the line of demarcation. This is indeed the case with the most important and most severely testable statements—the 'universal laws of science'. Popper supposes that some people found it hard to accept the view that pure or isolated existential statement (There exists a sea-serpent) shall be called 'metaphysical', even though it might be deducible from a statement of an empirical character. But Popper argues that they overlooked the fact that :

(a) in so far as it was so deducible it was no longer isolated, but belonged to a testable theory, and (b) if a statement is deducible from an empirical or a scientific statement then this fact need not make it empirical or scientific. Popper only wishes to make clear that if we accept that a universal statement could be meaningful while its existential negation was meaningless, then it would be strange to call metaphysical statements meaningless, or to exclude them from our language. For if we accept the 'negation' of an existential statement as meaningful, then we must accept the existential statement itself also as meaningful. Popper has been forced to stress this point because his position has repeatedly been described as a proposal to take falsifiability or refutability as the criterion of 'meaning' rather than of demarca-



tion, or as a proposal to exclude existential statements from our language, or perhaps from the language of science. Popper refers to Carnap who feels himself compelled to interpret his position as a proposal to exclude metaphysical statements from any language, when Popper has repeatedly said the opposite. Popper cannot accept Carnap's emphasis on 'the one universal language of the one unified science'. And he also cannot accept the ruling that what we say must be translated into the 'formal mode of speech' in order to be meaningful. No doubt one should express oneself as clearly as possible and no doubt what Carnap call the 'formal mode of speech' is often preferable to what he calls 'the material mode'. But it is not necessarily preferable. And why should it necessarily be preferable? Perhaps because the 'essence' of philosophy is language analysis. But Popper is not a believer in essences. How to make oneself better understood can only be a matter of thought and experience. For Popper, philosophy should not be merely a matter of linguistic analysis. It aims at 'rational reconstruction' towards the growth of objective knowledge.

Science, for Popper, is a human approach to the world and this is his philosophy of science. He apprehends that natural sciences are in danger of stifling mental growth, instead of furthering it, if they are taught as technologies and that they should be treated as human achievements, as great adventures of human mind, as chapter in the history of human ideas, of the making of myths, and their criticism.

For a humanist, our approach may be important because it suggests a new way of looking at the relation between ourselves, the subjects, and the object of our endeavours : the growing objective knowledge, the growing 'world 3' an objective, autonomous world which existed in addition to the physical world (world 1) and the world of the mind (world 2). The world 3 Popper prefers to describe as the world of "intelligibilia" or intelligible (not in the Platonic sense) or 'ideas in the mind'. Popper discards 'epistemological expressionism' because it is closely parallel to the expressionist theory of art. According to expressionism, a man's work is the expression of his inner state, the emphasis being entirely upon the causal relation and on the admitted but over-rated fact that the world of objective knowledge, like the world of painting or music, is created by men. Popper asserts that

this view is to be replaced by a very different one. It is to be admitted that the world of objective knowledge (world 3) is 'man-made'. But it is to be stressed that this world exists to a large extent as autonomous; it generates its own problems, especially those connected with methods of growth. Even the most original of creative thinkers should practise the critical and self-critical ways of thinking and develop the corresponding disposition. What is more important than all this, Popper suggests, is the relation between ourselves and our work, and what can be gained for us from this relation. The expressionist believes that all he can do is to let his talent, his gifts, express themselves in his work. As against this Popper suggests that everything depends upon the give-and-take between ourselves and our work, upon the product which we contribute to the third world, and upon that constant feed-back that can be amplified by conscious self-criticism. The incredible thing about life, evolution, and mental growth is just this method of give-and-take, this interaction between our actions and their results, by which we constantly transcend ourselves, our talents, our gifts. This self-transcendence is the most striking and important fact of all evolution, and especially of human evolution.

