

published in 1922.

2. See Ayer, 1946, p. 32.
3. For Schlick see his 1959, pp. 87f; for Waismann see his 1965, pp. 329–333.
4. See Carnap, 1928, section 67.
5. See Ogden and Richards, 1930, pp. 124–5.
6. Published in 1935. An English translation did not appear until 1959.
7. For Berlin see his 1938–39, pp. 233–4; for Church see his 1949.
8. See Ayer, 1946, p. 95.
9. See Ayer, 1946, p. 102.
10. Reprinted in Quine, 1976.
11. See Ayer, 1969.
12. See Ayer, 1973, pp. 211–35.

References

- Ayer, A. J. (1940) *The Foundations of Empirical Knowledge*, Macmillan, London.
- (1946) *Language, Truth and Logic*, 2nd edn, Gollancz, London.
- (1954) *Philosophical Essays*, Macmillan, London.
- (1968) *The Origins of Pragmatism*, Macmillan, London.
- (1969) *Metaphysics and Common Sense*, Macmillan, London.
- (1973) *The Central Questions of Philosophy*, Weidenfeld and Nicholson, London.
- (1984) *Freedom and Morality*, Oxford University Press, Oxford.
- Berlin, I. (1938–39) 'Verification', *Proceedings of the Aristotelian Society*, 39, 225–48.
- Carnap, R. (1928) *Der Logische Aufbau der Welt*, Weltkreis, Berlin. Eng. trans. as *The Logical Structure of the World*, by R. George, Routledge and Kegan Paul, London, 1967.
- Church, A. (1949) 'Review of A. J. Ayer's *Language, Truth and Logic*', *Journal of Symbolic Logic*, 14, 52–53.
- Lewis, C. I. (1929) *Mind and the World Order*, C. Scribner's and Sons, New York.
- Ogden, C. K. and Richards, I. A. (1930) *The Meaning of Meaning*, 3rd edition, Kegan Paul, London.
- Popper, K. R. (1935) *Logik der Forschung*, J. Springer, Wien. Eng. trans. as *The Logic of Scientific Discovery*, Hutchinson, London, 1959.
- Quine, W. V. O. (1973) *The Roots of Reference*, Open Court, La Salle.
- (1976) *The Ways of Paradox*, revised and enlarged edn, Harvard University Press, Cambridge, Mass.
- Schlick, M. (1959) 'Positivism and Realism', in A. J. Ayer (ed.), *Logical Positivism*, Free Press, Glencoe, pp. 82–107.
- Waismann, F. (1965) *The Principles of Linguistic Philosophy*, ed. R. Harré, Macmillan, London.
- Wittgenstein, L. (1922) *Tractatus Logico-Philosophicus*, trans. by C. K. Ogden, Kegan Paul, London.

2

Austrian Origins of Logical Positivism¹

Barry Smith

The rise of scientific philosophy

It was in 1922 that Moritz Schlick — a German physicist-cum-philosopher of aristocratic manners and conservative opinions — arrived in Vienna. He had been invited to take up the chair of philosophy 'with special reference to the history and theory of the inductive sciences' that had been created for another physicist-cum-philosopher, Ernst Mach, in 1895. Mach himself had previously served for almost thirty years as professor of experimental physics in Prague, and it will be important in what follows to remember that Prague was still to some extent a German city and a centre of intellectual activity almost no less important than Vienna herself. The lines of communication between the two former Imperial-Royal capital cities² were still strong, and the same figures were often, at different times, prominent in each.

The two cities shared also the characteristically Austrian predilection — nurtured, certainly, by the culture of the coffee house — for forming clubs, societies, and discussion groups.³ Austrian cultural life was indeed to a striking extent a matter of 'schools', 'movements' and 'circles of contemporaries', and one might pause to reflect on the degree to which such schools and movements have determined the artistic, intellectual and political world we inhabit today. Thus consider, in no particular order, the Vienna psychoanalytic movement, the Zionist movement founded by Theodor Herzl, the 'new Viennese school' of composition around Arnold Schönberg, the school of linguists and psychologists around Karl Bühler, the school of Austrian economics founded by Carl Menger in

1871 and evolving, by degrees, into the circle around Ludwig von Mises and the young Friedrich von Hayek in the 1920s. Or consider the 'Prager Kreis' of novelists and critics around Max Brod, Felix Weltsch and Franz Kafka; or the Prague linguistic circle of Roman Jakobson, Jan Mukařovsky and Nikolai Trubetskoy; or the so-called Louvre circle, a discussion group of adherents of Brentanian philosophy meeting fortnightly in the Café Louvre in Prague, to which the young Franz Kafka also belonged.⁴

Schlick, too, had his regular Thursday evening discussion circle. This comprised above all a group of mathematicians around Hans Hahn, himself a former student of Mach, and including Kurt Gödel, Gustav Bergmann, Karl Menger (son of the economist Carl) and Schlick's own assistant Friedrich Waismann. The Schlick circle included also Philipp Frank, another former student of Mach based principally in Prague (where he had succeeded Einstein in the chair of physics); and it included also Herbert Feigl, Viktor Kraft, Rudolf Carnap, and a sociologist-cum-philosopher, proletarian in manner and socialist in his opinions,⁵ by the name of Otto Neurath.

Carnap is, apart from Schlick himself, the single native German on this list, and it is indeed remarkable to consider the extent to which not merely logical positivism but also the exact or scientific philosophy of which it formed a part was and is a characteristically *Austrian* phenomenon. One thinks in this connection not only of Mach, but also of another Prague figure of an earlier generation, Bernard Bolzano. Bolzano was on the one hand a priest and social reformer, author of one of the last social utopias (*Vom besten Staate*); but he was also a notable mathematical logician and philosopher of science, though his contributions in these fields were unfortunately largely ignored until after his death. One thinks of Ludwig Boltzmann, hero of Wittgenstein and contemporary of Mach in Vienna; and indeed one thinks of Wittgenstein himself, of Ludwik Fleck, Karl Popper, Michael Polanyi, Paul Feyerabend, Wolfgang Stegmüller and Imre Lakatos — all of them Austrians (or Austro-Hungarians) who have, for better or worse, done much to determine the shape of the philosophy of science as we know it today.⁶

Here it is perhaps Ludwik Fleck who deserves most mention. Fleck was born in 1896 in Lemberg (Lwów), capital of Galicia on the eastern fringes of the Empire. He was the author of

some 200 scientific papers in the areas of medicine and microbiology.⁷ But he was also the author of a longer, philosophical work, published in 1935, entitled *Genesis and Development of a Scientific Fact. Introduction to the Doctrine of Cognitive Style and of the Thought-Collective*. This work is of interest first of all because, as a contribution to the nascent discipline of 'sociology of science', it anticipates and perhaps even served to inspire some of the now so influential ideas of Thomas Kuhn (who in fact contributed a preface to the English translation of the work). But it is of interest also, as we shall see below, because Fleck was one of a number of Lemberg-based philosophers and philosophically-minded scientists and mathematicians who were to become associated, in different ways, with the developments in scientific philosophy that were taking place to the west — and Lemberg will, like Prague, have a quite special role to play in the story that follows.

