

The Myth of the Framework

In defense of science and rationality

K. Popper

Dec 18 - 20, 2011

This is a collection of essays published at the end of his life, provided with a preface written only six months before he died.

The first essay entitled the rationality of scientific revolutions emphasizes that instruction is always within a structure, it never comes from the outside. The former is the Darwinian approach, the latter can be referred to as Lamarckian. There is no such thing as a neutral observation. Every observation is biased by expectation. The objectivity of science does not lie in the eye of the beholder, but in how his or her conjectures mesh with realities. In other words if their expectations are in accordance with the facts. Conjectures come before observations, they may be inspired by observations, especially observations that conflict with previous observations and guesses, but there is no general way we can out of observation infer a pattern, we provide the pattern ahead of time.

The object of science is to get closer and closer to the truth, thus there is a definite sense in which we can gauge progress in science. Science may be the only human endeavor for which there is a notion of progress. There are, however, obstacles against progress. Obvious ones are of course poverty, which prevents the necessary resources to be harnessed, but also affluence may paradoxically impair progress. Big Science is a threat, as is the explosion of publication, which threatens to drown the real significant ideas. Of course prevalent ideology may hamper progress by closing off promising initiatives. In fact a scientific revolution may also spark off an ideological one, and against the latter one needs to be on guard. Obviously any scientific breakthrough changes the way we see the world, in other words it makes for a change in ideology. Even if that ideology is confined to science, it can nevertheless have a dogmatic effect. Worse is if the revolution is generally understood, such as the Copernican, then it may bring about a new ideology which has influences beyond scientific activity as such. Einstein's revolution is another case in point, basically because it was widely misunderstood and led to a fashion of relativity, as well as an unwarranted fusion of space with time. As other examples of deplorable ideological changes, he lists the present fad for subjective interpretations of quantum mechanics. On the other hand some very crucial scientific breakthroughs such as those effected by Faraday and Maxwell did not bring about any ideological change. Popper also takes up the case of Thompson and his discovery that went against the dogma of the indivisible atom. Of course this is a rather strange way of expressing it. The atom was proposed by the Greek as the smallest constituent of matter, thus opposing a continuous view of matter; but Thompson discovery simply noted that what had so far been thought of as an 'atom' i.e. in the sense of being indivisible, was not. The (unending?) quest was on. Surprising is also Popper's statement that the breakthrough of Crick and Watson seems not to have brought about any ideological revolution. This was written in the early seventies, but possibly the

ideology of genetics had not yet at the time established itself as firmly.

The central essay deals with the myth of the framework. The underlying idea being that people with different views and understandings cannot really communicate with each other. Their views are so to speak 'incommensurable'. This is the essence of Kuhns sociological view of science, which has become very influential, even if Kuhn did distance himself from the claims made by his most ardent supporters. This view of science is subversive because it does away with the notion of objective truth and replaces it with a relative one, appropriate for each set of frameworks. Such a view can be traced back to Hegel, who did realize that the act of propagating it was by itself an act of proposing a universal truth, namely that of the relativity of truth, a logical trap in which every post-modernists finds himself. Hegel solution was of course to speak about the absolute truth as well, and in the well-worn tradition of thinkers evoking the Almighty when their arguments begin to totter. This is of course anathema to Popper whose metaphysical conviction is one of objective truth the same for everyone. Science is about critical discussion and can take place even if the participants come from very different backgrounds. The more different, the more difficult the discussion, but also the greater potential to become fruitful, when each participants is forced to develop his arguments and take into account the points of views of the other. A discussion in which everyone involved has pretty much the same opinions and background can of course be very pleasant and lead to agreement, but at the same time also a bit boring. The mistake the proponents of relative truth make is to have too high expectations on discussions. One cannot expect such discussions to lead to a resolution and a consensus, at most one can hope for some kind, however tentative, approachment. The point of a discussion is not to win. A discussion which has a winner is most likely a failed discussion. The point is to change your mind a little, to get a new and hopefully better understanding not only about the views of the other, which is part of the tolerant attitude, but more importantly about your own views. The success of a discussion is measured in terms how much closer we get to the truth. The moral issue of scientific discussion is your willingness to acknowledge that you may be wrong and that the other fellow may have something that is worth listening to. It is only hopeless if the participants are not willing to argue with words but prefer to shoot instead. Disagreement is not something to avoid, on the contrary it provides the lifeblood of science. It is only through disagreement that science can prosper and progress. And it is this tradition of rational criticism which we owe to the Greeks. It has only occurred once in the history of mankind, and it went into hibernation during the dark ages, only to be revived and rediscovered and not re-invented during the renaissance. It is the tradition of critically reviewing any theory, finding its weak points and to try to replace it with something even better. The ultimate theory will never be attained, there is always room for improvement. This should be contrasted against the dogmatism of ultimate theories, as in religion and its modern counterpart -Marxism. In a dogmatic setting, the point is not to improve but to purify. Dissent is scorned because it can only lead to schisms and a splitting. The overarching goal is consensus. Rational discussion is not an easy thing, to find the truth never is, but nevertheless it is something we may learn to enjoy.

