Introduction

Karl Raimund Popper was born on 28 July 1902 in Vienna. He died on 17 September 1994 in London. His father, Simon Siegmund Carl Popper, a lawyer, was interested in philosophy and actively involved in social reform. When World War I ended in 1918, Karl left school and, as a guest student, began studying history, literature, psychology, philosophy, mathematics, and physics. He joined a leftist youth group and even considered himself a communist for a few months during the spring of 1919, but he soon took this to be an aberration. It was in part his criticism of Marxism that put Popper on the path to his masterpiece, *The Logic of Scientific Discovery*, and that early aroused his interest in the *methods of the social sciences*. (The biographical data are taken from Popper's *Intellectual Autobiography* [1974a] and from Victor Kraft's *The Vienna Circle* [1950/1953]. More details can be found in Malachi Hacohen's *Karl Popper – The Formative Years, 1902–1945* [2000].)

In 1922, Popper passed, as an external candidate, the exam called the Matura. Now he could enroll as a regular student at the University of Vienna. At the same time, he attended a teachers college. He also became a carpenter's apprentice and, for a year, studied church music at the conservatory of Vienna. In 1924, he passed his apprentices' final examination as a carpenter and graduated as a primary school teacher. Then he worked as a tutor in a county council care centre for socially endangered and disadvantaged children. From 1925 to 1927, he was a student at the Paedagogical Institute of Vienna and advocated school reform. In 1928, he completed his doctoral dissertation, "Zur Methodenfrage der Denkpsychologie" (On the Problem of Method in the Psychology

of Thinking), and passed his oral exams in philosophy (under Moritz Schlick) and psychology (under Karl Bühler).

I

Now Popper turned to more general questions of *methodology* and *epistemology*. Such questions are at the core of his philosophy, which he calls "'*critical rationalism*'" (OS, 229, i.a.), and they are the subject of Part I: The Philosophy of Science of the present book.

In the term "critical rationalism," the word "rationalism" is used in a broad sense; it is the opposite of "irrationalism," not of "empiricism." This kind of rationalism comprises empiricism and classical rationalism – as, for example, that of Descartes, which Popper calls "'intellectualism'" (OS II, 224ff.). Uncritical or comprehensive rationalism follows the principle "that any assumption which cannot be supported either by argument or by experience is to be discarded"; but this principle is inconsistent, "for since it cannot, in its turn, be supported by argument or by experience, it implies that it should itself be discarded" (230). Therefore, Popper replaces comprehensive rationalism with critical rationalism, which "recognizes the fact that the fundamental rationalist attitude results from an (at least tentative) act of faith – from faith in reason" (231). As the rationalist demand for the justification of all assumptions is untenable, Popper takes "rational discussion" to be "critical discussion in search of mistakes with the serious purpose of eliminating as many of these mistakes as we can, in order to get nearer to the truth" (CR, 229).

Acquainted with leading members of the Vienna Circle through his family, Popper critically examined theses that were being defended in the Vienna Circle and its milieu, in particular by Ludwig Wittgenstein. The Vienna Circle was a group of scientists which at that time played the leading part in "logical empiricism" or "neopositivism" (cf. Kraft 1950/1953).

At first, Popper wrote notes but did not publish them. Finally, when Herbert Feigl urged him to publish his ideas in the form of a book, a manuscript evolved, called "Die beiden Grundprobleme der Erkenntnistheorie" (The Two Fundamental Problems of Epistemology). He means the problems of induction and demarcation. Early in 1932, Popper completed the part that he intended to publish as the first volume. Several members of the Vienna Circle read the manuscript. In 1933, Moritz Schlick and Philipp Frank accepted it for publication in the series Schriften zur wissenschaftlichen Weltauffassung (Writings on the Scientific Conception of the World). But the publishing house Julius Springer

in Vienna limited the size of the book to 240 pages. Therefore, Popper prepared another manuscript containing excerpts, this time from both volumes. As it was still too voluminous, Popper's uncle Walter Schiff condensed it to about half its size. This last excerpt appeared in December 1934 as *Logik der Forschung. Zur Erkenntnistheorie der modernen Naturwissenschaft* (literally: The Logic of Research: On the Epistemology of Modern Natural Science). The year of publication indicated in the book was 1935. The subtitle was omitted in all later editions. (For the sake of brevity, I will refer to the – first – English edition, which he called *The Logic of Scientific Discovery*, in the text as "*Logic*" and will cite it as "LSD." Accordingly, the abbreviations for the – second – German edition will be "*Logik*" and "LdF.") The manuscript of the first volume of the *Grundprobleme* still exists; the manuscript of a major part of the second volume has been lost. What was left was published only in 1979 by Troels Eggers Hansen. (Hacohen voices scepticism as to the existence of a second volume; 2000, 195ff.)

