

### Karl Raimund Popper (1902-1994)

Karl R. Popper is “the outstanding philosopher of the twentieth century” (Bryan Magee), even “the greatest thinker of the [twentieth] century” (Gellner). He felt affinity with thinkers of the Age of Reason and developed a new version of rationalism: critical rationalism. As a champion of science and of democracy he was the most influential philosopher of the post-WWII era. He was a close follower of Bertrand Russell and of Albert Einstein in that all three advocated problem-oriented fallibilism (during the peak of the influence of Ludwig Wittgenstein who did not), valued commonsense, taking its theories to be approximations to the scientific truths of the day, and considered scientific truths as series of approximations to the absolute truth [Agassi, 1981, 112-16]. In particular, all three viewed science as the bold flight of the imagination checked and tempered by experience [Russell, 1931, 102]; [Einstein, 1949, 680]. Insofar as Russell adumbrated Popper’s philosophy, it may be fair to consider the latter a streamlined version of the former (the way both Berkeley and Hume deemed their philosophies streamlined versions of Locke’s [Hattiangadi, 1985]; [Wettersten, 1985]. Russell raised the level of rational discourse in philosophy while remaining within the empiricist tradition; Popper continued and consolidated Russell’s achievements, adding a broad modification of the rationalist tradition [Popper, 1945, Ch. 24], thus forging new ways of philosophizing [Lakatos, 1978, 10]. Many sought a *via media* between rationalism and irrationalism, between individualism and collectivism, as well as between radicalism and traditionalism. Many sought a *via media* between empiricism and intellectualism. Popper’s philosophy is the only viable comprehensive rationalist suggestion in these directions (although it is open to modifications, of course), being thoroughly fallibilist and reformist, thus achieving a new and intensified commonsense philosophy, the only one that is integrated. “My theory of knowledge, my philosophy of science and my political philosophy are original only in their interdependence,” he said in a 1976 interview. Being fallibilist rather than axiomatic, this integration or interdependence differs from any that traditional philosophers had claimed for their systems. As commonsense, its influence is pervasive yet hard to detect. Parliamentary democracy does not fit classical enlightenment philosophy [Talmon, 1952]; it fits Popper’s fallibilism well. His views of science are elaborations on Einstein’s. They have more influence in the scientific community than in philosophy, where classical empiricism and technocracy still reign. His views on democracy are elaborations on Russell’s. They have more influence in the political public than in philosophy, where support for élitism, paternalism, and technocracy still reigns.

Popper's starting point was his (endorsement of Einstein's) uncompromising rejection of the view of the method of science as inductive and his alternative view of learning from experience as comprising refutations; thus, the empirical character of scientific theories is their refutability. (Corroborations are often refutations of alternatives.) This, said Popper, implies the demand (of Einstein) that new scientific theories should incorporate older successful ones as approximations and as special cases. Thus, scientific theories are series of approximations to the truth.

Popper is still reputed as a philosopher of science and as a principal detractor from the analytic or linguistic or "logical" positivist movement. For the general educated public he is also the champion of democracy and of liberalism, whose specific idea is (to reject their traditional grounding of democracy in the sovereignty of the citizens and) to ground it in our imperfections: governments may commit error and immorality, so that they are in constant need of watchfulness. This finds its best expression in the public's right to overthrow its elected government by peaceful means. This, said Popper, characterizes democracy best. The richness of his specific ideas comes into sight with the unfolding of their impact on diverse problems, some theoretical, some practical.

Finally, a word on his style: he is one of the clearest and most readable writers of his time.

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## **1. Life and Works**

Karl Popper was born in 1902 in Vienna to a respectable Jewish family converted to Protestantism. His father was a learned, well-to-do lawyer who lost all his means after World War I. His mother was a talented amateur pianist of a Jewish family of prosperous merchants distinguished in music, the academy, and the professions. Both parents, he reported, had great influence on him for life. So did the atmosphere of Vienna of the time, including its enormous variety of conservative and radical culture, including *avant-garde* art, psychoanalysis, “logical” positivism, Marxism, nationalism and rabid anti-Semitism. Although for a brief while during his adolescence Popper was a Marxist and interested in *avant-garde* art, he soon developed a lifelong distaste for both. He disliked the celebrated Vienna coffeehouse chic, considering it vulgar. (He associated with it the style of Wittgenstein’s first book.) He associated with a few members of the “Vienna Circle”, including its founder Hans Hahn, whom he admired, and its other two heads, Moritz Schlick and Otto Neurath, as well as Herbert Feigl and Rudolf Carnap, who won his gratitude for life, but only personally, and for their encouragement. Wittgenstein, whom they all worshipped, never impressed him. He believed that some philosophers ascribe to him some debt to Wittgenstein; this embittered him. His bitterness towards Vienna was much greater, however: he never forgave her the enthusiastic welcome to the *Anschluss* and to the *Führer*. Yet he loved Vienna passionately. He tried to return there late in life. Though he was well received, he could not stay. He soon returned to the England that he admired, to the countryside where he felt at home. He died there in 1994.