Relativism is based on a misunderstanding. The fact that we can never hope to attain the ultimate truth does not mean that there is no such thing. The fact that we as human

beings are fallible and far more prone to error than anything else, does not mean that anything goes. Our fallibility should simply be a source for humility. Furthermore much of the arguments for relativity is based on the tacit and mistaken view that rational discourse is concerned with justification, ideally that of a deductive proof. Such an attitude of course demands a set of basic axioms and principles in order to get started, and if the basic principles are very different it is very tempting to say that we have incommensurability. Of course if the axioms and principles are very different there is little to discuss, but in practice we have some level of commensurability once there is a commonly acknowledged problem. If there is none, there is no cause for discussion. But critical inquiry is not concerned with derivation of truth, instead it asks the questions, such and such are my basic assumptions, what do they lead to? Am I comfortable with their ramifications? Are the consequences acceptable, and if not, I may have to reconsider my principles.

There really is no such thing as incommensurability. There are still points of contact between a discarded theory and its improvement. A new theory should provide the same insights and explanations as the old, in short it should be true to a tradition and thus allow accumulation. In non-scientific enterprises revolutions simply means new fashions, overthrowing the old and starting from scratch again. In particular there is no incommensurability between different cultures. Languages may be different, and even if perfect and aesthetically pleasing translations may be impossible, it does not mean one cannot, if in a round-about way, describe the facts in one language but not in another. True our language imposes constraints on our thinking, as does our myths and assumptions. One may metaphorically speak about prisons. But a discussion allows us to break out of the prisons, not in complete freedom, because such does not exist, at least into a bigger prison. Clashes of cultures are essential for progress. And, Popper believes, it was in its constant clashes with surrounding cultures that eventually led the old Greeks to the tradition of rational critical inquiry. Only if one culture sees itself as vastly superior to the other, an especially if the other culture accepts this, will an exchange become degrading. I believe this accounts for the degrading influence modern civilization has had on primitive cultures it has encountered. The technological gap has simply been too wide to allow a giving and taking. The primitive culture has had nothing to give but has instead been swamped by outside 'gifts' which have replaced their own technology instead of merely enhancing it. With the abrupt cessation of tradition comes a host of problems connected to a loss of identity.

Popper takes strong exception to the inductivism of Francis Bacon which has had such a decisive influence on how empirical science is and should be conducted. Bacon was not a scientist but a philosopher and above all a prophet. He had a vision of the modern industrial society in which truth is manufactured systematically and in great quantity for the benefit of man. Truth is manifest, nature is an open book for everyone to read. The basic tenet of Bacon is that one should start with observations and to have as pure as mind as possible. In other words to rid oneself of prejudice before observing, in particular to discard all kinds of theories as being the fruits of idle speculations, because theories prejudiced the mind and leads you astray. Nature does not mislead you, only your own preconceptions and fanciful imaginations. To this Popper presents the opposite approach. Observation is not the basis for forming theories. As noted nature cannot instruct us,

instead we start out with guesses and conjectures and use observations only to corroborate our guesses, to see whether or not they comply with the facts. In fact we cannot make the simplest or most basic observation without any theory. We cannot purge our minds of every vestige of a theory, to do so would result in rendering our minds empty. An empty mind can observe nothing. The objectivity of science does not reside in the objectivity of the scientist, but in the objectivity of his theory. That the theory can be critically tested by others. Bacons wild claim that given a few years he would once and for all copy the book of nature and provide us with all knowledge was never put to the test. As Popper remarks sarcastically, no one gave him the research grant. One should note that Bacon did not believe in the heliocentric theory, the fact that the earth stands still and the sun is moving is apparent for anyone who makes the observation. The inductivist method of resorting to our uncritical acceptance of the testimonies of our observations does not allow us to go beyond those. Only daring guesses, going out on a limb, damn the consequences does that. Galileo understood that and he was the first modern scientist. The empirical content of a theory consists in t what extent future observations may be in disagreement with it. In other words whether it is refutable or not. This does not mean, and here many of Poppers supporters and critics alike get him wrong. A theory can very well be true even if we cannot refute it. First the possibility of refutation depends on the times. When the atomic theory was first presented by the old Greek materialists it was not falsifiable and hence not an empirical theory only a philosophical and speculative. As science and technology progressed, and the atomic theory got to have a more precise content, it became indeed falsifiable and part of empirical inquiry. Secondly it may be that a true theory cannot be refuted (partly because it is true). This only means that it is not part of science. Is Darwin's theory of natural selection refutable? Not if you define fit as prone to survival, then it reduces to a mere tautology. Nevertheless it has meaning as presenting a case of how order can arise from chaos without the intervention of a designer. And of course Popper's own philosophy of how we acquire knowledge is very much inspired by Darwin's theory. To refute Darwin's thesis you would need to come up with an alternative explanation and investigate how it would differ from the Darwinian as to consequences and then compare.