In a letter to the editor of the journal *Erkenntnis*, Popper sketched his basic ideas. The letter was published under the title "A Criterion of the Empirical Character of Theoretical Systems" and was reprinted as Appendix *I of the *Logic*. Here Popper weighs the two fundamental problems. "*Hume's problem of induction* – the question of the validity of natural laws" is but a preliminary question (LSD, 312; cf. section 1.1 of this book). As opposed to this, "the *problem of demarcation* (Kant's problem of the limits of scientific knowledge)" is the main problem (313; cf. section 1.2). Popper defines this as "the problem of finding a criterion by which we can distinguish between assertions (statements, systems of statements) which belong to the empirical sciences, and assertions which may be described as 'metaphysical'" (313).

Already in 1935 Rudolf Carnap counted Popper's *Logik* among the most important works in the field of the logic of science. Above all, he valued Popper's contribution to the debate on "protocol sentences," or the problem of the "empirical basis of science" (section 4.1, this volume). According to Popper's proposal, the observation statements that are used to test theories must be tested in their turn, and though they are accepted or rejected on the basis of sense perceptions, they do not refer to sense perceptions but to physical objects or events. There are connections between the problem of the empirical basis, on the one hand, and the problems of induction and demarcation, on the other hand, for in the last analysis all three problems concern the confrontation of statements with reality.

Today, Popper's *Logik* is counted among the most important works of the twentieth century in the philosophy of science. It contains the basic ideas of critical rationalism, which explain why all our "knowledge" of facts is fallible and why we learn, not from expectations that are fulfilled, but from expectations that fail: The progress of knowledge results from trial and the elimination of error. His reader *Conjectures and Refutations: The Growth of Scientific Knowledge* (1963) is a collection of articles elaborating these ideas.

In the thirties, conditions were not favourable for the *Logik* to have influence on a wide audience. True, Popper reports in his autobiography on its surprising success: "There were more reviews, in more languages, than there were twenty-five years later of *The Logic of Scientific Discovery*, and fuller reviews even in English" (A, 85). And Gilbert Ryle reports in his review of Popper's *The Open Society and Its Enemies* that "Popper was previously known as the author of an original work on the method of natural science, the 'Logik der Forschung'" (Ryle, 1947, 167). But in 1960, Warnock welcomes the translation of the *Logik* "for that influential book has been, in the twenty-five years since its publication in Vienna, often misrepresented and *too seldom read*" (99, i.a.). Popper himself states that until the publication of the English edition, "philosophers in England and America (with only a few exceptions, such as J. R. Weinberg) seem to have taken [him] for a logical positivist" (A, 69). And in 1959, when *The Logic of Scientific Discovery* was published, an anonymous reviewer in *The Times Literary Supplement* "described it as a 'remarkable book' and declared: 'One cannot help feeling that if it had been translated as soon as it was originally published philosophy in this country might have been saved some detours'" (Miller 1995, 121).

When *Logik der Forschung* appeared in December 1934, the (second) Vienna Circle, whose philosophy the *Logik* comments on, had already got into great difficulties. The Dollfuß government had (in February 1934) ordered the dissolution of the Verein Ernst Mach (Ernst Mach Society). This ended the political and enlightening activities of the Vienna Circle. But its influence on an international, philosophically interested public had only just begun.

II

Influenced by the developments of the thirties, Popper's political commitment again came to the fore. Now he increasingly turned to problems

of social philosophy and political theory, the subject of Part II: The Social Philosophy of this book. In 1936, Popper read a paper on "The Poverty of Historicism" in a seminar led by the liberal economist Friedrich August von Hayek at the London School of Economics (PH, iv). Toward the end of 1936, he was offered a lectureship at Canterbury University College in Christchurch, New Zealand. Popper and his wife thereupon gave up their teaching positions. In January 1937 they left Vienna, and in March they reached New Zealand. In Christchurch, Popper planned to elaborate the paper, showing "how 'historicism' inspired both *Marxism* and *fascism*" (A, 90, i.a.).