Popper’s career took off slowly. He dropped out of high school in 1918. For a time he tried his hand in voluntary work for the poor and in manual labor. He matriculated only in 1922, obtained a cabinet-maker diploma in 1924 and a primary-school teaching diploma in 1925. His studies in the University of Vienna were varied due to both restlessness and to dissatisfaction. He read mathematics, music, psychology, physics and philosophy. His Ph. D. is in psychology (1928), reflecting his lifelong, passionate interest in education. He soon received a secondary-school mathematics and science teacher diploma (1929) and worked as a teacher (1930-36). He then (1930) married Josefina Anna Henninger, known to friends as Hennie (1906-1985). They had no children. Till her death she served him as his right hand and was totally devoted to him; her help to him was indispensable. Between 1925 and 1931 he published a few papers on education and on the psychology of learning. Two short notes appeared in 1935 in the “logical” positivist periodical *Erkenntnis*. (In them, he reported, he tried to emulate the style of Einstein.) They miraculously

encapsulate the grand philosophy of science expanded in his first vintage and *magnum opus*: *Logik der Forschung* (1935). Its extended English version is *The Logic of Scientific Discovery* (1959).

Popper went to England in 1935 in a vain search for a job, expecting Austria to turn Nazi. The Poppers left Austria for good as soon as they could. In 1937 he accepted a teaching position in philosophy at Canterbury University College, Christchurch, New Zealand, where he received his M.A. degree and wrote his *The Open Society and Its Enemies* (1945), on the strength of which the London School of Economics at the University of London offered him a post as reader in logic and scientific method in 1946. He accepted it most gratefully and later made D. Lit. (1948) for his *The Open Society and Its Enemies*, received a personal chair (1949) and knighthood (1965) and was elected Fellow of the Royal Society of London (1976) and appointed a Companion of Honour (1982). He retired in 1969, received many honors (including a few honorary doctorates and honorary citizenship of Vienna) and remained active until his death (1994).

He enriched many traditional fields of philosophy, the history of ideas, the classics, and mathematics. The philosophical establishment showed him indifference if not hostility — beginning with Moritz Schlick, the famed leader of the prestigious “Vienna Circle” who called him an idealist and blamed him for self-aggrandizement. The educated public appreciated his *The Open Society and Its Enemies* [Jarvie and Pralong, 1999, 5]; the scientific community respected his *Logic of Scientific Discovery* [Parusniková and Cohen, 2009, 2]. He was a prolific writer to the very end, and his output almost always remained highly significant. He preached individual autonomy, responsibility, clear language, and constant concern with public affairs. More specifically, he advocated democratic control of power and moderate liberalism laced with minimal Keynesian interventionism.

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## **2. A Fallibilist Theory of Rationality and of Logic**

The suppression of criticism is common, especially in schools of thought (including the Marxians, Freudians and Wittgensteinians). Western philosophy, Popper observed, is exceptional: it established the critical tradition of raising questions, presenting diverse answers to them, and seeking criticisms of these. This, he said, fuses the scientific and the liberal traditions. Behind this stands the recognition it is unreasonable to depend on tradition and traditional way of life. This recognition raised the most central problem of

Western philosophy, the general problem of rationality: what way of life is reasonable, what views and values? This amounts to the recognition of the availability of different options to choose from, old or new, and of the ability to think this out. Thus, the general problem of rationality becomes the special problem of rationality: how is the truth to be found? Thus, Descartes said, whatever I think because I am a Frenchman and not a Chinaman, I do not want to think. How then do I decide? Socrates said, I do not know the truth, but I do know some falsehoods to be falsehoods to avoid. I should go on examining myself, since the unexamined life is not worth living. This old idea is Popper's new solution to the problem: rationality equals critical dialogue. In more detail, (a) clinging to refuted ideas is irrational dogmatism; (b) avoiding dogmatism is rational enough: it makes progress possible without promising it, however. This is the negative solution to the problem; it is rejected as a solution: (a) is not contested; (b) is [Gabbay and Guenther, 2007, 101]. Plato ascribed negativism to the sophists, and he declared them all unserious, demanding that all and only proven ideas should be endorsed. Sir Francis Bacon echoed Plato on this (*Novum Organum*, Bk. I, Aph. 156), reminding us that logic permits the rejection of criticism with frivolous excuses. This ancient observation is known today as the Duhem-Quine thesis. It is much discussed and often presented as the major refutation of Popper [Keuth, 2005, 78-84]. In response Popper observed that at times excuses are open to and may deserve critical examination; otherwise, he proposed, they are better ignored. Critics deem this response insufficient, as it does not impose rationality. This is where the dispute stands: is rationality obligatory? Exceptionally, Popper said, no: responsibility imposes rationality, he admitted, but responsibility is alas not obligatory.

