



## Motifs of Enlightenment Ideology in Popper's Logic of Scientific Discovery

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### Abstract

*Karl Popper's logic of scientific discovery is both the infra-structure and motor of the superstructure of his philosophy of science which is one of the few contemporary philosophies that can lay claim to being a system of thought. Popper's attempt to solve the problem of induction led him to found falsificationism both as the logic of scientific discovery and methodological criterion of demarcation between science and non-science. The thesis of falsificationism is that a scientist should strive to falsify his theory and not to confirm it. The criticisms provoked by the falsificationist methodology have fortuitously developed into what is now regarded as the corpus of Popper's scholarship. This essay seeks to contribute to that scholarship by arguing that the enlightenment ideology was an incisive and decisive influence on the formation and development of Popper's falsificationist methodology of science. It is significant to point out this ideological conditioning in view of Popper's deployment of great erudition to pass his refutability criterion off as an objective logico-mathematical axiom or algorithm dictated by, and exemplified in, scientific practice.*

### KEYWORDS:

Motif; Enlightenment; Ideology; Philosophy; Science

### Introduction

#### The Concept of Ideology Distinguished from Philosophy

It is proposed here to clear the mists of confusion which result in the unfortunate interchangeable usage of philosophy and ideology. Ideology has acquired so many meanings and usages which I am afraid are not within the scope of this essay to plumb. As David McClellan (1986, 1) has put it, "ideology is the most elusive concept in the

whole of social sciences". The variegated meaning acquired by ideology since 18<sup>th</sup> century when it was coined by Destutt de Tracy (1754-1836) has weighed more in the pejorative sense. R.F. Christianson (1972, 6) underlines this in the following quotation from his popular book, *Ideology and Modern Politics*: "A bad odor surrounds the word ideology. It suffers from ill-repute and, to some, is identified with hated totalitarian beliefs and is characterized as false, delusory and "highfalutin" propaganda".

Nonetheless, it should be noted that ideology had seen better days in the period of its conception when Destutt de Tracy (a founding member of French Institute Nationale) proposed it as "a new science of ideas" (thus the name idea-logy) which would study ideas trenchantly for the benefit of society. The fall of ideology from innocence and respectability and the accretion of multifarious doubtful meanings and usages began with the somber declaration of Napoleon shortly after the Moscow Campaign that "it is to ideology, this cloudy metaphysics... that we must attribute all the misfortunes of our fair French". (quoted in Osam Edim, 2006,75). The decay and proliferation in meanings and usages of ideology occasioned by Napoleon's vitriolic outburst peaked in Karl Marx's remonstrance against the cultural decadence of Europe of his days. Marx dismissed all philosophies and world-views other than his scientific socialism as "ideology" by which he meant false consciousness or deceptive and misleading myth.

It is incontrovertible from the above summary of the history of ideology that it has become an informal social formula encapsulating inchoate, rough ideas and



views of the individual, or group of individuals about the world, religion, politics, science, etc. Ideology is, therefore, characteristically commonplace, simple, pedestrian and emotionally-charged, compelling people to action. It is mass-oriented and this tendency and drive commonly transform ideologies into “a group mind” and, hence, into a kind of socio-psychological dynamo.

The above character of ideology cannot be said of philosophy or any pure theory whether in the real sciences or social sciences. Philosophy is detached and often solitary contemplation and search for truth in a most systematic, coherent, consistent, critical sense. Although philosophy, like theories in the social sciences is value-laden, it has developed objective logical principles to remain as critical and detached as possible. Ideologies have no such saving techniques to check conflicting assumptions, ideals, sentiments, interests etc.

### **A Synoptic View of Popper’s Philosophy of Science**

Popper’s rejection of induction led him to the formulation of his falsificationist methodology of science which formed both the nucleus and motor of his philosophy of science. Under his falsificationist methodology, he held that testing scientific theory or law can only be by refutation and not by verification or confirmation as claimed by inductivists. He was emphatic that scientific theories and laws, as universal generalizations, cannot be confirmed. According to him, ‘water boils at 100° centigrade is a scientific law. But we cannot conclusively confirm its truth. We may have large number of confirming instances; say billions and billions of them. Yet this would not conclusively prove the truth of the statement nor would it have increased the probability of its being true. Worst of all, the accumulation of confirming instances would itself never furnish the critical attitude required in testing scientific theories. Therefore, Popper abandoned inductive method and its concomitant verification principle and propounded and advocated the falsifiability

principle; that is to say, that the truth of a scientific theory of law is its falsifiability or refutability.