Then the manuscript proliferated. Later it developed into the book *The Poverty of Historicism* (see Chapter 10). But as Colin Simkin reports, he considered this manuscript "too abstract for wide appreciation" (Simkin 1993, 185). Thus he began "a companion article to be called 'Marginal Notes on the History of Historicism'" (ibid.). He considered the two works his "war effort" (A, 91). The latter work – which, in a more advanced stage, he intended to call "'False Prophets: Plato – Hegel – Marx'" (A, 90) – later developed into the book *The Open Society and Its Enemies* (see Chapter 11). The book was completed in February 1943, but it proved difficult to find a publisher; it appeared only in 1945, in two volumes, in London. *The Poverty of Historicism* first appeared in 1944–45 as an article in three parts in the journal *Economica*, and only in 1957 did it appear in London and Boston in book form. The journal *Mind* had rejected the manuscript (A, 94). While *The Poverty of Historicism* primarily addresses theoretical and methodological concerns, the emphasis in *The Open Society* is on political and historical considerations – in particular, on the history of philosophy. *The Open Society* became Popper's best-known work by far.

In both works, Popper transferred the basic ideas of critical rationalism to political philosophy: "[O]ne of the best senses of '*reason*,'" he argues, is "*openness to criticism*." Not only statements are criticizable, but also demands and value judgements. Therefore, Popper suggests "that the demand that we extend the critical attitude as far as possible might be called '*critical rationalism*'" (A, 92, i.a.).

According to critical rationalism, all "knowledge" of facts is fallible, and ethical knowledge is impossible. Hence, as we cannot know what we ought to do, we must decide what we want to do and take responsibility for our decisions (Chapter 9). As opposed to this, the *Critical Theory of Society*, which is based on Marx's political economics, claims to obtain

ethical knowledge from the philosophy of history. In the sixties, the confrontation between these two positions led to the "positivist dispute in German sociology" (Chapter 12).

III

The sobre methodology of the *Logik* (1935) and the social philosophical engagement of *The Open Society* (1945) were followed by studies addressing mainly metaphysical problems, the subject of Part III: Metaphysics of this book. Though *epistemology* remains a central topic of Popper's work, the emphasis shifts from *methodological* to *ontological* considerations. While in the *Logik* he took objectivity to be *intersubjective testability*, he now takes the logical contents of theories to be objective in the sense of their *real existence* in what he calls a third world. For Popper, "'objectively true'" is a "third-world predicate" (OK, 158).

When, a quarter of a century after *Logik der Forschung*, the English edition *The Logic of Scientific Discovery* appears (1959), it contains twelve new appendices, mostly on the theory of probability. The subject of Appendix *x, "Universals, Dispositions and Natural or Physical Necessity," is epistemology. Under the head words "universals" and "dispositions," Popper elaborates ideas that he had already formulated in the first edition of the *Logik*. On the other hand, his statements on *natural necessity* are new (see Chapter 13).

His work on classical metaphysical problems begins with his article "Language and the Body-Mind Problem" (1953) and ends only with his book *Knowledge and the Body-Mind Problem* (1994). Beginning in 1966, he publishes on a *theory of three worlds* (see Chapter 15), which adds to the first, physical world not only – as is traditional in philosophy – a second, mental world but also a third world of objective thought contents. In connection with his theory of world 3, he sketches a *theory of evolution* (section 15.3) and critically examines the *determinism-indeterminism problem* (Chapter 14).

In order to save the ideas of freedom of will, responsibility, and creativity, Popper defends an ontological (metaphysical) indeterminism (Chapter 14), which may be necessary for this purpose but is not at all sufficient (section 14.7). Therefore, he also postulates the "openness" of the first, physical world toward the second, mental world and, in the end, toward the third world of objective thought contents.

PART I

THE PHILOSOPHY OF SCIENCE

1

The Two Fundamental Problems in the Theory of Knowledge

In 1979, Karl Popper's book *Die beiden Grundprobleme der Erkenntnistheorie* (GPE) (The Two Fundamental Problems in the Theory of Knowledge) was published. It contains a collection of drafts and preliminary work dating from 1930 to 1933 to his masterpiece, *Logik der Forschung* (LdF), which appeared late in 1934. *Logik der Forschung* was published in English in 1959 as *The Logic of Scientific Discovery* (LSD). The title *Die beiden Grundprobleme der Erkenntnistheorie* alludes to *Die beiden Grundprobleme der Ethik* (The Two Fundamental Problems of Ethics) by Schopenhauer (1788–1860), who had written two prize essays, "On the Freedom of Will" and "On the Foundation of Morals," and whom Popper took as an example because of the clarity of his style.

According to Popper, the two fundamental problems in the theory of knowledge are the problem of induction and the problem of demarcation. The *problem of induction* is the "question whether the universal statements of the empirical sciences can be valid or can be justified" (GPE, 3), or, more precisely, the "question whether inductive inferences are justified, or under what conditions" (LSD, 28). The *problem of demarcation* is the question, "How can we decide in case of doubt whether a statement is scientific or 'only' metaphysical?" (GPE, 4), or, more precisely, the "problem of finding a criterion which would enable us to distinguish between the *empirical sciences* on the one hand, and *mathematics and logic* as well as '*metaphysical*' *systems* on the other" (LSD, 34, i.a.). Following Kant (1724–1804), Popper calls the problem of induction "Hume's problem," and he considers calling the problem of demarcation "Kant's problem" (34).