Einstein's theory of relativity dethroned Newton. No scientific theory had been better tested than that of Newton. Thus it was considered by people that it was an indubitable fact of the world. It was true, it had not only been justified and verified, it had in a deeper sense been proved. Even Poincare, who came close to presenting special relativity himself, took it as scientific dogma, One Newton was shown to be superseded by Einstein did the authoritative nature of science come to an end. Although Einstein defended his theory ferociously he had no illusions as to its status as the ultimate truth. It was subjected to the facts of the world, it could be shown false, it could be superseded. Before Einstein few people had this idea of the fallibility of science, the logician C.S.Pierce being one of the few.

Science begins with a problem. The problem leads to guesses and conjectures. That is the second step. The third step is to test the conjectures, and if successful, this will lead to new problems. Problems which are even more interesting than the original problem. And so on. We may know a vast amount, but our ignorance is even more formidable. It

is on the cusp of this tension, between the known and the unknown that a problem is born. We have expectations, and those expectations may be frustrated. Our knowledge has foundered on the shores of our vast ocean of ignorance. There are an infinite number of possible theories, thus we cannot naively hope that by eliminating the false ones, one by one, as believed by Mill, that we will end up with the true one. In order to solve a problem we need to acquaint ourselves with it. This is a long process that involves trial and error, in particular finding out why the obvious solutions do not work. It is only by trying to solve the problem we really appreciate its nature. In the same way we can never understand the solution of a problem unless we have acquainted ourselves with it, and understood what are the true difficulties and what the solution really addresses. Newtons elegant solution would be no solution if there was no problem. There would be nothing to understand. Understanding a solution is linked to understanding the problem which prompted it. Thus we may understand theories, even if those cannot be easily explained or visualized. Still, Popper laments, scientific papers are written in the style suggested by Bacon. First there are the hard facts, the observations, carefully described, then the explanations and at the very end maybe some speculative material. This is not how papers should be written. They should concentrate on the problem and then explain their attempts at solutions, maybe bringing up alternate solutions and why the author rejected those. The papers should clearly explain what the author hoped to achieve, and what he in fact did achieve. And there should of course be a description of the experiment in which the aims of the author become clear. Then there might be suggestion of new guesses and possible ways of testing them. Guessing and conjectures lie at the heart of scientific inquiry. We learn by eliminating our errors, we do not learn directly from observations. Thus a method of finding correlations between different phenomena may seem as an efficient method of discovery. In fact much of what goes under the name of research seems to be of that nature. But correlations as such tell us nothing at all, it is only when put into a context they may be interpreted fruitfully. Facts as such are not really interesting unless they help us to understand the world. Naked correlations give no understanding.

A scientist has a social responsibility. As a typical such the responsibility of scientists to prevent a nuclear war has been proposed. This is a misleading example, according to Popper. Few people can do anything about it, and on matters one can do nothing one cannot take responsibility. If everyone should take a personal responsibility for the eradication of the nuclear threat, which was of course very much on the agenda at the time of writing, there could ensue nothing but hysteria, which might have dangerous consequences. The idea of unilateral disarmament, as proposed by the otherwise eminent Bertrand Russell, is firmly rejected by Popper. Such a radical step would if anything just encourage the other side to use its weapons. The Americans bombed Japan with nuclear bombs, had they suspected that the Japanese might retaliate in kind, they might very well not have done it. No the real responsibility of a scientist is to express himself clearly. He owes to society to be understood. Unfortunately many bright people think that the purpose of an academic education is to be able to impress people, to be able to express oneself in a manner that is opaque and impenetrable. In fact to belong to an elite. Part of the motivation for such behavior may be, Popper speculates, the impenetrability to the outsider of mathematical formulas. While tolerance is a virtue, there are limits