The native *German* philosophers who have made serious contributions to exact philosophy or to the philosophy of science in the modern sense are, in contrast, remarkably few, and of these — one thinks particularly of Hans Reichenbach and Carl Hempel — it can often be asserted that the true flowering of their thought and influence has occurred through formal or informal collaboration with their Austrian teachers or contemporaries.⁸ Of quite specific interest for our own purposes is the fact that so many of these philosophers, as also of the sympathetic philosophically-minded German scientists — one thinks in particular of Kurt Grelling and of the Gestalt psychologists Wolfgang Köhler and Kurt Lewin — were based in Berlin, where the 'Society for Empirical Philosophy' was established in 1928 as a counterpart to the Schlick circle in Vienna.

Philosophy and politics

Ayer himself arrived in Vienna in late November of 1932, spending a protracted honeymoon of just over three months in Austria before returning to Oxford to write *Language, Truth and Logic*. The Schlick circle was at this time at the very height of its activity. It had already organised its first two international conferences, and at the first of these, held in Prague in 1929,

had distributed copies of its manifesto, the 'Wissenschaftliche Weltauffassung' or 'Scientific Conception of the World'. This was written, effectively, by Neurath, with Carnap and Hahn (and to a lesser extent other members of the circle) serving merely to temper some of Neurath's wilder flights of fancy. The patrician Schlick, to whom the manifesto was dedicated, was less than satisfied with the result. This was first of all because he was not taken by the conception of the circle as a 'movement' of any sort, favouring a more modest and more narrowly scientific approach:

Schlick hated everything that smacked of agitation, was against it all: 'It is not necessary for us to agitate: that we can leave to the political parties: in science we say what we have found, we hope to say the truth; and if it is the truth, then it will win out.' (Haller and Rutte, p.31)

But it was also because he was distressed by the political tone of the piece, and more specifically by those portions which suggested some sort of alignment of logical positivism with socialism and with the movement for workers' education in Vienna at the time.

The circle had already, by 1932, taken over — with the group around Reichenbach in Berlin — the journal *Annalen der Philosophie*, renaming it *Erkenntnis*. And it had published some six volumes of its series of *Schriften zur wissenschaftlichen Weltauffassung*, including works by Richard von Mises (brother of the economist Ludwig), and by Carnap, Schlick, Neurath and Philipp Frank, together with a peculiar work, entitled *On the Biology of Ethics: Psychopathological Investigations of Guilt-Feelings and the Formation of Moral Ideals: A Contribution on the Essence of the Neurotic Human Being*, by a certain Otto Kant.⁹

Ayer himself, who attended the weekly discussion meetings of the circle and a course of university lectures given by Schlick on the philosophy of science, seems not to have been troubled by the puzzle as to why it should have been Austria, specifically, that witnessed such a peculiar flowering of scientific philosophy. His autobiography does however contain one remark on what Ayer saw as the political role of the group around Schlick:

The members of the Vienna Circle, with the notable

exception of Otto Neurath, were not greatly interested in politics, but theirs was also a political movement. The war of ideas which they were waging against the Catholic church had its part in the perennial Viennese conflict between the socialists and the clerical reaction. (1977, p.129)

A thesis along these lines has indeed been argued quite seriously by the Viennese historian Friedrich Stadler, who provides us with a great mass of documentation to support his case. Stadler suggests that we see the University of Vienna in the interwar period as split into 'two camps':

on the one side, in the realm of scientific philosophy, there dominated democratic (enlightenment, liberal, socialist) tendencies; on the other side there was a spectrum of almost all forms of anti-democratic feeling, from neo-romantic conservatism to fascist-totalitarian outgrowths. Thus it is tempting to see the philosophical life as part of the fierce party-political *Kulturkampf* of the time, between the bourgeois camp and the workers' movement. (1979, p.42)

The idea that the flowering of scientific philosophy in Austria can be accounted for by regarding the Schlick circle as a manifestation of Austrian socialism, or of anti-clericalism, seems however to be at best the product of a certain sort of over-tidy wishful thinking. Why, one might ask, did socialist anti-clericalism not lead to similar phenomena in France, or Spain, or Italy? And how is such a thesis to cope with the fact that so few important Austrian philosophers of science, and so few of the members of the Vienna circle — Neurath, Hahn and Carnap constituting here the principal exceptions — were of socialist persuasion?¹⁰

Neurath was, it must be admitted, the most vocal and the most ardently propagandistic of the group around Schlick. It was Neurath's conspicuous advocacy of crackpot schemes for 'international planning for freedom' and for an 'economy in kind' as a substitute for prices and markets¹¹ which dissuaded Hayek from making overtures to the group after his interest had been sparked by his friend and fellow member of the Mises circle Felix Kaufmann. And as the case of Schlick himself surely makes clear,¹² it would be overly simplistic to see the circle in particular or Viennese scientific philosophy in general

as in any sense a part of the Austrian socialist movement.

How, then, are we to explain the fact that, as far as achievement and wider influence is concerned, scientifically oriented philosophy of science was the dominant branch of philosophy in Austria?