Baconian-Cartesian radical anti-traditionalism was popular in the Age of Reason, first intellectually and then politically too. It is neither necessary nor possible, nor is it consistent with democracy [Talmon, 1952]. Popper's theory of rationality replaces radicalism with criticism and piecemeal reform — intellectually and politically. This has greatly influenced thinking in our own times [Hacohen, 1998, 712]. Yet radicalism is still very popular although Popper answered Plato on behalf of the sophists: Aristophanes rightly presented Socrates as a sophist; unlike Plato they all supported democracy. Plato based his rigid élitism on his theory of knowledge, on his idea that only proofs render theories rational. There was no theory of proof then. One may perhaps take as the traditional proof theory the idea that axioms deemed self-evident and their consequences are in no need for proof. Euclidean geometry was the paradigm. As mathematicians considered not quite self-evident the parallel axiom in it, efforts to make do without it kindled proof theory proper. It began in the 1890s (Pierre Duhem, Henri Poincaré, David Hilbert), continued in the 1930s (Kurt Gödel, Gerhard Genzen), and is still going strong.

One fact, however, was agreed upon since antiquity: proof renders the proven propositions perfect, true knowledge, obviously true and in no need of modification or qualification. In the traditional sense, then, science is the body of demonstrated theories. Is Newton's theory scientific? Newton's theory gave way to Einstein's. In the traditional sense, then, it is not scientific. In the modern sense, science is the body of theories taught in the faculty of science of any respectable institution of higher learning. This renders Newton's theory scientific of course. Why? More generally, what is the claim for fame of an imperfect theory? This is the problem of demarcation of science newly worded. Popper ascribed it to Kant; this is unclear, since Kant took it for granted that all and only perfect theories are scientific. Popper's solution clashes sharply with tradition. It seems counter-intuitive: a theory is to be treated as scientific if (and to the extent that) it is vulnerable to empirical criticism.

A scientific theory meets the demands of methodology, of the theory of scientific method. What then are these demands? Popper listed all the demands that he could find in the literature, eliminated some of them as untenable, mainly the demand for proof or proof-surrogates, and argued that the demand for openness to criticism suffices. To abide by openness to criticism is also to abide by the other demands, such as explanatory power and simplicity, he added. Under his unacknowledged influence, some philosophers stress explanatory power, others stress simplicity, and so on. And then they argue that before Einstein came along Newton's theory was the best by their criterion. They do not refer to his claim that these qualities come bundled with refutability because it conflicts with the traditional view. Modifying it somewhat they view the problem of demarcation as, what theory imposes itself on us with the powers of reason? What theory deserves endorsement? Endorsement follows support, say Popper's critics, not criticism. Popper offered two replies. First, support stems from resilience in the face of criticism: other support is sham. Already Galileo Galilei noted that support without openness to criticism is a form of cheating ("so no one can ever win against you, but must always lose; then it would be better not to play" with you). William Whewell and Henri Poincaré took this for granted; the former demanded critical tests; the latter denied openness to criticism and concluded the impossibility of empirical support. They both advocated error avoidance; Popper advocated (rightly or not) making bold conjectures, considering refutations informative. Endorsing a theory is admitting it as an object for critical examination. Technology is different: it is the search for new means. Endorsing a technique is admitting it as an object for possible application; it comprises permissions to apply [Agassi, 1985]. Technological testing and marketing is regulated by law. Belief never comes into the picture, as it is personal. (Disagreements may contribute more to research than shared

beliefs. What disagreement is rational? This is a new problem of rationality, answered with Popper's theory of friendly-hostile cooperation [Popper, 1945, ii: 217; see also his 1996, "The Myth of the Framework"]; [Jarvie, 2001, 29, 40, 86, 189, 193.) Endorsement in politics seems essential for cooperation. Watkins disagrees: cooperation stems from compromise [Watkins, 1957-8]. Right or not, all this seems eminently commonsense. Popper's criterion of openness to criticism is minimal in the sense that all other criteria include it. (As criticism of irrationalism traditionally refers to its hostility to criticism, it often sounds like antecedents to Popper. Indeed, his name appears more often in works critical of irrationalism than in those that advocate rationalism.)

A common obstacle to viewing critical rationalism as commonsense is the confusion of refutability with refutation. To overcome it one may notice that some true ideas are refutable in principle. Quite a few modern scientific researchers said that they found it hard to view their ideas as perfect rather than as way stations. Perhaps Newton was the only one who insistently and constantly claimed perfection for his ideas. Even that is questionable. And although Descartes and Spinoza, for example, took the demand for proof for granted, they invited criticism and declared that they did their best to eliminate error from their works. It is thus both hard to admit and hard to deny that possibly one's ideas are false. Charles Sanders Peirce declared himself a fallibilist (he invented the term) yet he deemed science infallible and could not overcome this obvious inconsistency. The first who did that was his contemporary Pierre Duhem, who declared science perfect only when utterly stripped off of its empirical information (so as to become empty mathematical truths); applications of it, being informative, are open to correction. (He nevertheless was no fallibilist: strangely, he deemed commonsense infallible.) Things changed radically under Einstein's influence. As Popper cited him to say, insofar as geometry is certain it is not about reality and insofar as it is about reality it is uncertain. Russell took fallibilism for granted all his life, allowing certitude only for the uninformative formulas of logic. (Notice a sad terminological vagueness here: Russell endorsed skepticism as fallibilism and Popper rejected skepticism as the ancient doctrine that embraced an untenable idea about *ataraxia* (peace of mind). Both were right.) Acknowledging the influence of Hume, Einstein reported that in part he owed his intellectual ability to the conviction that science is fallible. This became the cornerstone of Popper's philosophy; his contribution was of immense significance just because it was a fallibilist theory of rationality as critical-mindedness and of progress as the elimination of some errors that he presented as an alternative to Plato's theory of rationality as demonstrated truth. Popper viewed reason as a means of hopefully approaching the truth.

