Introduction

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This collection of essays on the work of Sir Karl Popper is based on the Royal Institute of Philosophy's annual lecture series given in London from October 1994 to March 1995. Popper himself died in August 1994, shortly before the start of the lectures. His death was the cause of sadness to all of those involved in the series. Some, indeed, had been close friends of Popper over many years, and others colleagues and acquaintances, some close, some more distant. Even those unacquainted with Popper personally spoke in their lectures of the profound intellectual stimulation they had received from the study of his works.

Towards the end of the course of planning the lecture series, I did, with some trepidation, contact Popper. His reaction was at once generous and self-effacing. Having initially told me that he did not envy me my task of getting speakers, when he saw the outline programme, he wrote that 'the plans for the course on my philosophy were very interesting: much more interesting than I thought possible'. Credit here should be given where it is really due. Once the Royal Institute determined on the topic, both subjects and speakers suggested themselves naturally; and there was no difficulty in persuading potential contributors from

Britain to participate. Popper himself suggested that Günter Wächtershäuser from Munich and Hubert Kiesewetter from Eichstatt should be added to the original list of British-based contributors, and this was done. Thanks are due to all who took part in the series, and who have helped to make this book as comprehensive and wide-ranging as it is.

Popper also agreed to take part in a question and answer session at the end of the series. That this was not to be is a matter for great regret, both personally and intellectually. Many original observations and criticisms were made during the course of the lectures, to which it would have been fascinating to hear Popper's own reactions. Despite the sense of regret shared by all involved in the series, however, the lectures as given and as here reproduced engaged fully and critically with Popper's philosophy. They are neither eulogistic nor valedictory, but testify to the sense that, whether Popper himself is alive or dead, his ideas continue to pose problems, to have consequences still to be fully explored and so to bear intellectual fruit.

Popper's philosophy is marked by a breadth and a 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. On science, Popper's thought is marked by a deep hostility to any profession of certainty or to any claim to justification. He accepts Humean scepticism about induction, taking on board the consequence that this means that we can never know whether any universal theory is true. He believes that even observation statements implicitly use universal theories

because in referring to objects such as glass or water we are making claims about how they will behave in the as-yet-unknown future. His scepticism thus runs deep, but he thinks he can base an account of scientific rationality on the negative activity of attempting to disprove theories. The empirical disproof of a theory is conclusive, while any amount of evidence in favour of a theory remains inconclusive. True scientists make bold conjectures and then, equally boldly, attempt to refute their conjectures by the severest tests they can devise. Following this procedure, we are entitled to accept as yet unfalisified theories provisionally, though we should not think this means they are in any sense justified. True science, indeed, is demarcated from other activities by the rigorous acceptance of the method of falsification and its results.

While some unscientific activities, such as Marxism and psychoanalysis are intellectually disreputable in that they pose as science while refusing to accept empirical disproofs as conclusive, there are intellectually respectable pursuits which are not scientific. Examples would be mathematics, ethics and philosophy itself. While not being susceptible to empirical disproof, they do all have well-established traditions of criticism to underpin their rationality. Rationality is thus seen by Popper as the generalized application of the critical method.

In science Popper's stress on criticism combined with a strong commitment to realism leads him to develop an original line on probability. He regards probability statements as objective and falsifiable. They are not to be seen as expressions of our ignorance about the full causal determinants of events, but as describing actual, but non-

deterministic propensities in the real world. The world is not wholly deterministic, but in many areas is governed by such propensities producing real but non-determining tendencies for events to happen in particular ways. Popper's commitment to indeterminism is closely linked to belief in human freedom and creativity, which he believes would be ruled out by any form of determinism. His belief in propensities allows him to think of probabilities as objective forces which leave room for the exercise of freedom.