A more subtle answer to this question, deriving from the work of the Hungarian philosopher J. C. Nyíri,¹³ might read as follows. On the one hand one can point to the fact that, while the Austrian Empire was the equal of Germany in the cultural field, it lagged behind its richer and more developed neighbour to the west in the spheres of intellect and science. The Habsburg Empire had witnessed a relatively late process of urbanisation, bringing also a late development of those liberal habits and values which would seem to be a necessary presupposition of the modern, scientific attitude. It therefore lacked institutions and traditions of scientific research of the sort that had been established and cultivated in Germany throughout the nineteenth century. On the other hand, as the more liberal and enlightened ways began to be established in Austria — effectively in the second half of the nineteenth century — the desire to enjoy the various trappings of a modern enlightened culture made itself strongly felt. The Austrians were not, however, in a position to summon forth the means to create serious and reputable institutions and traditions of science in the narrow sense. This, as Nyíri puts it, created 'a vacuum which the *theory* of a practice so attractively pursued elsewhere could then fill'¹⁴ — a thesis illustrated particularly clearly by the case of Mach, whose lack of funds for serious experiments in physics seems to have constrained him to turn, instead to the (cheaper) fields of physiology and psychology, and to the work in history and philosophy of science which occupied him especially at the end of his life.

An account along these lines is supported further by pointing to the absence in the Empire of any entrenched national philosophy of the Kantian or Hegelian sort. This implied that, when the time came for the establishment of a modern and scientifically inspired philosophy in Austria, there was very little of substance against which the new philosophical developments had to compete. Catholic Austria was indeed largely free of the influence of German (Protestant) idealist metaphysics,¹⁵ an influence which has done so much to thwart the development of exact philosophy in Germany itself. This

was not least in virtue of the fact that the works of both Kant and Hegel, as notorious effluvia of the French revolution, were for a time included in the Papal index of prohibited books. Their place was taken by a peculiarly superficial form of scholasticism — larded, here and there, with bits of Leibniz and Herbart, but still quite literally an inheritance of the middle ages. The canons and textbooks of this doctrine were imposed upon the institutions of learning throughout the Empire, a state of affairs which was to end only with the educational reforms after 1848, leaving the way clear for more positive developments, some of which will be considered below.

This is of course in contrast to the German case, where the strength of the idealist metaphysics had derived in no small part from the fact that it was closely associated with the development both of German nationalistic feeling and of the German nation itself. Kant, Hegel, Fichte and Schelling came thereby to occupy an entrenched position in German thought and feeling (comparable, perhaps, to the position of Catholicism in contemporary Poland or in the Irish Republic). At no time was philosophy rooted in this way in the structure of the Austrian state. An Empire which was at best an accidental compromise, a dynastic convenience of the Habsburg family itself, seemed indeed to be lacking in all potential for legitimation on the plane of philosophy.¹⁶ The primary legitimacy of the Empire was seen as lying much rather in its role as the last bulwark of Catholic Christianity against the expansionist powers of Russia and Turkey to the east.

There is however a further reason for the absence in Austria of a counterpart to German idealist metaphysics. For the Austrians, similar in this respect to the English and the Scots, have tended to react with derisive suspicion in the face of 'metaphysical systems' (when, that is to say, these are put forward as the constructions of man). This may explain also why those native German philosophers who have favoured painstaking argument and careful empirical work over grandiose speculation have to an extent been able to find a receptive audience in Austrian universities.¹⁷

The Neurath-Haller thesis

Much of the previous section consisted in the attempt to provide an explanation of developments in the intellectual or cultural sphere by appeal to underlying social or economic factors (as the relative predominance of the coffee house in Austria might be made understandable by pointing to the long-standing shortage of adequate housing in the major cities of the Empire). Explanations of this kind have been found tempting both by Marxist thinkers and also by advocates of the new 'economic approach to human behaviour'.¹⁸ Where, however, we are dealing with complex movements of thought and doctrine, they would seem to be at best only partial. For they cannot give us insight into the precise intellectual content of the movements in question. Why did the Austrians' initial substitute for true scientific development take precisely these (alternatively phenomenalist and physicalist) forms, rather than those? What is to account for the peculiar blend of British empiricism and Russellian logic which provided the basic framework within which, in their various ways, the members of the Schlick circle would operate?

Clearly, and for all the dominance of schools and movements in any particular case, it can only be by pointing to the influence of specific *individuals* that we shall provide truly satisfactory answers to questions such as these. And there are a number of candidate individuals who do immediately come to mind, including Boltzmann — whose vision of a unitary science made itself felt not only among physicists but also in the wider intellectual community in Vienna — and Wittgenstein — whose *Tractatus* exerted a not inconsiderable influence on both Schlick and Carnap in precisely the formative years of the Vienna Circle. We may presume, reasonably, that no social or economic explanation of the genius of Boltzmann or Wittgenstein (or Gödel, or Einstein) would be forthcoming. Yet it would, on the other hand, be insufficient for our purposes to look at individuals in abstraction from the wider social and institutional context in which they worked. For the individual will himself have been shaped by his surrounding culture, and his ideas will at least to some extent have been determined thereby, whether positively, through absorption, or negatively, through critical reaction. Moreover, these ideas will be able to take root in this surrounding culture only to the

extent that they strike a congenial chord in the thinking of those to whom they are addressed. Hence also an individual of genius will have a greater opportunity to influence the thinking of others to the extent that he has an oratorical or pedagogical talent. Longevity, too, may play a not insignificant role. But further: a body of thought that is promulgated from a number of distinct centres and in such a way as to attract the representatives of a number of different disciplines will, other things being equal, have a greater chance of becoming influential; for it will have the opportunity to make an impression on the thinking of different members of its audience by degrees, by appealing simultaneously to their several competing interests.

Most importantly, however, an individual, even an individual of genius, is able to exert an influence upon his contemporaries only to the extent that there are institutions which can facilitate the dissemination of his ideas. Hence there is a need, in regard to our own specific problem, to provide a mixed explanation, one that makes room both for social and economic factors of the kind so far considered and also for the serendipitous role of individuals. A remarkably forceful and coherent explanation along these lines has been provided, ironically enough, by the much-maligned Otto Neurath in the section labelled 'Prehistory' of the Vienna Circle manifesto already mentioned above, and I shall here deal in turn with each of the four main components in Neurath's account.