The difficulty of developing a fallibilist theory of rationality is manifest in the alternatives to Popper's theory extant at the time and still popular. They all offer certitude surrogates, usually "soft" certitude, usually probability in the sense of the mathematical calculus of probability. (This includes even Russell; yet he stressed that his views are tentative, to be eschewed upon finding that they clash with commonsense.) As a certitude-surrogate is not supposed to guarantee truth, how does it contribute to the search for the truth? Popper said, the advocates of certitude-surrogates suggest, vaguely or clearly, that certitude-surrogates are often true. This suggestion is patently false, as perusal of a science textbook more than a century old will illustrate. The theory that science is rational because it is probable renders all philosophical theories not only unscientific but also irrational. Also, the idea that a theory is scientific and rational if some given empirical information raises its probability rests on the idea that the given empirical information is certain: there is no way to calculate the probability of a given theory in the light of evidence unless that evidence is taken for granted. (We can suggest that the evidence is probable given certain other evidence, of course. This will render the picture even more problematic. Richard Jeffrey has attempted to circumvent this difficulty. His suggestion seems confused or inconsistent. Until he renders it axiomatic, it is hard to tell.) Consider Carl G. Hempel's objection to Popper's claim that scientific theories are open to empirical refutation. Since evidence is uncertain, he agreed with Popper, refutation too is uncertain. Hence, he added, both confirmation and its opposite come to replace proof and disproof in a symmetrical fashion. Wittgenstein and Hempel viewed proof and disproof as symmetrical; Bacon and Popper viewed it as asymmetrical: the negation of disproof (or impossibility) is not proof (or necessity) but possibility.

The asymmetry in question is clear in crucial experiments: its outcome contradicts one theory but it does not entail the other. (It does so in the light of the disjunction between the competing theories. This disjunction, however, is very questionable: a new theory, said Duhem, is always possible.) And so a hypothesis that wins a crucial experiment need not win assent and, indeed, when a new alternative appears on the horizon a new crucial experiment is called for. This shows the superiority of Popper's concern with the growth of knowledge over the common concern with its justification.

Still, the fact is, we do give assent to some theories. When is such assent rational? Plato went too far: he required that assent be given to all and only the demonstrated: he expected infallibility of ordinary mortals. His excess raised a strange problem, known as the problem of error. As error is avoidable, we should expect its avoidance. Why then do people err? The answer was a central part of the views on science of Francis Bacon and

the whole Enlightenment Movement, from René Descartes to Immanuel Kant: people err because they do not stick to the correct means for acquiring knowledge; they cut corners; they speculate and deceive themselves that their pet speculations are demonstrated: they are prejudiced and they spread their prejudices and thus impede the natural growth of knowledge. This is the radicalism of the Age of Reason.

Russell rejected this traditional view: all claim for total freedom from prejudice is humbug [Russell, 1956, 77]. The battle against prejudice is then endless. In line with this, Popper replaced the traditional radicalism of the Age of Reason with critical adherence to democratic traditions and presented logic as the theory of dialectic, of the art of conjuring answers to given questions and then seeking criticism of them. He viewed logic as the theory of valid inference and valid inference as the tool for criticism. The theorems of logic he viewed as marginal, as statements that happen to be immune to criticism because they reflect the canon of criticism. They are true by virtue of this, as they merely express the structure of language. In a dialogue one party uses logic in efforts to bring the opposite party to admit a contradiction, namely, to admit having erred. The end of this exercise is the elimination of error. A consistent theory may be false and so a critical dialogue may come to test it, to find statements that contradict it yet are admitted. This situation is rare. To begin with, it is more likely to happen with a theory that is a set of statements rather than an isolated statement (although this is not a matter of principle, since, in principle, no matter how many statements a theory includes, it is equivalent to their conjunction; this matters only as it shows that it is a theory, not all its components, that science tests [Einstein, 1949, 679]). And if we find a rare theory that happens to be consistent with available information, then, in the dialogue about it, efforts to test it further comprise searches for new information to contrast it with. This, said Popper, is empirical research proper. As some admirable dialogues are not scientific in this precise sense, not all criticism amounts to scientific findings, and so not all theories under dispute are scientific. And so only strong rationality is scientific..