For Popper, therefore, a scientific theory or law properly so called must be falsifiable. The reverse applies to non-scientific or pseudo-scientific theory or law. A practical example will illustrate Popper’s refutability criterion as the demarcation between science and non-science: one is taught at school that it is a scientific law that water boils at 100° centigrade. No number of confirming instances will prove this, but by the refutability criterion one can nevertheless test it by searching for circumstances in which it does not hold. This alone challenges us to think of things which, so far as we know, no one else has hit on it. If we are imaginative, we will soon discover that water does not boil at 100° centigrade in closed vessels. So what we thought was a scientific law turns out not to be one.

At this point we could salvage the original statement, “water boils at 100° centigrade” by narrowing its empirical content to “water boils at 100° centigrade in open vessels”. And we could then look systematically for a refutation of our second statement. And if we were rather more imaginative than before, we should find it at high altitudes so that, to salvage our second statement “water boils at 100° centigrade in open vessels”, we would have to narrow its empirical content to “water boils at 100° centigrade in open vessels at sea-level atmospheric pressure”. And we could then begin a systematic attempt to refute our third statement. And so on. In this way, we might regard ourselves as pining down ever more and more precisely our knowledge about boiling point of water. This methodology of conjectures and refutations is aptly rendered by Popper thus:

*‘Knowledge can grow, and... science can progress- just because we can learn from our mistakes. The way in which knowledge progresses and especially our scientific knowledge is by unjustified (and unjustifiable) anticipations, by*



*guesses, by tentative solutions to our problems, by conjectures. These conjectures are controlled by criticism; that is, by attempted refutations, which include severe critical tests. They may survive these tests, but they can never be positively justified: they can neither be established as certainly true nor even as "probability" (in the sense of the probability calculus)' (1963, vii)*

It is against the foregoing procedure of testing scientific statements for the truth of their contents that it will become clear why it is inherent in Popperian view of science that what we call our knowledge is of its nature provisional, and permanently so. At no stage are we able to prove that what we now "know" is true and it may turn out to be false. Indeed, it is an elementary fact about the intellectual history of mankind that most of what had been "known" at one time or another eventually turned out not to be the case.

Popper, therefore, concludes that it is a profound mistake to try to do what scientists and philosophers have almost always tried to do, namely, to prove the truth of a theory, or justify our belief in a theory since this is to attempt the logically impossible (Magee 1973, 19). What we can do, however, and this is of the highest possible importance, Popper tells us, is to justify our preference for one theory over another. In the above successive examples about the boiling point of water one was never able to show that the current theory was true; but one was at each stage able to show that it was preferable to the preceding theory. This, according to Popper, is the characteristic situation in any of the sciences at any given time. The popular notion that the sciences are bodies of established facts are entirely mistaken because, as he says, nothing in science is permanently established, nothing unalterable, and indeed science is quite clearly changing all the time, and not through the accretion of new certainties. If we are rational, we shall always base our decisions and expectations on "the best of

our knowledge", as the popular phrase so aptly has it, and provisionally assume the "truth" of the knowledge for practical purposes, because it is the least insecure foundation available; but we shall never lose sight of the fact that at any time experience may show it to be wrong and require us to revise it.

Bryan Magee, in his exposition on Popperian philosophy opines, and I agree with him, that "Popper's view of science slides on its history like a glove" (1973, 21). In Magee's reckoning, what brought home to Popper the permanently conjectural nature of scientific knowledge was Einstein's challenge to Newton. Newtonian physics was the most successful and important scientific theory ever to be advanced and accepted. Everything in the observable world seemed to confirm it: for more than two centuries its laws were corroborated not just by observation but by creative use, for they became the foundation of western science and technology, yielding marvelously accurate predictions of everything from the existence of new planets down to the movement of the tides and the workings of machinery. If anything was knowledge, this was the most secure and certain knowledge man had ever acquired about his physical environment.

Yet, in spite of all this, at the beginning of the twentieth century, a theory different from Newton's was put forward by Einstein. Opinions about the truth of Einstein's theory varied but its claims to serious attention could not be denied, nor its claim to go beyond Newton's theory in the range of its applications. All the observational evidence which fitted Newton's theory (and some about which Newton's theory said nothing) also fitted Einstein's. The world had simply been wrong in believing that all those innumerable evidence proved Newton's theory. Yet a whole era of civilization had been based on it, with unprecedented material success. If this amount of *verification* and *inductive support* did not prove the truth of the theory, whatever could?