I. The fact that Vienna provided especially fertile soil for the development of the scientific conception is, Neurath argues, 'historically understandable' first of all as a consequence of the growth of liberalism in Vienna in the second half of the nineteenth century. Indeed he claims that liberalism was in this period:

the dominant political current in Vienna. Its world of ideas stems from the enlightenment, from empiricism, utilitarianism and the free trade movement of England. In Vienna's liberal movement, scholars of world renown occupied leading positions. Here an anti-metaphysical spirit was cultivated, for instance, by men like Theodor Gomperz (who translated the works of J. S. Mill), and by Suess, Jodl

and others. (Neurath, 1973, p. 301, translation amended slightly)

This liberal atmosphere fostered also, Neurath tells us, the development in Austria of scientifically oriented popular education — leading eventually to the school reform movement of the 1920s in which Wittgenstein, perhaps inadvertently, participated.

II. Mach, too, was a product of this Viennese liberal enlightenment, which was as it were compressed, in Austria, into the short span of a few decades. His formative years as student and *Privatdozent* were spent in Vienna, where his political attitudes — subsequently to reveal themselves in his activities as Rector of the still unified University of Prague — were also shaped. These same attitudes then manifested themselves also, Neurath suggests, in Mach's philosophy of science, and specifically in his attempt to 'purify' empirical science of metaphysical notions:

We recall his critique of absolute space which made him a forerunner of Einstein, his struggle against the metaphysics of the thing-in-itself and of the concept of substance, and his investigations of the construction of the concepts of science from ultimate elements, namely, sense data. (Neurath, 1973, p. 302)

The influence of Mach and of his successor Boltzmann, Neurath now argues, 'makes it understandable' why there was in Vienna 'a lively dominant interest in the epistemological and logical problems that are linked with the foundations of physics' (Neurath 1973, p.302). This influence was, certainly, of lasting importance, despite the fact that, after only six years as professor in Vienna, Mach was forced by ill-health to retire. Thus Hayek, for example, reports that he and his contemporaries on arriving in Vienna to take up their studies in the immediate post-war years 'found in Mach almost the only arguments against a metaphysical and mystificatory attitude' such as was manifested by the dominant philosophers in the University at the time:

from Mach one was then led on to Helmholtz, to Poincaré

to similar thinkers, and of course, for those who went into the matter systematically such as my friend Karl Popper, to all the natural scientists and philosophers of the period. (Hayek, 1966, p.42f)

The quite special importance of Mach for the Vienna Circle itself can be seen in the fact that they gave the name 'Verein Ernst Mach' to the public lecture society which they founded, as a supplement to their other activities, in 1929.

III. Neurath mentions also a number of Viennese social thinkers, from both the Marxist and the non-Marxist camps, who had 'served consciously in the spirit of the enlightenment' in the late nineteenth century.¹⁹ Above all he mentions the work of Carl Menger, pointing out that 'in the sphere of political economy, too, a rigorously scientific method was cultivated by the school of marginal utility' which Menger had founded in 1871. Menger's methodological individualistic doctrines, especially as developed by Mises and by Hayek, can indeed be seen as standing in opposition to German historicist and collectivist doctrines in the sphere of economics in a way that parallels the opposition of, say, Bolzano or Mach to Kant and Hegel. Moreover, these doctrines constitute a synthesis of liberal political and economic ideas with the affirmation of the importance of scientific rigour of just the sort that is required by Neurath's thesis.²⁰

IV. Apart from Mach, however, the most important individual philosopher mentioned by Neurath in his account of the Viennese prehistory of logical positivism is Franz Brentano. The ground was cleared for the endeavours of the Vienna Circle in the direction of a reform of logic and of a concern with problems of foundations also, as Neurath himself puts it, 'from quite another quarter':

through Franz Brentano (professor of philosophy . . . from 1874 to 1880, later *Dozent* in the philosophical faculty). As a Catholic priest Brentano had an understanding for scholasticism; he started directly from the scholastic logic and from Leibniz's endeavours to reform logic, while leaving aside Kant and the idealist system-philosophers. Brentano and his students showed time and again their understanding of

men like Bolzano and others who were working towards a rigorous new foundation of logic. (Neurath, 1973, p.302)

Brentano, too, was marked by the Austrian liberalism of the nineteenth century (thus for example he played an instrumental role in commissioning the young Sigmund Freud — who had been for a time a devoted admirer of Brentano's work — to translate one of the volumes in the already mentioned Gomperz edition of the works of Mill²¹). Of Brentano's students, Neurath mentions in particular Alois Höfler (1853–1922), who had organised numerous discussions on Brentanian perspectives in logic and foundations under the auspices of the Philosophical Society at the University of Vienna, a forum in which, as Neurath puts it, 'the adherents of the scientific world conception were strongly represented'.²²

Neurath mentions also 'Alexius von Meinong, a member of Brentano's Viennese Circle from 1870–1882 and later professor in Graz, whose theory of objects has certainly some affinity to modern theories of concepts'. (Neurath is presumably referring here to the similarities — pointed out also by Carnap — between Meinong's work on higher order objects and Carnap's *Logical Structure of the World*.²³) He mentions also Meinong's pupil Ernst Mally, who had been one of the first Austrians to work on the logic of Whitehead and Russell and would later play a seminal role in the development of deontic logic.

Brentano, for all his scholastic background, was not only sympathetic to a rigorously scientific method of philosophy; he shared with the logical positivists also a certain anti-metaphysical orientation²⁴ and his work involves the use of methods of language analysis similar, in some respects, to those developed later by philosophers in England. The distinguished Graz philosopher Rudolf Haller has indeed argued that it makes sense to point to these features — which were shared in common not only by Brentano and the logical positivists but also by thinkers as diverse as Mach and Wittgenstein — as constituting what might be called a 'typically Austrian philosophy'.²⁵ Haller's writings on the history of Austrian philosophy²⁶ have not merely extended and clarified the Neurath interpretation; they have also contributed to our understanding of German-language philosophy as a whole.

For Haller has shown that it is possible to distinguish within this whole a coherent alternative to the speculative idealisms predominant in Germany proper. But now, if this Neurath-Haller thesis can be accepted, it follows that the Vienna Circle itself comes to be linked, via Brentano, to Catholic scholasticism. Indeed one could go further and point to the *method* of communal philosophical argument — of 'philosophising by means of a sometimes ritualised process of discussion — as something that is shared, not merely by Brentano and the medieval schoolmen, but also by Schlick, with his Thursday evening discussions, and indeed by Wittgenstein in his cell in Cambridge.