Popper viewed science as a rare bird: most theories we have are too vague for scientific tests, and then criticism of them is not definitive. Among these are some metaphysical theories, some political ones, and more. (Even the noble view of all humans as siblings, the view of the rational unity of humanity that is at the root of science, is irrefutable.) Science then is the peak of critical activity and critical activity is the peak of thinking. Creative thinking may lead to new criticism of received opinions and it may be triggered by extant criticism (the hen and the egg). All this runs in sharp contradiction to the idea that all meaningful assertions are scientific, an idea that the “logical” positivists of

Popper's time adopted from the *Tractatus Logico-Philosophicus* of Wittgenstein. Popper noted that this is their solution to the problem of the demarcation of science, and that for it to hold water it must, at the very least, demarcate meaning very sharply (as Wittgenstein seems to have declared in the famous closing sentence of that book) or else the problem of the demarcation — of science and of meaning — would reemerge. This criticism was deadly, since the “logical” positivists noted that as universal theories do not follow from observation reports they are not as certain, and so they had to grant theories a lesser degree of meaning and of certitude. The problem of demarcation then reemerges as the question, what degree of certitude marks a theory as scientific?

Far from the hostility to metaphysics that the “Vienna Circle” displayed, Popper viewed even some refuted myths and folk theories as rationally held, since their advocates gave them up, presumably under the pressure of criticism. Thus, the theory that the earth is flat that Eratosthenes of Cyrene refuted should count as rational. Other empirically refuted superstitions should count as much less rational. What then is the status of metaphysics?

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### **3. Between Science and Metaphysics**

The hostility to metaphysics that the “Vienna Circle” displayed was not new: their rationale for it was: it is meaningless. Now, as not all meaninglessness is metaphysics, the “Vienna Circle” had to characterize metaphysics at least by the intent of its advocates. It is the most basic presuppositions, the all-embracing theories as reported (in Aristotle's lame terminology) in Aristotle's *Metaphysics*, Book Alpha: “Thales, who was the first to seek the *material cause of all things*, says that it is water.” Bacon promised that the final stage of the growth of science will be an empirically founded, scientific metaphysics, on the condition that we eschew today's metaphysics as speculative (and thus as prejudicial). The culprit is thus not metaphysics but speculation. Accordingly, Descartes declared his metaphysics demonstrated; Kant declared all speculations contraband (Preface to *Critique A*). Following him, Ernst Mach proscribed partaking in metaphysical controversy. He fortunately violated this own rule and took sides against Newton's theory of absolute space. This was a boon for Einstein and thus for us all. Mach's taboo on metaphysical disputes won popularity. Einstein's critique of Newton was wrongly taken as support for it. Fortunately, Einstein did not share this view, not even in his early days, much less later, when he found that avoiding metaphysics blocked progress on his study of gravity.

Popper rightly preferred Mach's taboo on metaphysical controversies over Wittgenstein's denial of their very possibility. His *Logik der Forschung* excelled this way. In particular, he offered there his theory of observation as indifferent to the dispute between realism and idealism (declaring his partiality for realism personal). He also avoided there discussing truth and suggested to make do with contradictions, as their falsehood is uncontested. He changed his view on this; he did not report on his rejection of Mach's proscription in general but he did report on his rejection of it in the case of the dispute over the truth. He said, the change is due to Alfred Tarski's theory of truth by which he was deeply impressed: the correspondence theory of truth that we all take for granted seemed to him too vague, and Tarski changed this by making it precise. This is hardly a change of view: the real change was the rejection of Mach's proscription on metaphysical disputes. For, Tarski did not close the dispute about truth.

Popper changed his philosophy after his move to London. He was dismayed to learn then that (under Wittgenstein's influence) metaphysical realism was often rejected while its commonsense version was advocated. He then advocated realism as both metaphysical and commonsense. He thus made peace with metaphysics and attacked instrumentalism as anti-metaphysical in a brilliant move.

Already in *The Open Society and Its Enemies* of 1945 Popper observed that dismissing metaphysics as meaningless nourishes superficiality. Those who declare the word "soul" meaningless should nonetheless endorse the rule to care for their souls and discuss that rule; evading the word "soul" is thus no impediment. Determinism is a discouraging metaphysics, he observed, but it need not be so, as its adherents may (and usually do) agree with the commonsense admission of some responsible choice. (This renders their opinions inconsistent, but he would not object to their holding an inconsistent metaphysics as long as they advocate responsibility. This is very thoughtful, although Socrates might have disapproved.) Thus, Popper's 1945 deprecation of metaphysics did not prevent his advocacy of commonsense metaphysics. Advocates of classical rationalism might warn him that this may lead to prejudice; he would invite them to replace vague warnings with specific criticism.