Popper realized that nothing could. He saw that no theory could ever be relied on to be



the final truth. The most we can ever say is that it is supported by every observation so far, and yields more and more precise predictions than any known alternative. It is still replaceable by a better theory.

Popper's falsifiability principle is meant to be a methodological touchstone not only for the natural sciences but also for the social sciences. And most readers of Popper's thoughts on politics and scientific method and rationality agree that there is an intriguing consistency. For example, Anthony O'Hear (1995, 2) opines: "Popper's philosophy is marked by a breadth and coherence unusual for a modern philosopher. While his fundamental insights may stem from the philosophy of science, what he has to say there reaches out into politics, into the theory of rationality and into the nature of life itself". Similar opinion is held by another authority on Popper, namely, Professor Bryan Magee who opines that: "Popper has extended ideas originally worked out in the natural sciences to the social sciences, and a knowledge of the former is indispensable to a deeper understanding of the latter(1973,9). Popper characteristically couched such extension of his ideas in the natural sciences to the social sciences in high-flown terminology, namely, the theory of "piecemeal social engineering". This theory is to be found in the three books of Popper which he devoted to society and politics viz: *The Open Society and its Enemies*, vols. 1 and 2, and *The Poverty of Historicism*. In fact, in these books, Popper set up his refutability criterion most powerfully against Marxism which had sought to do for society what Newtonian physics did for the natural sciences.

In opposition to Marxist revolutionary overthrow of the capitalist social order, Popper propounded and advocated his principle of piecemeal social engineering which he claimed to be an extension of his falsificationist methodology to social science. He writes (1960, 58): "piecemeal tinkering is the main way to practical results in the social as well as in the natural sciences". What does Popper exactly mean by piecemeal social engineering or piece

meal technology? According to him (1960,21-22), "Just as the main task of the physical engineer is to design machines and to remodel and service them, the task of the piecemeal social engineer is to design social institution, and to reconstruct and run those already in existence".

### **Motifs of Enlightenment Ideology in Popper's Logic of Scientific Discovery**

It is proposed here to consider the contribution of the ideology of the enlightenment to the evolution of Popper's thought generally and particularly to his logic of scientific discovery or falsificationist methodology which is both the nucleus and motor of his philosophy of science. Popper could not be said to be immune to the Western humanist tradition which found its strongest expression in the ideology of the enlightenment. The values and sentiments of the enlightenment left their decisive imprints on Popper's image of life, society, science and human knowledge as a discerning reading of his works would readily show.

An elucidation of the ideology of the Enlightenment is necessary to help the reader to appreciate the nature and extent of its influence on Popper's methodology of science. *The Macmillan Encyclopedia* Vol.5 (Isaacs ed.1981, 415) defines "Enlightenment" or Age of Reason (as it is also called) as "An 18<sup>th</sup> century philosophical movement that sought to replace orthodox authoritarian beliefs with rational scientific inquiry". On the other hand, *The Chambers English Dictionary* (472) defines "Enlightenment" as: "The spirit of the French philosophers of the 18<sup>th</sup> century with a belief in reason and human progress and a questioning of tradition and authority". For the German philosopher, Immanuel Kant, who was one of the leading thinkers of the enlightenment,

*'Enlightenment is man's release from self imposed tutelage. Tutelage is the inability to use one's natural powers without direction from another. This tutelage is called "self-imposed" because its cause is not any absence of rational competence but simply a lack of courage and resolution to use one's*



*reason without direction from another. Sapere aude - Dare to reason! Have the courage to use your own minds! - is the motto of Enlightenment' (Quoted in Jones 1979, 7).*

The enlightenment, as an intellectual movement, derived its life force from three concepts, namely, Optimism (Faith in progress), Reason and Nature. These concepts merit some elucidation because of their long and venerable history.

Optimism or Faith in progress developed from the enlightenment philosophers' belief and teaching that man's knowledge and power over nature will increase indefinitely, and that this knowledge and power will bring worldly happiness (Plamenatz 1963, 410). It is not surprising that the enlightenment was optimistic. Europe had finally emerged from a long period of superstition and bigotry. The new science was revealing that the universe, appearances to the contrary, is a vast but fundamentally simple mechanism. As a part of this orderly universe, man's behavior should be subject to prediction and, hence, to control in the interest of improving his material and social well-being. Great progress had already been made in this respect. There seemed to be no reason why continued, indeed unlimited, progress was not possible.