The Neurath-Haller thesis is not without its problems however. Thus it seems that in the actual discussions of the Vienna Circle the works of Meinong or Höfler or Mally — to say nothing of the medievals — were hardly mentioned, and Brentano himself was discussed only because his work on ethics was chosen by Schlick as a special object of criticism.

The thesis has been attacked most especially by the Viennese sociologist left, which of course cannot stomach the idea that the 'two camps' of Catholic reaction and progressive socialist neopositivism should become confused together in the way described. Friedrich Stadler, in particular, has suggested that — in contrast to the picture of the typical Austrian philosopher painted by Neurath and Haller — the influence of logical positivist ideas, or of scientific philosophy in general, was in fact rather small, at least as concerns the official life of Vienna University in the period 1918–38. What predominated, both in lecture courses and in dissertation topics, was rather the history of philosophy of a rather old-fashioned sort, dealing in Kant, Schopenhauer, Spinoza, Plato, Nietzsche. The circle around Schlick can be seen from this point of view to have consisted largely of philosophical outsiders or cranks, of individuals who would in fact be taken seriously only sometime later — and only without the boundaries of Austria herself.

What is important for our purposes, however, is not the education of the inter-war generation in Vienna, the generation which would come of age in the period (say) 1939–45. Rather, we are interested in those intellectual currents which had shaped and determined the thinking of specific members of the generation already mature in the inter-war period, and in particular given rise to such schools as the Schlick and Mises

circles. And to pick out such currents it will not suffice simply to examine the sheer numbers of lectures or dissertations on different themes — for this is to ignore just those differences of quality, achievement and wider influence which are here all-important.

The school of Franz Brentano

Franz Brentano (1838–1917) was born in Marienberg, near Boppard on the Rhine, of a distinguished Italian-German family whose forbears included Clemens Brentano, Carl von Savigny and Bettina von Arnim. He studied in Berlin under the Aristotle scholar Adolf Trendelenburg, and later in Würzburg, where he took holy orders in 1864 and where, from 1866, he taught philosophy. In part as a result of difficulties in accepting the dogma of Papal infallibility, Brentano withdrew from the priesthood in 1873 and this necessitated also a withdrawal from Würzburg. In 1874 he was appointed professor of philosophy in Vienna, where he taught for some twenty years with great success. Brentano moved to Florence in 1896 and from there to Zurich in 1915, where he died two years later.²⁷

Brentano remained a quite singularly powerful figure in Austrian philosophy even when, for technical reasons connected with his marriage as an ex-priest, he was forced to resign his chair in 1880. It is one of the tragedies of Austrian philosophy that, due to the repeated interventions of the Emperor, Brentano was not re-appointed to a professorial post in Vienna after his marriage, despite the fact that, year after year, his re-election to such a post was carried *unico voto* by the faculty itself. Brentano remained in Vienna as a mere *Privatdozent* until 1895. He was thereby able to exert his influence in Vienna as a teacher, but his students and disciples were largely forced to turn elsewhere in order to pursue their philosophical careers. Had Brentano been able truly to establish himself and his school in the University of Vienna, then it seems clear that the philosophy of Austria in this century would have been significantly different. It may, therefore, have been a somewhat ironic consequence of the Emperor's veto of Brentano's appointment in the name of Christian propriety, that he thereby left the way clear in Vienna for just such

positivistic and atheistic movements of thought as were promulgated by Schlick and his circle in the 20s and 30s.

Another consequence was that Brentanian ideas came to predominate in other centres of learning both within and without the Empire. Thus centres of Brentanian or of Brentano-inspired thought were established particularly in Prague and in Lemberg, and Brentano's students held chairs also in Graz and Czernowitz, as well as in Berlin, where Stumpf, formerly in Prague, was professor in the University for over thirty years.

Brentano's influence was not restricted to philosophers. Among those who came under his spell were also a number of important thinkers in the Church, as well as such figures as T. G. Masaryk, later President of the Czechoslovak Republic. What is most remarkable about Brentano, however, is the extent to which his most important philosophical heirs — Kasimir Twardowski in Lemberg, Christian von Ehrenfels and Anton Marty in Prague, Carl Stumpf in Prague and Berlin, as well as Meinong and Husserl — have distinguished themselves by the power and originality of their thinking, which amounted in each case to a more or less radical transformation of Brentanian ideas.²⁸ Moreover each had influential students of his own, to the extent that, leaving aside certain exclusively Anglo-Saxon developments, a table of Brentano's students and of his students' students would come close to embracing all of the most important philosophical movements of the twentieth century.

Twardowski (1866–1938) was born in Vienna and took his PhD under Brentano with a dissertation on Descartes in 1892. After a short period as *Privatdozent* in Vienna he moved to Lemberg in 1895. On the basis of work on logic and psychology inspired by Brentano (and due in no small part to his own brilliance as a teacher), he then went on to establish almost single-handedly a tradition of exact philosophy in Poland which was to include all of the important figures of the Polish philosophical renaissance of the first decades of the present century.²⁹ Thus present at different times in Lemberg and falling under Twardowski's influence were, *inter alia*, the historian Wladyslaw Tatarkiewicz, the phenomenologist and aesthetician Roman Ingarden, the logicians St. Leśniewski, Jan Lukaszewicz and Tadeusz Czeżowski, the already mentioned Ludwik Fleck,³⁰ as well as philosophers later sympathetic to the

Vienna logical empiricist movement such as Tadeusz Kotarbiński and Kazimierz Ajdukiewicz.³¹ Members of the circle around Twardowski were gradually transplanted to Warsaw, where Leśniewski, especially, was dominant, and it was from there that contacts with the Vienna Circle were initiated in the spring of 1930 by Alfred Tarski. Carnap in turn visited Warsaw in November of that year. He gave lectures to the Warsaw Philosophical Society and had discussions with Leśniewski, Kotarbiński and Tarski, at just about the time when Tarski himself was developing his semantic conception of truth.³²

Ehrenfels (1859–1932), professor in Prague for more than thirty years, was above all responsible, together with his student Max Wertheimer, for initiating that revolution in psychological research which is associated with the concept of Gestalt, a revolution to which contributions were made also by Ehrenfels' teacher Meinong in Graz and subsequently by Bühler in Vienna.³³ Meinong's followers would go on to establish a school of Gestalt psychology that is still influential in Italy today, and not least in the former Imperial-and-Royal Port City of Trieste. The group around Bühler (to which incidentally the young Karl Popper belonged), promulgated a naturalistic philosophy of Gestalten similar, in many respects, to the work of Stumpf. Bühler's student Egon Brunswik, especially, was to make important contributions to this Vienna Gestalt psychology before allying himself with the neopositivist movement newly transplanted to America and serving as one of the advisory editors to the *International Encyclopedia of Unified Science* founded by Neurath in 1938.