Popper developed his indeterminism into grand-scale metaphysics. First, he criticized reductionism, the identification of theories about humanity with theories about computing machines of sorts. He then developed his *Postscript* to his *The Logic of Scientific Discovery* to criticize determinism in three volumes that suggest repeatedly that determinism is problematic and has no argument in its favor. This is still problematic, as Popper's chief asset is his taking scientific theories literally — as true or false (*à la* Frege)

as objective; probabilities, including quantum probabilities, are thus objective too. He interpreted these probabilities as propensities of the physical world that are more basic than forces. Applying realism to the mind-body problem, he declared the mind real in a sense, although not in the Cartesian sense, since the doctrine of substance is *passé*. He thus allowed for diverse kinds of reality. He never explained. He surprised positivists most by speaking of objective knowledge. This is odd, since we all speak of the fund of knowledge, recognizing with ease utterly forgotten and rediscovered ideas — in archeological digs, in ancient libraries, in attics, and in legal texts: ideas need not vanish when forgotten. The positivist response to this is to identify ideas with their written signs that represent them. This response fails. (Carnap advocated it in 1934 and recanted in 1942.) Popper then spoke of three worlds, of material objects, minds, and ideas. It is no accident that this idea of three worlds appears in the writings of Frege and of C. S. Pearce, and elsewhere. Nor that it wants repeated rediscovery. Yet we should beware of identifying this world of ideas with Plato's Heaven: this world of ideas includes false statements whereas Plato's Heaven includes ten or eleven basic truths.

Popper's idea of objective knowledge ties in with his view of social institutions. In his *The Open Society and Its Enemies* he criticized psychologism, the theory that the social is reducible to the individual so that at heart all the human sciences are psychology. He recommended avoiding the question, do social institutions exist? In his later phase he took it for granted that they do exist — in World 3. He insisted that they have no aims, however, since only individuals do. And as he always considered science a social institution, he then took it to be more than a set of theories. This is one example of the challenge that Popper's thought has left for the future.

#### **4. Philosophy of Science**

Popper's first vintage, his *magnum opus*, *Logik der Forschung* (1935), presented two questions. First, what demarcates science from non-science? Here the objects to characterize are theories, namely, sets of statements within a given language. The answer is, they are characterized by their methods. This leads to the second question: what is this method? Popper added a new answer to the two traditional ones. We can see this in the following presentation that is a bit more historical than in Popper's original book and more consistent with his later views. (In the original Popper erroneously identified as pseudo-science all non-science, including all metaphysics and much commonsense.)

Viewed traditionally, science is a set of demonstrated theories, namely, ones known to be true. And their truth, we remember, are truths by nature, since truths by convention are not

binding. Two historical claims exist as to the way to demonstrate a theory. First, by the use of intuition or reason (*a priori*ism, intellectualism). Second, by experience (empiricism, inductivism). Kant said it is a scandal that we claim to have proof and yet differ about it. He suggested a mix. The fear of using a mix is the fear of landing in a contradiction. He took care of this by suggesting a division of labor: the intellect is responsible for theory and the senses for raw experience. This is quite unnecessary as it suffices that theory has the last word, as all intellectualists stressed (beginning with Giordano Bruno). Kant added an important point though: the priority of the intellect rests on it imposing itself on raw experience to generate scientific information. Kant's philosophy is in need of modification as it forbids innovation (as his follower William Whewell has noted): it makes every human familiar with Newtonian mechanics. Modern conventionalism (Duhem, Poincaré) overcame this difficulty: it rendered Kant's system relative to different axioms and observed that already in Kant's system prior to their applications the axioms possess no informative content. Each axiom system is then valid within its domain of application. We thus have two traditional views of scientific truths: they are true by nature or true by convention. Einstein created a new category; scientific truth, he said, need not be true. Popper then elaborated. Any given theory is initially true-or-false, and it has empirical character in the sense that it can explain some extant observations and is refutable by other extant ones, or else the search for new refuting observations is underway. Scientific truth, then, is an explanatory theory that is tested and not refuted, and not all scientific theories are scientific truths. Truth is timeless; scientific truth is not. To admit this is to break away from the justly revered ancient dichotomy between truth by nature that is demonstrated and thus binding and truth by convention that is arbitrary and thus not binding: scientific truth is the nearest we can bring truth by convention to resemble truth by nature. This requirement for resemblance to the truth, for verisimilitude, Einstein characterized as the requirement that the new theory explains the success (success as explanation and success as having passed severe tests) of its predecessors by presenting them as special cases and good approximations. Popper offered a more precise theory of verisimilitude that was devastated by criticism and he withdrew it. Commentators, especially Hempel, took as Popper's solution to the problem of induction his theory of positive evidence or empirical support, his view that support is failure to refute. This is a serious error: this solution is to the traditional problem of rational belief that he refused to recognize. He worded the problem of induction thus: how is empirical theoretical knowledge possible? His solution is, empirical theoretical knowledge is possible as refutations, since these are theoretically informative.

All this is stupendous. We may read it as a proposal and as a description. In either reading

its great asset is its fallibilism, of course: it takes as final nothing but the falsehood of (formal) contradictions and it offers the exhortation to be critical as a replacement for the traditional demand to avoid all error and the traditional view of error as evil. As a proposal it is easier to take than as a description: such critical activity is rather rare. Yet the reading of Popper's view as descriptive should enhance the value of what we value by showing the contribution of criticism to it. As examples for this Popper mentioned thinkers who enjoyed modest success but who were not pleased with their results, applied severe criticism to them, and then did much better. Clearly, dissatisfaction and the resultant criticism can be very enlightening. Is this always the case? We do not know.