The enlightenment philosophers saw in the idea of science a necessary, though not sufficient, condition of the idea of progress. It was widely believed that knowledge would increase indefinitely and that happiness would increase with it. It was argued in justification of this belief that the invention of printing had diffused knowledge more widely than ever before, and so made it unlikely that a calamity would destroy it, as the barbarian had destroyed the accumulated knowledge of antiquity.

The rationalization goes further. The more men know and the more men there are who share the knowledge, the faster knowledge accumulates and the less likely that something will happen to slow down the rate of accumulation. There is a natural tendency for knowledge to accumulate, because men are endowed with memory and can keep records and so make a store to which they can add

continuously; and the greater that store the more unlikely its destruction. Knowledge, like man its possessor, is more vulnerable in infancy, and becomes the less so the larger it grows. These enlightenment philosophers' belief in the inevitability of progress by reason of the increase in knowledge finds clear, confident, and classic expression in Condorcet's *Sketch for a Historical Picture of the Progress of the Human Mind* which in part reads:

*New instruments, machines and looms can add to man's strength and can improve at once the quality and the accuracy of his productions and can diminish the time and labor that has to be expended on them....So not only will the same amount of ground support more people, but everyone will have less work to do, will produce more and satisfy his wants more fully....No one can doubt that as preventive medicine improves and food and housing become healthier... the day will come when death will be due only to an extraordinary accidents. Finally, may we not extend such hopes to the intellectual and moral faculties? (Quoted in Jones 1979, 3)*

Concerning the concept of "nature" as construed in the enlightenment ideology, the individual thinkers each had his delicate formulation of it. Yet whether they were thinking of past or present, whether of physical nature or of human nature, they excluded the unpredictable and miraculous, especially the possibility of intervention by supernatural forces from outside the closed system of nature. As W. T. Jones (1979, 3) observes, "although few enlightenment thinkers were explicit atheists, they were, at most, very tepid Deists. They envisaged a God who, having created an orderly universe left it strictly alone".

Indeed it is correct to infer that the enlightenment thinkers rejected the concept of divine intervention in the world and relegated God to the role of a spectator. This they did in order to be able to deal with a closed,



completely regular system they conceived as nature. Whatever differences existed among the enlightenment thinkers' views of "nature", a common feature that held them together was the notion of "order". And an understanding of this notion of "order" is the key to an understanding of the enlightenment thinkers' concept of nature which, they held, should be studied independently. This theme of "order" was clearly sounded by Montesquieu (1689-1755), one of the pre-eminent thinkers of the enlightenment, when he wrote: "Laws, in their most general signification, are the necessary relations arising from the nature of things. In this sense, all beings have their laws: the Deity His Laws, the material world its laws, the intelligences superior to man their laws, the beasts their laws, man his laws" (Quoted in Jones 1979, 6).

Turning to "Reason" as one of the constitutive concepts of enlightenment, despite diverse formulations by many thinkers, there is also a common core of meaning put on it by the Enlightenment thinkers. Though these thinkers equated reason with anything from common sense to strict logical deduction on a geometric model, they generally agreed that there exists an innate intellectual power which is equal, or nearly equal, in all men. They reasoned that all men have what Descartes had called *bons sens* (good sense). Consequently, the enlightenment thinkers held that given adequate education, men will be able to solve all the problems that arise in the course of their lives. They further argued that Reason will demonstrate that nature is orderly, that the universe, though a mighty maze, is nonetheless not without plan and, what is more, that Reason will demonstrate that each man's long-term interests dovetail with those of other men, and thus men can work together in peace and harmony, each pursuing his own good.