Marty (1847–1914) was a native of Switzerland who, following the example of his teacher Brentano in Würzburg, took holy orders in 1870. He was professor, successively, in Czernowitz and Prague, and was responsible for applying Brentano's ideas in the areas of linguistics and the philosophy of language, where his writings anticipated a number of aspects of contemporary work on linguistic universals. Marty played a role also in the early development of Brentanian ideas on language in the direction of a theory of speech acts,³⁴ and exerted an influence in this respect both on Bühler and his followers in Vienna and also on Jakobson and other members of the Prague linguistic circle.

The philosophical atmosphere in Prague in the first decades of the twentieth century had of course been determined to no

small extent by the work of physicists such as Mach, Einstein and Frank. Yet it is clear that Marty, Stumpf, Ehrenfels and other Brentanians — as well as phenomenologically-oriented psychologists such as Ewald Hering — played a no less important role in determining the scientific orientation of Prague philosophy. Moreover, whilst the two groups were doctrinally at loggerheads, particularly over the theory of relativity itself, which Brentano charged with incoherence, there were examples of amicable collaboration across this doctrinal divide. Thus Einstein was to be a life-long friend of Wertheimer,³⁵ and also of Marty's student and assistant Hugo Bergmann, who was in turn a close friend of Franz Kafka and had done much to encourage the latter to attend the philosophy lectures of Ehrenfels, Marty and other Brentanists as part of his studies in the German University. Bergmann had also initiated Kafka into the mysteries of the already mentioned Brentanist discussion group in Prague. Initially, as Bergmann writes, the group had

called itself the 'Louvre Circle' after the Louvre coffeehouse where we used to gather. Later on, we got together in the drawing-room of my then mother-in-law, Berta Sohr-Fanta, where Einstein was a frequent visitor when we were reading Hegel's 'Phenomenology of the Spirit'. I scarcely remember whether Einstein took part in these readings. Yet I well recall a popular lecture he held before this score of non-physicists on the special theory of relativity. (Bergmann, 1974, p.389)

Bergmann himself was the author of books on Brentano's concept of evidence and on the philosophy of Bolzano, dealing especially with the latter's logic and philosophy of mathematics. On the other hand however he was the author of a volume on *The Controversy Concerning the Law of Causality in Contemporary Physics*, dedicated 'In memory of my teacher Anton Marty' and described by Einstein in his Foreword to the book as 'promoting the best in our present-day attempts at merging physical and philosophical thought'.³⁶

Stumpf (1848–1936) was born in the village of Wiesentheid in Lower Franconia (Bavaria) from where he moved to the University of Würzburg in 1865. In 1866 he began a close collaboration with Brentano which extended across the period

1866 to 1874 when Brentano left for Vienna. Stumpf himself was professor in Würzburg from 1873, before leaving for Prague in 1879 and going on from there to Halle in 1884, where he would serve for a time as teacher and colleague of Husserl. After a period in Munich, Stumpf was called in 1894 to serve as professor of philosophy in Berlin with the explicit task of establishing there an institute of psychology. It was in this institute that his most important students and collaborators — Wertheimer, again, but also Wolfgang Köhler, Kurt Koffka and Kurt Lewin — would establish the so-called Berlin school of Gestalt psychology.

Stumpf's influence on his Gestaltist students was two-fold. On the one hand he gave them a rigorous training, especially in the philosophical foundations of psychology³⁷ — echoing in this respect the work of his own teacher Brentano. And on the other hand he conveyed to them an understanding of and a respect for philosophy as a scientific enterprise in its own right — as a science of the most general properties (both material and psychological) of what is real. Philosophy therefore stands to the physical and psychological sciences in much the same relation as, say, logic to the sciences of language.

This philosophical background was indispensable to the initial successes of the Gestaltist enterprise as a research programme in psychology. Indeed it seems quite generally to have been those thinkers who have had powerful convictions as to the importance of philosophy as a discipline in its own right who have exerted the strongest influence on developments in science proper, as contrasted with, say, the thinkers of the Vienna Circle, who saw philosophy as very much an inferior aid to science. The Vienna Circle has in fact given rise to almost no truly creative developments in the extra-philosophical sphere: even the early work of Gödel seems hardly to have been affected by the efforts of Schlick *et al.*, and Gödel's later philosophy was, notoriously, closer to the metaphysics of a Leibniz or a Husserl than to the anti-metaphysical attitudes of his erstwhile Viennese contemporaries.

The Stumpfian *Naturphilosophie* led to a quite particular concern with the problem of demarcation of the sciences, inspiring Stumpf's student Kurt Lewin, in his study of the different concepts of identity presupposed by the different sciences, to develop the notion of 'genidentity' — for example of two successive states of a single organism or physical system

— a notion which was then adopted by Carnap in his works in logic. The same theme of demarcation of the sciences was taken up by Schlick in one of his earliest philosophical writings (1910), and the fact that other early publications of Schlick, too, are devoted to markedly Stumpfian themes, taken together with the respectful references to Stumpf in Schlick's *General Theory of Knowledge*,³⁸ may suggest that there was some influence of Stumpf during the time (1900–1904) when Schlick was studying physics in Berlin. This hypothesis is to some extent supported by the fact that the Berlin Philosophical Faculty was in those days still not divided into separate faculties for the *Natur-* and *Geisteswissenschaften*.

Perhaps the clearest illustration of the close links between scientific philosophy in Berlin and Vienna is provided by the case of the Austrian novelist Robert Musil. Musil studied under Stumpf in Berlin from 1903 to 1908, writing his doctorate on the philosophy of Mach.³⁹ He enjoyed friendly contacts in this period with Gestalt psychologists such as Köhler and von Allesch, and Gestaltist ideas make themselves felt at a number of places in Musil's novel *The Man Without Qualities*. Musil was indeed tempted, on completing his studies in Berlin, to accept an invitation from Meinong to serve as his assistant in Graz. But he enjoyed contacts with the positivists, also, and particularly with Richard von Mises in whose home in Berlin he was a regular guest.