What is peculiar to Popper is not his praise for criticism: this is rather traditional. What is peculiar to Popper is the view of criticism in science not as appetizer but as a part of the main course. Maimonides had said, human language is not fit to describe the attributes of the divine, yet it behooves humans to try to do so and to acknowledge the limitations of the results of their efforts. Combining his negative theology with Spinoza's replacement of theology with natural philosophy amounts to Einsteinian-Popperian negative science. How adequate is it as a description? Are all refutations of reasonable/great theories reasonable/great discoveries? Are all reasonable/great discoveries refutations of reasonable/great theories? We do not know. The greatest and still most impressive of discovery is Eddington's refutation of Newton's theory of gravity that set Popper on his long quest. Was Einstein's theory of gravity due to refutation? It is very hard to decide. (Newton's theory of gravity is invariant to Galileo transformations. Taking the famous experiment of Michelson and Morley as a refutation that was met by the replacement of the Galileo transformations with the Lorenz transformations possibly required a theory of gravity that is invariant to Lorenz transformations. Einstein found this impossible, and he then assumed a more general rule of transformation.)

All this is an elaboration on the first two chapters of Popper's *magnum opus*. The other chapters compare his criterion of demarcation of science with other criteria. He dismissed the "logical" positivist equation of scientific character with meaning (*à la* Wittgenstein). He argued that explanatory power and simplicity come together with refutability so that there is no need to seek for them separately. This is an error: technology comprises highly refutable, well-tested theories of little scientific worth; science may struggle with some metaphysical ideas in efforts to render them testable (by raising their content). Here Popper's philosophy is extremely useful, as his theory of content as improbability led to the suggestion to compare contents of some theories and to the suggestion to enrich the contents of meager ones. Popper also developed his theory of degrees of testability that

has merit but is in need of further development. His theory of basic statements led him to offer a new and exciting if unnoticed theory of relative atomic propositions to replace that of Wittgenstein and Russell. His theory of probability led him to an improvement of the axioms of the theory of probability and to a careful study of quantum theory. The suggestion that Heisenberg's uncertainty principle puts a limit to tests has won Popper's comment that is a true eye-opener: the principle should be put to test. Popper tried to devise a thought experiment to do that. It was erroneous: the experiment allowed a quantum particle to pass through a filter, thereby smuggling in a new uncertainty. Einstein, Podolsky and Rosen offered a new and more decisive thought experiment, in which the quantum particle encounters not a filter but another quantum particle, pitting the two uncertainties against each other. This is called quantum entanglement. Its empirical applications are very exciting and very puzzling, and its philosophical import is still under debate.

Popper's ideas of explanatory power, simplicity, metaphysics, informative content as improbability, and degrees of testability, his axioms of probability and his views on quantum mechanics, these are all subject of many studies, some of which he has inaugurated. In particular, he first proscribed the use of *ad hoc* hypotheses as reducing the degree of testability of the theories they come to supplement, not to say defend. He then allowed them as temporary measures, as long as they do not impede criticism and thus progress. This invites much discussion. The details of the text of Popper *Logik der Forschung* invite much further study, which is admirable. This raises the question, is Popper's major thesis that scientific progress comes through conjectures and refutations, still a serious contender? This is a most significant question. Those, like Adolf Grünbaum and Hilary Putman who make light of Popper's view, return to efforts to justify induction. Others find it more challenging to further Popper's concern with critical rationalism by practicing it further.

## **5. Social and Political Philosophy**

In the Age of Reason, when all researchers were philosophers, philosophy was understood in the broadest sense. German idealists, particularly Fichte and Hegel, introduced philosophy in the narrow sense of the word, not so much because they were professors of philosophy (Kant was that too) but because they were ignorant of science and hostile to reason. The rationalist wing of philosophy in the narrow sense soon developed too. It reached its peak with the new philosophy of science that in Popper's days turned into a philosophy of language under the impact of Wittgenstein. He had one thesis: he

axiomatically rejected all philosophical problems. The application of this to parts of philosophy, the philosophy of science, of history, and of the social sciences, not to mention social philosophy, amounted to dismissing their problems. This rendered them scholastic, irrelevant to the genuine problems that Wittgenstein's disciples left for science to solve. Popper, on the contrary, glided into social philosophy as well as to the philosophy of the social sciences on the wings of his social and political concerns. At the time salon political discussions turned on the question, what do you prefer, Fascism or Bolshevism? This question obviously rests on despair over democracy. Popper sought the factor common to both options, the tools with which to choose between them. It was historicism, the doctrine of historical inevitability, the idea that history has a meaning, a divine plan for humanity. The religious version of the theory of the divine plan relates to history loosely: on the day of judgment, divine intervention will reveal the divine plan. The version of it that claimed scientific status was the idea that History goes through stages that end with the attainment of the end of history. Popper had a theory of scientific status. He applied it to historicism and found it wanting (*The Poverty of Historicism*). Many commentators still repeatedly say, he has refuted historicism. Not so: it is the scientific versions of historicism, he said — all of them — he refuted: the versions that claim to be explanatory and thus testable. The mere assertion that historical laws exist he found irrefutable and thus unscientific (as all purely existential assertions are). Irrefutability, he said, is not a virtue but a vice. This he explained in his *The Poverty of Historicism* that he began working on soon after he finished his *Logik der Forschung*. He had his first results published during WWII (1944-5) [to reissue as a book first in Italian (1952-3, 1954) and French (1956) translations and finally in English (1957) and then in other languages]. His *The Open Society and Its Enemies* is a more detailed critique of historicism, done not as a survey of the literature of the social sciences but as a criticism of Plato and of Marx, where he developed the detailed theories of both the closed society and of the open society: there are two theories of society and of morality, he said, not one.