In further justification of the powers of Reason, the enlightenment ideology held that since men are rational beings, they are, by and large, capable of running their own affairs and hence laws can be kept at a minimum. *Laissez-faire* political and economic systems and moral theories based on self-respect, decency, and the dignity of man became the logical outcomes of this line of thought. For

enlightenment man, so much about civilization hung on the spirit of reasonableness believed to be inherent in man such that Condorcet, a dominant voice of the enlightenment, had written:

*The time will therefore come when the sun will shine only on free men who know no other master but their reason; when tyrants and slaves, priests and their stupid or hypocritical instruments will exist only in works of history and on the stage; and when we shall think them only... to learn how to recognize and so to destroy, by force of reason, the first seeds of tyranny and superstition, should they ever dare to reappear amongst us (Quoted in Jones 1979, 2).*

It is a trite point in history of thought that the enlightenment meant indeed a new dawn for western civilization in relation to the struggle between science and religion, reason and faith, state authority and individual liberty. It was a new dawn because the thinkers of the period, deriving support from the wonders of the new science, sowed in men's minds the ideas of the irreconcilability between science and religion, reason and faith and, therefore, the need for science and reason to go their own way and further, the moral superiority of individual liberty over authoritarianism. Professor W.T. Jones, in his *Kant and the Nineteenth Century*, wrote glowingly of the new dawn of the enlightenment thus:

*The basic assumption of Enlightenment was that the universe is rational in all its aspects and in every detail. Because the physical is rational, there are a number of "rational principles" at work in it; it therefore has a simple orderly pattern. Because the human intellect is rational, it has the capacity to discover these principles, to understand the pattern. Because the human will is rational, it is capable of acting in the light of this knowledge. Given these beliefs, it is not surprising*



*that the age was optimistic (1979, 9).*

These enlightenment ethos, beliefs, or ideology of “rational principles” governing the universe were part of the intellectual heritage of the twentieth century world (in which Popper was born, studied and taught) as it is also of our 21<sup>st</sup> century. It is the inherent and ineluctable ideological framework within which Popper as a rationalist philosophized. It is the intellectual nursery in which a good measure of Popper’s thoughts formed. Even Popper himself admitted unequivocally the ineluctability of an ideological framework for the intellectual in two of his mature writings. In a 1965 paper titled “Normal Science and its Dangers”, he writes: “I do admit that at any moment we are prisoners caught in the framework of our theories; our expectations; our past experience; our knowledge” (in Lakatos, ed. 1965, 56). In his book, *Objective Knowledge*, Popper declared “common sense assumptions” or “common background knowledge” as that ineluctable starting point of every inquiry and further wrote: “Science, philosophy, rational thought, must all start from common sense- the often inadequate or false instincts or opinions of many men” (1972,33).

Beyond showing that enlightenment ideology was one of the ideological frameworks within which Popper’s thoughts were formed, it is proposed to show particularly how it contributed to the development of Popper’s logic of scientific discovery or falsificationist methodology of science. Popper, the philosopher of science, was very much a child of the Enlightenment. He shared its faith in progress, its critical spirit and its concept of independent, self-contained nature susceptible to rational study. It is easy to see the enlightenment’s apotheosis of reason come to its flower in Popper’s falsificationist philosophy. It is significant in this regard that Popper labeled his philosophy “critical rationalism”. And characteristically, he writes in his “Epistemology without a Knowing Subject” that:

*‘In upholding objective knowledge, I hope to provoke those whom I call ‘belief*

*philosophers’: Those who, like Descartes, Locke, Berkeley, Hume, Kant or Russell, are interested in our subjective beliefs, and their basis or origin. Against these belief philosophers I urge that our problem is to find better and bolder theories; and that critical preference counts, but not belief’ (1972, 107).*

In effect, Popper maintained that, unlike those he called “belief philosophers”, he was not concerned with security and justification of claims. Instead, he holds that the methodologist and scientist are concerned at any given time to choose between the potentially infinite numbers of theories which will explain the set of phenomena under investigation. Faced with this choice, he (the methodologist or Scientist) can only eliminate those theories which are demonstrably false and rationally choose between theories that survived critical tests. This insistence on critical preference explains Popper’s emphasis on the importance of the critical spirit of science. This is because for him, as a child of the enlightenment, *critical attitude of mind* is the very essence of rationality. He maintained that it is by critical attitude that we can eliminate false theories and determine which one, among the surviving theories, is the best in the sense of possessing the highest level of explanatory force and productive power. It is precisely this kind of *critical attitude* which he claimed was lacking in Marxism, Nazism, and Psychoanalysis and for which he therefore set them aside for annihilation.

This critical attitude, as a canon imbibed from the enlightenment ideological framework, became transformed in the full gale of Popper’s methodological thought into the famed falsificationist methodology of science or logic of scientific discovery which would, for him, become the criterion of demarcation between science and non-science. How Popper devised and deployed this falsificationist methodology is of particular interest to both admirers and critics of Popper as it provided him with formidable intellectual ammunitions in his ideological



struggle against his *bete noires*, Marxism and Nazism.