Neurath, too, studied in Berlin in the early years of the century, and so also, from 1906 to 1908, did Ludwig Wittgenstein. For our purposes here, however, it is the manifold links between the Berlin Gestalt theorists and a later generation of scientific philosophers in Berlin that will be of importance. Thus we know that Kurt Lewin was involved with Carnap and Reichenbach in the earliest efforts to cultivate a tradition of scientific philosophy in Germany, and both he and Köhler actively participated in the discussions of the Reichenbach group in Berlin.⁴⁰ Lewin's paper on the transition from Aristotelian to Galilean modes of thought in biology and psychology was published in the first volume of *Erkenntnis*, and a paper by Köhler on Boltzmann appeared in volume two of the same journal. Köhler's book on *Physical Gestalten at Rest and in the Stationary State: An Investigation in Natural Philosophy* (1920), an attempt to show that the Gestalt structures given in experience and in the world of organic matter are present also

in the purely physical realm, was greeted by many of the neopositivists as a substantive contribution to just that 'unity of science' which they themselves were advocating in their philosophical writings.

Positivist philosophy had until this time — largely as a result of the efforts of Mach and his British empiricist predecessors — been associated with the doctrines of elementarism, with the view that the ultimate constituents of reality and of experience are 'elements' or 'atoms'. Thus, Carnap's new Viennese phenomenalism, too, started out from the view that reality can be understood as a 'meaningless complex' of sensory *elements*,⁴¹ a development that was stimulated also by certain logically atomistic implications of the new logic of Whitehead and Russell, as also by the work of Wittgenstein. Carnap however, under the influence of Wertheimer and Köhler, saw that there were reasons to reject this elementarist view. Thus he took as the basis of his system in *The Logical Structure of the World* not elements but necessarily unanalysable 'instantaneous total experiences'⁴² (though the Gestaltists could rightly object that even this concession ignores the fact that our experiences are organised structurally not only within each instant but also across time). Ayer, too, was sensitive to the Gestaltist challenge, as is shown by his remark in *Language, Truth and Logic* to the effect that 'our empiricism is not logically dependent on an atomistic psychology, such as Hume and Mach adopted, but is compatible with any theory whatsoever concerning the actual characteristics of our sensory fields' (1936, p. 122).⁴³

A special role in the attempts by the Austro-German logical positivists to come to terms with the Gestaltist challenge was played by a series of papers by Kurt Grelling and Paul Oppenheim, the first of which, on 'The Concept of Gestalt in the Light of Modern Logic' was published in volume seven of *Erkenntnis* in 1938.⁴⁴ The paper was designed to defend the Gestaltist position against (not entirely unjustified) charges that much of the then current talk of psychological and other sorts of 'wholes not reducible to the sums of their parts' was either meaningless or inherently confused. The aim of the paper was therefore 'to suggest definitions which accomplish the following: when the concepts thus determined are appropriately inserted into sentences which appear characteristic of the Gestalt theorists, these sentences turn out neither trivial nor empty of sense'.⁴⁵

Oppenheim was an example of that rare breed, a philosophically-minded banker, rich enough to pay philosophers to serve as his co-authors in a series of works in the philosophy of science published in the period 1938 to 1978. One of the first such ventures was his paper with Grelling on Gestalt. He collaborated also, *inter alia*, with Hempel — a peculiar volume entitled *The Concept of Type in the Light of Modern Logic* (1936), an analysis of the work on human typology of psychologists such as Lewin, Kretschmer, and Jaensch — and with Nicholas Rescher — again on the 'Logical Analysis of Gestalt Concepts' — as well as writing a series of books and papers of his own on the demarcation and 'natural order' of scientific disciplines and on the 'static and dynamic laws of the formation of scientific concepts'.

Husserl (1859–1938), whose unequalled influence on the philosophy of continental Europe in the twentieth century needs no commentary, was responsible for transforming Brentano's 'descriptive psychology' into his own somewhat more ambitious-sounding enterprise of 'phenomenology'. Like so many others, Husserl was won for philosophy by the power of Brentano's thinking and teaching. As he himself put it in 1932: 'Without Brentano I should have written not a single word of philosophy.'

The superficial view of the relations between phenomenology and the logical positivists has long centred around Carnap's attack in the second volume of *Erkenntnis* on the 'metaphysical nonsense' of Heidegger's *Sein und Zeit*. Thus it has been readily assumed that phenomenology as a whole appeared to Carnap and his associates as just another example of the bad old metaphysics which the Vienna positivist movement was out to vanquish.⁴⁶ The two camps were, certainly, at odds with each other in central points of doctrine. Thus it was the phenomenologist Roman Ingarden who presented one of the first formulations of the now familiar criticism of the Vienna circle verifiability criterion of meaning — that the criterion is itself meaningless by its own lights — at the Prague World Congress of Philosophy in 1934.⁴⁷ When one looks more closely, however, one sees that there are a number of respects in which Schlick and his circle were influenced by Husserl's phenomenology, even if only in the sense that, as in the case of the Gestaltist movement, phenomenology provided a substantive and influential group of problems

which the positivists felt called upon to solve (or at least to do away with, by whatever means).

As has often been noted, the very project of phenomenology — the project of basing philosophy on a painstakingly adequate description of what is given in experience precisely as it is given — can be regarded simply as a more comprehensive and radical version of phenomenalism in the traditional sense, so that Hermann Lübbe, for example, finds no difficulty in asserting that 'Ernst Mach and other critical empiricists, regardless of their "positivism", belong in the tradition of phenomenology'.⁴⁸ The two strands of Austrian positivist philosophy were indeed at one stage so closely intertwined that Husserl could be considered as a potential successor to Mach in the chair in Vienna.⁴⁹ Guido Küng, more recently, has defended the view that there are quite specific parallels between Husserlian phenomenology and the project of 'explication' that is defended by Carnap in his *The Logical Structure of the World*. A view of this sort was indeed advanced already in 1932 by Ernst Polak, a student of Schlick in Vienna, in a clearly Wittgenstein-inspired dissertation entitled *Critique of Phenomenology by Means of Logic*. The sense of phenomenology, according to Polak, 'is logic (grammar in the most general sense), clarification of what we mean when we speak; its results are tautologies; its findings not statements, but explications' (1932, p.157).