to tolerance, according to Popper. Intolerance is not to be tolerated (there is a logical loop here of course) and failure to try for clarity. Violence makes rational discussion impossible, but so does obfuscation. As a particular target The author has The Frankfurt school in mind, Marxist sociologists such as Adorno and Habermas. What they write is incomprehensible, and when scrutinized it turns out to contain nothing but trivialities and inanities. The only thing that Popper finds worthy of note in the writings of Adorno is his pessimism. A pessimism which of course is inevitable given the meaninglessness of his endeavors. Popper was invited to a conference to provoke Adorno and his supporters. He took the invitation seriously and prepared twenty-seven statements as a challenge. To the great disappointment of the organizers Adorno refused to take up the challenge and instead only expressed agreement. Only one thing he did in terms of criticism was to accuse Popper of being a positivist. This he finds ridiculous. The only indication of any positivist leanings would have been the case that he was once allowed to publish under the auspices of the Vienna Circle. Anyone who had taken the trouble to read his works would have realized that he is not at all a positivist. In particular he sees no reason that the social sciences should emulate the natural sciences as to methodology. Methodology is something that naturally arises from the problems that provokes the growth of a particular line of inquiry.

Is history science? It is generally assumed that there is a vast difference between the methodology of history and that of the natural sciences, especially this is assumed by the humanists who in general have a rather superficial understanding of the scientist craft. Popper argues that the supposedly vast difference is vastly exaggerated. The methods of the scientists are in fact far more humanistic than the humanists are aware. Or conversely good history is pursued in a spirit close to that of natural science. One should not think of the scientific element in history is concerned with finding universal laws, this is an ambition rejected by Popper in his 'The Poverty of Historicism'. Nor shall one think that history needs to be more quantitative. Such tendencies have been ridiculed by Hayek as mere 'scientism'. In history as well as in the natural sciences one needs to confront a problem. A historical problem is admittedly rather different from one in the natural sciences, in particular, as already noted, one is not after general historical laws; but it is a problem nevertheless that admits an objective solution, or at least an attempt at such. While in the sciences we make observations, in history we consult documents. One may as little write a history by aimlessly reading a lot of documents, as one may derive natural laws from mere observing. Just as an observation has to be interpreted in the light of theory and the problem involved, historical documents need to be interpreted by the situation they are part of and the problem whose elucidation they are expected to contribute to. As Collingwood notes, it is not so much a question of reading and taking the information of a document on face value, as to interpret its meaning, given the historical circumstances. History, according to Collingwood is to reconstruct the past in the present using the available sources. This can be compared to forming a conjecture given our present knowledge. Future discoveries of unknown documents may lead to major revisions, just as future tests and observations may undercut theories that we now accept. The big difference between history and science is that in history the human actor is at the center. In particular the task of the historian is to re-enact the thought that motivated the historical actor. Without such

a reconstruction the actions of the past become incomprehensible. Popper is in sympathy with Collingwood, although he takes exception to his ambition of re-enactment, which he finds too subjective. It may serve some psychological support but should be removed in the final analysis. Instead of reenacting the thought one should re-enact the given situation. However, to do so without any empathy as to the motivating thoughts, this is impossible. Also, with thoughts Collingwood is not so concerned with the purely personal, the qualia so to speak, and furthermore he has a healthy contempt of psychology. What makes history interesting is shared humanity. Only by sensing a common rational motivation are we able to engage in the past and make sense of it. Furthermore Popper does not agree with Collingwood's and other philosopher's concept of knowledge. To Popper knowledge can in fact exist outside human beings. It can be encoded in books and collected in libraries. In effect, it constitute what he refers to as World 3, the world of the creations of World 2 the human mind, and is objective. To somebody like Collingwood knowledge only emerges when it is re-enacted by a mind. Knowledge which is stored is inert. I very much sympathize with Collingwood, yet coded matter does constitute a reservoir, the destruction of which would greatly reduce our potential of achieving knowledge.

Finally does history have a plot? This is somehow at the core of the idea of historicism. Grudgingly Popper admits that historicism may have some point, and if there is a plot to the history of mankind the growth of knowledge surely provides it. As notes, Popper claims that science and the knowledge it generates, is the only human process in which one unequivocally can speak about progress. And indeed this tends to be the naive way we look at history when we study it. A record of progress chronicling an increased technological sophistication, all of it the fruits of increased knowledge.