There is not just a bare whiff but a full-blown storm of enlightenment critical spirit in Popper's methodological thought both in the mainstream sciences and in the social sciences. Enlightenment ideology took it for granted that criticality is the correlate of science. Popper, as a child of the enlightenment, equally took criticality (now ingeniously renamed falsificationist methodology) not only as the hallmark of science but indeed as the criterion of demarcation between science and non-science.

According to the way Popper appropriated the enlightenment ideology's critical spirit in his philosophy of science, at no stage are we able to prove conclusively that what we now "know" is indubitably true, and it is always possible that it may turn out to be false. This critical and fallibilist position is obviously supported by the facts of the intellectual history of mankind which show that most of what has been "known" at one time or another has eventually turned out not to be the case.

Popper, possessed of this critical attitude, would, therefore, denounce scientists and philosophers who labor at proving the *truth* of a theory, which effort he described as akin to attempting the impossible. What we can do, he held, and this is of the highest importance to him, is to justify our *preference* for one theory over another. He would conclude, therefore, in his philosophy of "critical rationalism" that nothing in science is permanently established, nothing unalterable, and indeed science is quite clearly changing all the time and not through the accretion of *new certainties*. If we are rational, he posits, we shall always base our decisions and expectations on "the best of our knowledge" as the popular phrase so rightly has it, and provisionally assume the "truth" of that knowledge for *practical purposes*, because it is the best insecure foundation available; but we shall never lose sight of the fact that at any time experience may show it to be wrong and require us to revise it. This ideology of permanent revision of our theories, of our knowledge, as typical as it was of the enlightenment's critical spirit,

is articulately put in Popper's own words in his reply (1982, 33-4) to Imre Lakatos thus: "The methodologists of scientific research programmes seem to show insufficient understanding of the fundamental role played by criticism in the growth of knowledge. As I see it, criticism is the prime duty of the scientist and anyone who wants to advance knowledge".

Popper also extends his falsificationist methodology to the social sciences. Here, Popper finds the social equivalent of his critical methodology in "Open and free society" by which later phrase he meant a criticism-friendly, and pluralistic society within which incompatible views are expressed and conflicting aims pursued; a society in which everyone is free to investigate problem-situations and to propose solutions; a society in which everyone is free to criticize the proposed solutions of others, most importantly those of the government, whether in prospect or application; and above all, a society in which the government's policies are changed in the light of criticism (Magee 1973, 74).

In Popper's scheme, theories in the natural sciences have their social equivalents in social policies. And in this light, conflicts and contradictions amongst theories and replacement of some theories by better ones constitute progress of science just as much as competition amongst social policies and replacement of some by better ones constitute progress for political or administrative science and, by implication, for the society.

Furthermore, Popper maintains that since policies are normally advocated and their implementation supervised by people who are in some way or other committed to them, changes of more than a certain magnitude involve changes in personnel. So, if the open society is to be a reality, the most fundamental requirement is that those in power should be removable (at reasonable intervals and without violence) and replaceable by others with different policies. And for this to be a genuine option, people with policies different from those of the government must be free to





constitute themselves as an alternative government, ready to take over. This means that they must be able to organize, speak, write, publish, broadcast, and teach in criticism of the people in power and must have constitutionally guaranteed access to a means of replacing them, for example, by regularly held free elections. Popper's genius in crafting the foregoing seamless transition from his critical methodology in the philosophy of natural science to his critical methodology in the philosophy of social sciences is not only significant but commendable.

Finally, attention is given to Popper's adoption of enlightenment ideology of faith in progress (optimism) in the development of his philosophy of science. For sure, the enlightenment's ideology of faith in progress rested on the emerging facts that the rational methods of the new science were increasingly enabling man's power to predict and to control the course of physical phenomena. The knowledge of these methods, therefore, became a means to power which in turn became a means to happiness. What is more, it was believed, and so indeed it turned out, that new discoveries would ever be made implying an indefinite increase of knowledge.