Criticism, freedom and rationality are central to Popper's views on politics and open society, views which have struck a resounding chord with those in Eastern Europe and elsewhere who have lived and suffered under dictatorships. As an aspect of Popper's general epistemological scepticism and his hostility to justificationism in any form, we are told that any of our actions and policies are likely to have unforeseen and unintended consequences. This is significant particularly where large scale political changes are being attempted. We should, therefore, be suspicious of rulers and politicians who wish—even for the best of motives—to impose comprehensive blueprints on a society. Far from acceding to such dictatorial ambitions, we should work for open societies, ones in which anyone is entitled or even encouraged to criticize a policy, and in which rulers can be removed by the ruled regularly and peacefully. Accepting their own inevitable ignorance of the effects of policies, rulers should confine their activities to the eradication of manifest evils, rather than attempting to impose their untried and possibly unwelcome visions of happiness on the rest of the population.

Science and politics, then are ideally to be characterized by an admission of our ignorance and by the attempt to weed out false theories and to remedy the negative effects of our policies. Life itself comes to be seen by Popper in very similar 'problem-solving' terms. In the process of evolution, all kinds of modifications to existing creatures occur. Like a false scientific theory, most of these modifications are ruled out by the refuting environment. It is the environment, indeed, kicking back which assures us that our theories are about a real world and, in various directions, making progress. But in our scientific theorizing we are following the same evolutionary sequences as the most primitive amoeba, going from initial problem to an attempt to solve it. Then after eliminating error from the proposed solution, with luck we may reach a partial solution, and so move on to new problems. The difference between human beings and other life-forms is that we can make our modifications and propose our attempts at solution exosomatically, in symbols, outside our bodies. The criticizing environment can attack our theories, which die in our stead, rather than, as in the case of biological evolution, the modified organism.

The main lines of Popper's thought are clear, comprehensive and far-reaching. As would be expected, his doctrines brought him into conflict with many of the intellectual fashions of his and our times—with, for example, attempts to work out positive theories of induction, with anti-realism in the philosophy of science, with subjectivism in quantum theory, with Marxism in politics and with deterministic accounts of history and of our future. All these

disputes and controversies are alluded to and pursued in the essays which follow.

The first four essays deal with some familiar and basic problems arising from Popper's account of science. W. H. Newton-Smith is the latest in a long line of critics of Popper who wonder whether he can really be said to have dispensed with induction in his account of science. Newton-Smith, though, takes the criticisms a stage further than most, suggesting that philosophy of science should abandon the attempt directly to defend a particular method for science whether falsificationist, inductive of some other. What it should do is to analyse scientific rationality in terms of that institutional values, though whether one is thereby entitled to regard them as justified or desirable because of the success of science is less clear.

Peter Lipton also considers Popper's anti-inductivism, and contrasts it with what he calls a reliabilist approach to knowledge. On this approach one may be said to know something if one has acquired a true belief through a method which is in fact reliable. One does not have, over and above actual reliability, to prove that the method in question is bound to work. If inductive methods (or some inductive methods) are in fact reliable, contra Popper, they may thus be said to produce knowledge. Philosophical opinion will be divided as to whether this essentially naturalistic approach to knowledge is an advance in epistemology or its final abrogation, in that the approach starts by assuming that we can in fact identify bundles of true theories. Lipton, though, goes on to argue that a Popperian method of falsification may be not just necessary for

positive knowledge, in that positive claims to knowledge have to survive attempted falsification, but also sufficient for it. This is because there can, in fact, be no falsification without a background of accepted truth, which is an interesting way of looking at the familiar suggestion that Popper's method of falsification needs some basis of justified truth on which to stand.

With that, Elie Zahar would agree, though he conceives the basis rather differently from Lipton. Zahar accepts Popperian scepticism about general theories and even about singular observation statements where that is observed are held to be objects and states of affairs in the external world. But, following Brentanco, Zahar makes out a strong case for regarding statements about one's current psychological states as both justified and—perhaps more controversially—as the explanada of the theories of science. According to Zahar, then, we should regard such statements as the firm and justified empirical basis for science, something Popper would emphatically reject, but without some such basis, his system has seemed to critics to be hopelessly drifting in the shifting currents of theory.