Is Social Science possible? Are there Social Laws as strict and unforgiving as Natural Laws? The impossibility to establish a Social Science modeled on Physical Science, and the disparagements of the desperate attempts to do so, may make the ambition of making a Science out of social problems impossible. Popper thinks that the much touted differences are exaggerated or at least largely irrelevant. The relevant fact is that there are problems, urgent problems, and amenable to a rational critical discussion. Social theories are not as elegant and powerful as those in Physics, still it is possible to set up explanatory models. Any model by definition is bound to be an oversimplification, and many of its shortcomings may be explained by this. However, it is hard to know whether there are more principal and fundamental short-comings that do not stem from the simplification. The only way to investigate that is to come up with alternative models to provide comparisons. Now in the physical sciences there are two types of models. One is the singular one, in which a specific event, such as an eclipse, is predicted using general laws and specific initial and boundary conditions. This kind of computational model has no counterpart in the social sciences. The other model is the explanatory one, in which we are interested in eclipses per se, how they come about. To understand such a qualitative model is of course a prerequisite to set up a quantitative one and see to its computational success. The latter kind of models should also be possible in the Social setting. What is central here is the so called situational model, taking into account the relevant factors. Given a situation we can then explain the action of an individual as an appropriate response to the situation. In short we assume that the actor acts rationally. Can we expect that? of course not, but in a sense we have

no choice not to. Thus we run into the difficulty of assuming the rationality of the actors as an *a priori* assumption. This does of course go against the grain of Poppers critical philosophy. But not accepting it, means that we will have to give up the most promising, and in fact the only conceivably fruitful model approach, because rational behavior is a feature in them all. One way of getting around it, is to modify the situation, to describe it not in objective terms, but in the way it must have appeared to the actor. The underlying assumption is that even the actions of a madman becomes intelligent if we only understand how the situation appears to him. Thus madness is not so much a failure of rationality as a failure in assessing a situation. Once we really put ourselves into the shoes of a madman we can rationally explain his antics. This is the basis of Freud's psycho-analysis. The neurotic behavior is comprehensible in view of a skewed and incomplete assessment of a situation, once the patient is given a complete and accurate description of the situation, his or her rationality will result in an appropriate response and hence a recovery of health.

To understand the nature of Poppers philosophy of science one needs to contrast it to that of Francis Bacon, whose influence has been pervasive right into modern times. Bacon was a second-rate philosopher according to Popper, his writings are shallow and confused; but he was a great visionary. His vision was of the modern industrialized society, and the road to that utopia of his was the simple formula that knowledge means power. To find the truth was easy, you just had to divest yourself of false beliefs and read the open book that Nature constituted. Knowledge derived not from speculation but from empirical observation. By observing we found the laws of Nature which we could exploit to our advantage. In short we should conquer nature.

This vision has proved very resilient and most people think of science as a way of gaining power by finding out facts by unsentimental observation and that the plot of human history, at least in the last centuries, have been to conquer nature, to make ourselves less and less dependent upon its caprice by wielding the power given to us by knowledge.

Popper differs in some basic aspects. First Truth is not manifest, it is not easy to come by. He is not, like Bacon, an epistemological optimist. Nor is he an epistemological pessimist, he believes that even if Truth is hard to come by, it is not impossible. He thus shares Plato's attitude that the real world is not the world of phenomena which we partake of with our senses, but that the real world lies deeper and the world we perceive is just a shadow of the real world- the world of forms. This makes the finding of truth difficult. But not impossible, as Plato believes that we nevertheless can get access to the real world by our intellects. This is a far more arduous path to knowledge but not an impossible one. Popper teaches us that the world does not instruct us, we have to instruct ourselves. We have to come up with our own guesses and conjectures as to what theories and patterns hold. Those guesses of ours have to comply with the facts, and by testing them we imbue our efforts with an empirical element. If we cannot test our theories empirically, i.e. if they are not falsifiable, they are not scientific. This, however, does not mean that they are meaningless or without value. They can nevertheless be inspirational, and may be even developable until they become refutable by experiment. In particular the objectivity in science is not to be found in the scientist, as no human being can be fully objective. In fact objectivity is no real asset when it comes to create daring guesses. Objectivity in science is situated outside the individual scientists. It is constituted by the objective nature of

the theories, objective in the sense that they can be communicated to other people and be subjected to criticism including empirical testing. This is the way true scientists have always worked intuitively, the vision of Bacon has however taken over societies view of science. As this also have political consequences is unfortunate, as exemplified by the growth of Big Science, which threatens to subvert the true spirit of science, by making it an industrial enterprise, in which each scientist is merely a specialized cog. True science is pursued in an disinterested quest motivated by pure intellectual curiosity to get closer and closer to the truth, the attainment of which may be impossible, but which nevertheless will lead to an increase in knowledge. The only kind of progress known to man, and as far as there is a plot in history the only contender.

Dec 19–20, 2011 **Ulf Persson:** *Prof.em, Chalmers U.of Tech., Göteborg Sweden* ulfp@chalmers.se