The process of learning, of the growth of knowledge, is always fundamentally the same. It is 'imaginative criticism'. This is how we transcend our local and temporal environment by trying to think of circumstances 'beyond' our experience, by criticising the universality, or the structural necessity, that is, by trying to find, construct, invent new situations, 'critical' situations and by trying to locate, detect and challenge our prejudices and habitual assumptions. "This is how we lift ourselves by our bootstraps out of the morass of our ignorance, how we throw a rope into the air and then swarm up it—if it gets any purchase, however precarious, on any little twig."<sup>4</sup>

Seen in this light, life is a problem-solving and discovery—the discovery of new facts of new possibilities, by way of trying out possibilities conceived in our imagination. On the human level, this trying out is done in (the world 3) by attempts to represent in the theories of this third world our first world, and perhaps our second world too, more and more successfully and thereby trying to get nearer to the truth - to a fuller, a more complete, a more interesting, logically stronger and more relevant to our pro-

blems. In all the different ways of learning, both we ourselves and the world (third world) grow through mutual struggle and selection. This, it seems, holds at the level of the enzyme and gene: the genetic code may be conjectured to operate by selection or rejection rather than by instruction or command. If humanism is concerned with the growth of the human mind, what then is the tradition of humanism if not a tradition of criticism and reasonableness?

There would be no mistake in saying that Popper has combined intellectual power with liberty of spirit. Popper insists in his philosophy as much as in his life that there is no final sanction and authority for knowledge, even in science, that only that is knowledge which is free to change and grow, and that a condition for its growth is the challenge by independent minds. This is the humanist view which passes on from philosophy into conduct, because it derives the social responsibility of each man from his consciousness of human dignity. On this view, the growth of knowledge is indeed an organic growth.

Department of Philosophy  
Visva Bharati  
Santiniketan

KHANA BASU

#### NOTES

1. *The Philosophy of Karl Popper*, Ed., P.A. Schilpp, The Library of Living Philosophers Series (Vol. XIV, Book I).
2. *The Logic of Scientific Discovery*, Karl Popper, Hutchinson; page 86.
3. In a footnote in *The Logic of Scientific Discovery*, Chapter X, page 251, Popper writes "Carnap translated my terms 'corroboration' and especially 'degrees of corroboration' which I had first introduced into the discussions of the Vienna Circle, as 'degree of confirmation'.

I did not like the term, because of some of its associations. I therefore proposed in a letter to Carnap to use the term 'corroboration.' But as Carnap declined my proposal, I fell in with his usage, thinking that words do not matter. This is why I myself used the term 'confirmation' for a time in a number of my publications.

Yet it turned out that I was mistaken; the associations of the word 'confirmation' did matter, unfortunately, and made themselves felt; 'degree of confirmation' was soon used — by Carnap himself — as a synonym of 'probability'. I have therefore now abandoned it in favour of 'degree of corroboration'.

4. *Objective Knowledge*, Karl Popper O. U. P. page 148.

**PHILOSOPHICAL INQUIRY**  
**INTERNATIONAL PHILOSOPHICAL QUARTERLY**

Edited by : D. Z. Andriopoulos  
( in co-operation with a group of 50 distinguished  
scholars from 45 countries )

---

Philosophical inquiry is designed to promote research and discussion in all areas of philosophical thought. The journal appears four times a year, publishing articles in English, French and German. Philosophical Inquiry is committed no particular methodology or interest and regularly publishes studies in areas such as the following : history of philosophy, metaphysics, epistemology, aesthetics, logic, ethics and value theory, language, political, social and religious philosophy. Members of the Honorary Board include A. J. Ayer (Oxford University), C. de Vogel (University of Utrecht), M. Farber (SUNY at Buffalo), G. Vlastos (University of California at Berkeley), W. H. Waish (University of Edinburgh), G. Caloero (University of Rome), P. Agaësse (centre d'Etudes at de Recherches, Paris), H. Osborne (London University) and R. Kröner (Switzerland). Selected articles from Volume VI of Philosophical Inquiry :

Persons as Temporally Extended — Gl. Langford  
Thw Identity of the Work of Art — S. Shusterman  
On the logic of Picture Worlds — Ch. Karelis  
Institutional Definition of a work of Art—B. Dziemidok  
Concerning Historical Explanation — S. F. Sapontzis  
Bei Den Ersten Griechischen Philosophen  
— E. Papadimitriou

---

Annual Subscription Rates ( USA and Canada ) :

\$ 12 for one year; \$ 20 for two years; \$ 5 single copy.

Please make remittance payable to Philosophical Inquiry and send to :

**D. Z. Andriopoulos**, Editor

Philosophical Inquiry

P. O. Box 825, CP

ATHENS — GREECE