Popper was not immune to the influence of the enlightenment ideology of faith in progress. There are unmistakable motifs of this ideology in Popper's characterization of science. This is strongly expressed by the notions of cummulativism (accretion) and verisimilitude in Popperian science. In the lecture "*Normal Science and Its Dangers*" he writes:

*In science, as distinct from theology, a critical comparison of the competing theories, of the competing frameworks, is always possible. And the denial of this possibility is a mistake. In science (and only in science) can we say that we have made progress: that we know more than we did before (1965, 57).*

Elsewhere, in *Objective Knowledge*, Popper again writes concerning faith in growth or progress of scientific knowledge: "The fundamental problem of the theory of knowledge is the clarification and investigation of this process by which, it is here claimed, our theories may grow or progress" (1972, 35). The ideology of faith in progress would exercise further influence on Popper's cosmological view about which he writes in *The Open Universe* thus:

*"We live in an open universe...it is emergent....No good reason has been offered so far against the openness of our universe, or against the fact that radically new things are constantly emerging from it; and no good reasons have been offered so far that shed doubt upon human freedom and creativity"* (1982,130).

Popper's cosmological view is further expressed by his indeterminist and objectivist interpretation of quantum physics which is a conscious or unconscious expression of his cultural repertoire amongst which the enlightenment's world picture of inevitable cumulative growth of knowledge (progress) ranked high. Popper opposed most vigorously the Copenhagen interpretation of quantum physics which is both subjectivist and determinist. Subjectivist, because it holds that, in atomic theory, we have to regard "the observer or "the subject" as particularly important in that atomic theory takes its peculiar character largely from the interference of the subject or the observer (and his measuring agencies) with the physical object under investigation. Upholding the popular dictum of the Copenhagen school that "objective reality has evaporated", Niels Bohr, a foremost defender of the school, wrote:



*"...indeed, the finite interaction between object and measuring agencies... entails the necessity of a final renunciation of the classical ideal...and a radical revision of our attitude towards the problem of physical reality" ( Schilpp ed. 974, 232).*

Popper, as a votary of the enlightenment ideology, would get back at Bohr in the introduction to his *Quantum Theory and the Schism in Modern Physics* where (1982, 35) he held thus: "I attempt to exorcize the ghost called 'consciousness' or 'the observer' from quantum mechanics and to show that quantum mechanics is as 'objective' a theory as, say, classical statistical mechanics".

The Copenhagen interpretation also regards quantum theory as the "end of the road" in physics. But Popper, caught in the ideological framework of the enlightenment's faith in inevitable progress, advanced intricate arguments against the "end of the road" thesis or determinist physics. Popper anchored his opposition to the determinist "end of the road" thesis on his argument that there may be a deeper layer of physical reality beyond that described by the equations of quantum mechanics, perhaps in nuclear physics - since after all quantum mechanics had, essentially, developed as the theory of the electronic shells surrounding the atomic nucleus.

Popper's views on politics, physics, and cosmology are shot through and through with objectivist and indeterminist themes. Popper's opposition to determinist quantum physics was not casual but deep-running because Popper was one philosopher who took the determinist threat very seriously and was under no illusion that there would be any authentic freedom in a physical world that was fully determined.

Furthermore, Popper did emphasize how important it is for us that the world should not only not be determined at the level of physics - in the domain that (from the early 1970s onwards) he referred to as world 1 -- but that it should be causally

open to other influences, especially those from world 2 - the world of mental activity - and (through the intercession of world 2) those from world 3- the world of abstract human creations, especially problems and theories.

Like the enlightenment thinkers, Popper held that notions crucial to the way we ordinarily see ourselves as rational agents would be rendered completely otiose if the thesis of physical determinism as held by the Copenhagen interpretation of quantum mechanics were true. The truth of quantum determinism, he argued, would entail that we inhabited a nightmare world. Commenting approvingly on the opening passage of Arthur Holly Compton's *The Freedom of Man*, Popper wrote as follows:

*'Compton described here what I shall call "the nightmare of the physical determinist." A deterministic physical clockwork mechanism is, above all, completely self-contained: in the perfect deterministic physical world there is simply no room for any outside intervention. Everything that happens in such a world is physically pre-determined, including all our movements and therefore all our actions. Thus all our thoughts, feelings and efforts can have no practical influence upon what happens in the physical world: they are, if not mere illusions, at best superfluous by-products ("epiphenomena") of physical events.'* (1972, 217)