At first glance, the problem of induction does seem to be epistemologically important. After all, it is not insignificant which universal

statements of the empirical sciences are accepted on the basis of particular experiences and whether they are rightly accepted. On the other hand, the problem of demarcation seems to be only a terminological question. Why should it be so important whether a certain statement is called "scientific"?

Popper reports that he already had "(in the winter of 1919–20) formulated and solved the problem of demarcation between science and non-science . . . [but] did not think it worth publishing" (OK, 1 n1). After he had also found (what he thought was) the solution to the problem of induction (around 1927), he discovered a connection between the two problems. This led him to think that the problem of demarcation is of utmost importance "for research work in the less highly developed sciences" (GPE, 4), and even that "the problems of both the classical and the modern theory of knowledge (from Hume via Kant to Russell and Whitehead) can be traced back to the problem of demarcation, that is, to the problem of finding the criterion of the empirical character of science" (LSD, 55 n3). But why is the problem of demarcation more fundamental than the problem of induction (LSD, 34)?

Since the time of Francis Bacon (1561–1626), the "problem of *drawing a line of demarcation*" between the statements of empirical science, on the one hand, and "pseudoscientific" and "metaphysical" statements or statements of pure logic or pure mathematics, on the other, has become increasingly important: "The most widely accepted view was that science was characterized by its *observational basis*, or by its *inductive method*, while pseudo-sciences and metaphysics were characterized by their *speculative method* or, as Bacon said, by the fact that they operated with '*mental anticipations*' – something very similar to hypotheses" (CR, 255).

David Hume (1711–1776) also considered it an empirical fact that universal hypotheses are, in everyday life and in science, formed on the basis of repeated observations of singular events, that is, that they are *found* by inductive generalization. On the other hand, he showed – as Sextus Empiricus had shown before him – why no inductive method can secure the truth of universal hypotheses. Induction does not *justify* hypotheses.

Popper agrees to the latter proposition but emphatically contradicts the former. He claims to have discovered that instead of a *method of generalization*, we use a "*method of trial and the elimination of error*": First we make conjectures, then we test them by sense experience and try to

replace them by better conjectures. Thus the "place of the *problem of induction* is usurped by the *problem of the comparative goodness or badness of the rival conjectures* or theories that have been proposed" (PKP, 1016, i.a.). As opposed to this, the *problem of demarcation* remains, and in order to solve it, Popper first makes strict empirical *falsifiabilty*, later "practical" falsifiability or *testability* of a statement, the criterion of its *scientific character*.

1.1. THE PROBLEM OF INDUCTION

Our word "induction" is derived from the Latin word *inductio*. This is Cicero's (106–43) translation of the Greek word *epagoge* (*Topics*, X, 42), "induction," as *Aristotle* (384–322) called the "progress from particulars to universals" (*Topica*, I, XII, 105 a 13). Science takes this path in order to *prove* its statements. In order to avoid an infinite regress, it has to start from *unprovable* principles, the *archai*, which are at once true, unmediated, and prior to the conclusion. Knowledge of the *archai* is based on *epagoge*: "Sense-perception gives rise to memory, . . . and repeated memories . . . give rise to experience," which "is the universal when established as a whole" (*Posterior Analytics*, II, XIX, 100 a 6). Aristotle believed that the universal was really contained in the things and that *epagoge* was therefore immediately *evident* insight into the one in addition to the many. This seems both to *explain* the *formation* of (the most) universal statements and to *justify* their *acceptance* as true (cf. OK, 3).

But the sceptic *Sextus Empiricus* (ca. 200–250) criticized the idea of a reliable "progress from particulars to universals." Until today, his argument has not needed any essential improvement. It says: "[W]hen they propose to establish the universal from the particulars by means of induction, they will effect this by a review either of all or of some of the particular instances. But if they review some, the induction will be insecure, since some of the particulars omitted in the induction may contravene the universal; while if they are to review all, they will be toiling at the impossible, since the particulars are infinite and indefinite" (*Outlines of Pyrrhonism*, II, xv, 204). Hence induction *cannot justify* the acceptance of universal statements as true.

For this reason, *Hume* distinguishes between the *genesis* of an expectation or hypothesis and its *validity*. In the context of his discussion of causality (the "Idea of necessary Connexion"), he distinguishes between