Taking up some of the controversies between Popper and Kuhn, Lakatos and other philosophers who have examined the history of science, John Worrall argues that Popper's view of scientific theory is over-simplified. In particular, innovations in scientific theory should not be seen, as Popper would wish, as bold, imaginative conjectures produced, like Darwinian mutations, without any instruction from without. Worrall shows how, in the case of Fresnel's development of the classical wave theory of light,

the new theories were produced in a thoroughly directed way, by systematic and logical argument from what was previously known. While not strictly incompatible with the broad lines of Popper's falsification, Worrall certainly does something to qualify Popper's more extreme rhetoric about the utterly un-Baconian nature of the scientific process.

The next three papers all focus on Popper's propensity theory of probability and his commitment to indeterminism. Donald Gillies suggests that the propensity theory fails to solve the problem of the objectivity of singular probability statements—that for which it was originally proposed—but argues that the theory is nonetheless desirable in avoiding the operationalism inherent in the frequency theory. He goes on to sketch a broadly Popperian account of the falsification of probability statements, and ends by showing that corroboration is not a probability function; Popper was anxious to defend this view as part of his anti-inductivism, though, as he says, Gillies arrives at the same conclusion by a distinctly un-Popperian route.

David Miller accepts that determinism, as a philosophical thesis, is empirically unfalsifiable (and hence, in Popper's terms, 'metaphysical'). However, various difficulties with completing deterministic accounts of the physical world ('scientific determinism') do expose its status as a metaphysical rather than a scientific theory and ought to lead to its rejection. Miller goes on to examine one of Popper's favourite arguments for indeterminism, that from Landé's blade, and finds it inconclusive in that regard. In the final part of his paper, he shows that Popper's most recent account of propensity, as that which allows genuinely new

possibilities to emerge, is something over and above what is meant by probability in the probability calculus; for in that calculus genuinely new possibilities must have zero probability. Miller, nonetheless, concludes with the claim that zero propensity need not imply impossibility, and that many things which have actually happened, such as the painting of the *Night Watch* or the building of the Parthenon, cannot have been foreshadowed by propensities in the first few seconds of the universe.

That the link between Popper's views on indeterminism and his belief in genuine creativity is by no means clear is the conclusion of Peter Clark's paper. Clark admires the seriousness of Popper's commitment to human freedom and creativity, but questions the relevance of Popper's arguments about unpredictability to this. After all, things, including ourselves, may be unpredictable without being undetermined. Clark accepts that the propensity theory is a bold attempt to solve the thorny problem of the existence of stable, non-trivial statistical regularities in the physical world, but he is dubious that it solves other problems to which Popper has applied it, such as the measure zero problem in statistical mechanics or the paradoxes in quantum theory.

In the first of two papers on the application of Popper's thought to specific areas of science, Michael Redhead focuses on Popper's incursions into quantum theory. These go back as far as 1934 and continued well into the 1980s. While, as Redhead shows, Popper's suggestions are flawed in detail, it is certainly arguable that Popper's 1934 article may have influenced Einstein in what has come

to be known as the EPR paradox (published in 1935). Popper's interest in quantum theory was from that start motivated by a strong commitment to realism, in an area and at a time when realism was distinctly unfashionable. That in itself put Popper in the Einstein camp, though his later espousal of indeterminism took him partly outside it. Apart from the details given by Redhead (much deriving from private conversations and correspondence, and hitherto unpublished), what is fascinating about Popper's dealings with quantum theory is that in them we see the method of conjecture and refutation at work in practice, as well as a readiness on Popper's part to bow to criticism and refutation which has not always been so evident in his pure philosophy.

Günter Wächtershäuser also relates Popper's philosophy of science to a specific area of science, in this case to biology and the study of the origin of life. In considering the work of van Helmont, Berselius and other pioneers in the field, Wächtershäuser argues that biology achieved the Popperian goal of moving ever closer to the truth by definitely non-inductive methods. More recent work, however, on the pre-biotic broth from which life is supposed to have originated, has been dominated by inductivism, and, in Wächtershäuser's view, has been largely inconclusive. Wächtershäuser concludes his paper by outlining his own original theory on the origin of life. Though initially presented without observational or experimental support, it has succeeded in capturing the attention of many scientists by virtue of its explanatory power. Work is currently underway to test and refine the theory empirically.