## Conclusion

A discerning study of Popper's falsificationist philosophy of science would reveal a pronounced tug between subjectivism and objectivism. This is evident in Popper's epistemological-cum-ontological theory of three worlds- the external physical universe, the inner world of the mind, and the world of culture. But because he is concerned with furnishing a rational image of science as part of the general cultural heritage of our Age, Popper comes down on the side of



objectivism. He tends to stifle subjectivism by his emphasis on the causal relations linking the three worlds (1972, 155). Yet elsewhere (in *The Logic of Scientific Discovery*) while attesting to the decisive importance of the irrational, intuitive and creative elements in scientific procedure, he relapsed into subjectivism when he wrote:

*'My view of the matter, for what it is worth, is that there is no such thing as a logical method of having new ideas, or a logical reconstruction of this process. My view may be expressed by saying that every discovery contains 'an irrational element' or 'a creative intuition' in Bergson's sense' (1968, 32)*

Therefore, Popper's view is that there is indeed no such thing as definite logical method of scientific *discovery* but only logic of scientific *testing*. He made this clear enough in his *Conjectures and Refutations* where he argued that if the method of trial and error is developed more and more consciously, then it begins to take on the characteristic features of 'scientific method'. It is not a method in the sense that if you practice it, you will succeed or if you don't succeed you can't have practiced it; that is to say, it is not a *definite* way to results: method in this sense does not exist (1963, 313). Based on the above, one is bound to infer that from a logical point of view that there is no definite method of choice between rival theories.

Hence, the basis of Popper's logic of scientific discovery or falsificationist methodology is not logic but some mix of ideologies despite his deployment of his great erudition to pass it off as some primitive, objective, logico-mathematical axiom or algorithm as objective as statistical mechanics, what with all the splash of complex and ponderous symbols, diagrams, and tables he called in aid of elucidation of his falsificationist methodology. The exposition of this ideological basis of Popper's logic of scientific discovery or falsificationist methodology, in my opinion, does not detract from his enormous contributions towards the characterization and

understanding of the scientific enterprise. Rather it shows him being *human*. As *humans* we approach everything in the light of a preconceived theory. We know and interpret every factual situation in concepts which reflect our specific culture, environment and even accidental idiosyncrasies. At any moment we are prisoners caught in the framework of our theories, expectations, our past experiences, and our language. Even when we break out of our framework, as Popper urges us in his critical rationalism, we find ourselves again in a framework which may be better or otherwise depending on the criterion of judgment. Popper, like everyone else, has the freedom to choose his philosophical framework but does not have the freedom to cajole us through his legendary erudition into believing that his logic of scientific discovery or falsificationist methodology is a pure logical *criterion or algorithm*.

He denounces (1944, 32) Hegel for spawning a misleading official philosophy for the Prussian state – thus regrettably turning philosophy to “a tool of interests”. He cites (1944, 33) approvingly, Schopenhauer's criticism of Hegel: “Philosophy, brought afresh to repute by Kant...had soon to become a tool of interests; of state interests from above, of personal interests from below”. Popper himself has committed similar misdemeanor. He has turned philosophy and methodology of science, a supposedly very dispassionate discipline, into a tool for his implacable anti-Nazism and ant-communism. He became, in the process, a foremost apologist of capitalism and was rewarded with a professorial chair in 1946 in the London School of Economics and Political Science even when philosophy and philosophy of science were not on the school curriculum (Solo 1991, 5) and was knighted in 1965 by the Establishment's ancient symbol, Queen Elisabeth II. It is an irony with some dramatic effect that Popper ended in the grips of his irreconcilable ideological foe, Marx, who bequeathed to history the timeless truth that our ideas, our ideologies are products of material, economic conditions in which we find ourselves. Popper, a jobless, embittered Austrian refugee intellectual escaping the Nazi



maelstrom and casting about for both material sustenance and intellectual renown, lent credence to Marx's great insight.

And Bertrand Russell in the essay, "From Logic to Politics" (1956, 36) echoed Marx's great insight above by positing that 'the fillings and views of adult individuals are a product of many causes: experiences in infancy, education, economic struggles, and success or frustration in private relations'.

This dissection of Popper's famed logic of scientific discovery or falsificationist methodology has exposed the cultural and ideological struggle which powered Popper's falsificationist philosophy of science. Such cultural conflict and ideological struggle show that ultimately history of thought is the history of cultural conflicts and ideological struggles. As our theories are the bearers of our culture and ideologies, it does follow that the elimination, under the determination of utility, of our "bad" theories translates to elimination of "bad" culture and ideologies. Where rational criticism as to utility fails to decide between rival cultures and ideologies, propaganda, blackmail or outright war does so.

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