More about *The Open Society and Its Enemies*. That the Fascists and the Bolsheviks shared historicism is hardly surprising, as they both stem from Hegel's philosophy. Considering Hegel unoriginal, Popper sought the origin of historicism. He used a simple prop here: he assumed that the appeal of historicism was not its challenge to seek the divine plan for history but aversion to taking responsibility for our fate. He likewise assumed that this aversion amounts to a yearning for the return to tribal life. If so, then the place to seek the origin of historicism is the first disintegration of tribal society, namely ancient Greece. He found it in Heraclitus, in the Old Oligarch, and, above all, in Plato. It is to be profoundly regretted that Popper's association of Plato with modern Fascism and

Bolshevism prevented many scholars from appreciating his great admiration of Plato. He considered him a great metaphysician and scientist as well as a worthy enemy of the open society. This is exemplary chivalry. In the same vein Popper viewed Marx as an individualist despite the collectivist aspects of his views. *The Open Society and Its Enemies* that chiefly criticizes historicism has many valuable ideas about democracy and about science and, in quite an innovative mood, on the sociology and politics of science.

Since both *The Poverty of Historicism* and *The Open Society and Its Enemies* are polemical — offering criticism and sketching solutions rather than discussing problems — it is important to notice that all of Popper's discussions are problem-oriented. The first and most central problem here is, how is social science possible? Hegel said it is impossible ("the owl of Minerva flies at dusk"). He offered his historicism against the Enlightenment universalist idea of the siblinghood of humanity and advocated war as a defense of a (German) version of particularism. Popper discussed the pro-science and the anti-science versions of historicism and criticized them separately (*The Poverty of Historicism*). His own view is that the refutability and human/social character of a theory resides in the assumption of rationality. He replaced the traditional individualist rationality principle with his situational logic that shares with tradition the idea that only individuals have ends — not History, not Society, and not any institution — and differs from tradition in its assumption that human actions happen in and depend on institutional settings.

Most traditional social philosophies consider social stability the aim of social and political philosophy. By contrast, philosophers of the Enlightenment offered justifications of good government. Popper wanted no justification and no stability but control, and as the tool for social and political reform. He advocated piecemeal social and political engineering that differs from utopianism as its blueprints are detailed and open to criticism and modification. This requires democracy, regimes that allow for the peaceful change of government as means of rectification of error. This idea is now the general consensus. Popper's *The Open Society and Its Enemies* that advocates it is a best-selling classic despite hostile reviews and cheap word-of-mouth campaigns.

## **6. Optimism**

Popper deemed his philosophy optimistic, and increasingly stressed this ("The History of Our Time: An Optimist's View," in Popper, 1963). His philosophy is skeptic as it is fallibilist, yet he said he was not a skeptic, meaning that he greatly differed from traditional skeptics, particularly the Pyrrhonists who had discredited optimism in

preference for a passive attitude to life — an attitude that he staunchly rejected for diverse reasons. He was distressed by the popularity and disingenuousness (*Verlogenheit*) of much of the pessimist philosophy (the existentialists and especially the mock-progressive Frankfurt critical school and their likes). He found the pessimism that follows from reactionary irrationalism more cogent, but also disingenuous and immoral. He found irresponsible their skepticism about individuals and their dogmatism about society.

His arguments for optimism were diverse. First and foremost, the world is beautiful. ("The propaganda for the myth that we live in an ugly world has succeeded. Open your eyes and see how beautiful the world is, and how lucky we are who are alive!") Second, recent progress is astonishing, despite the Holocaust and similar profoundly regrettable catastrophes. The clinging to life that victims and survivors of the Holocaust displayed despite all horrors, he observed, stirs just admiration for them that bespeaks strong optimism. Most important, however, is the moral aspect of the matter: we do not know if we can help bring progress and it is incumbent on us to try. This is the imperative version of optimism. Popper clung to moral and philosophical optimism although he was fairly pessimistic in personal disposition. He never dreamt he would have so much influence and he always felt his endless efforts would fail to eradicate the vicious myth that he had once sympathized with the philosophy of Wittgenstein or of the Vienna Circle. As things turn out, his fame has outlived theirs, and it is his friendly remarks on some of them that today stand out.

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