As is seen from Wittgenstein's own repeated employment of the terminology of 'phenomenology', particularly around 1929, it is primarily in regard to the problem of the synthetic *a priori*, of an 'intermediary between logic and physics', that Husserl's thinking is crucial to the development of Austrian positivism. Husserl's account of the synthetic *a priori* is indeed no less important to the Vienna circle than that of Kant,⁵⁰ for where Kant sees the realm of the synthetic *a priori* as residing in the relatively restricted and practically inaccessible sphere of transcendental consciousness, Husserl claims that there is a directly accessible *a priori* dimension in the entire range of everyday experience — so that vastly more propositions turn out to be synthetic and *a priori* on Husserl's view than on that of Kant, including such homely examples as 'nothing can be both red and green all over' to which the logical positivists devoted a great deal of their attentions.⁵¹ From the standpoint of the positivists, of course, synthetic *a priori* propositions do not and

cannot exist: all true propositions are either tautologies of logic or contingent truths relating to matters of fact. From the Husserlian perspective, in contrast, there are entire disciplines of synthetic *a priori* truths, including the discipline of phenomenology — and it is fascinating to observe the extent to which the positivists are driven to unsupported claims as to the 'logical' character of Husserl's theses in the face of the quite evidently extra-logical or 'material' character of his examples.

Brentano and scientific philosophy

Our conclusion, then, is that European logical positivism is a part of the exact philosophical heritage of Brentano. More specifically, it is a reflection of the interplay of the intellectual and institutional influence of Brentano and his school with developments in logic and in the philosophy of physics inspired by Russell and Wittgenstein and by Mach and his successors in Vienna and Prague.

What, precisely, are the implications of a view of this sort? It suggests first of all — as I hope has become clear from the foregoing — that one needs to look again, and more closely, at the relationship between logical positivism on the one hand and Gestalt theory and phenomenology on the other. But still more importantly it suggests that there may be benefits to be gained from the examination of Brentano's own conception of philosophy and of its relations to the different sciences.

Brentano is, clearly, a somewhat paradoxical figure. We have already referred above to Kurt Lewin's paper on the transition from 'Aristotelian' to 'Galilean' modes of thought in modern science. This paper is an echo of a much earlier piece by Brentano entitled 'Auguste Comte and the Positive Philosophy',⁵² in which Brentano expounds Comte's doctrine of the 'phases' of philosophical development from the fictive and anthropomorphic thinking of theological and metaphysical philosophy to the scientific thinking of that modern 'positive' philosophy which seeks to establish the 'general laws governing the connections between facts'. Brentano had already three years earlier set forth the fundamental elements of this scientific mode of philosophising — very much in the spirit of Comte — in the twenty-five 'Habilitation Theses' which he defended in Würzburg in 1866. The

most influential of these theses, which was chosen by Richard von Mises as a motto for his textbook on positivism, reads as follows: 'Vera philosophiae methodus nulla alia nisi scientiae naturalis est.' (The true method of philosophy is none other than that of the natural sciences.)⁵³ Brentano held indeed that the method of the natural sciences is common to all the sciences, so that he is, in this respect at least, an advocate of the unity of science. Thus also he is critical of the view of the German philosopher Wilhelm Dilthey according to which the so-called *Geisteswissenschaften* or human or moral sciences would somehow call for a special method of understanding or *Verstehen*, as opposed to the 'explanation' of the natural sciences.

The first of Brentano's theses is a repudiation of (German) metaphysics as a whole:

Philosophia neget oportet, scientias in speculativas et exactas dividi posse; quod si non recte negaretur, esse eam ipsam jus non esset (Philosophy must protest against the division of the sciences into the speculative and the exact, and the justification of this protest is what justifies its own existence),

a view which sits neatly — and bravely — alongside the second thesis:

Philosophia et eos, qui eam principia sua a Theologia sumere volunt, et eos rejicere debet, qui, nisi sit supernaturalis revelatio, eam omnem operam perdere contendunt. (Philosophy must protest against the presumption of taking its principles from theology and against the assertion that it is only through the existence of a supernatural revelation that a fruitful philosophy becomes possible.)

Brentano in fact went so far as to protest against the view that universities should contain faculties of theology, precisely because theology cannot live up to the standards of science proper.

What, then, were these standards? Briefly, we can say that Brentano was an empiricist in the Aristotelian sense. The thirteenth of his theses reads: 'Nihil est in intellectu, quod non prius fuerit in sensu, nisi intellectus ipse.' (Nothing is in the

intellect which was not previously in the senses, except the intellect itself.)⁵⁴ It is in this sense that we are to understand the title of Brentano's masterpiece, the *Psychology from an Empirical Standpoint* of 1874. Brentano took empiricism to imply that there are in fact two sources of knowledge: what is given in intuition, i.e. in outer and inner perception, and what is given through the logical analysis of concepts. Most importantly, however, he differed from empiricists such as Hume or Mach, in his belief that truly scientific knowledge, a knowledge of *general laws*, is possible on these two pillars as basis.

Scientific induction is understood by Brentano as the process of establishing general laws starting from the observation of particular facts — as opposed to that other kind of induction which attempts to use given particular facts merely as a starting point for predicting other particular facts. Scientific induction is therefore not, as it was for Hume and Mach, a matter of habit. The intuition of lines and points, and of ourselves as intuiters of lines and points, gives us knowledge of the concepts of geometry. The combination of this intuition with processes of deductive reasoning may then lead to evident, insightful laws in the geometrical sphere. And this same combination of intuition and deduction can be employed to yield the basic concepts and associated evident laws also in other spheres of scientific investigation. But it is necessary to start in each case with a mode of intuitive knowledge that is precisely appropriate to the relevant objects of investigation, just as they are given in experience. Brentano is accordingly opposed, in his understanding of the properly scientific method, to the attitude of reductionism so characteristic of the later positivist proponents of physicalism and related doctrines.

One might, now, be tempted to suppose that Brentano's talk of 'intuition', 'evidence' or 'insightfulness' is entirely alien to the tradition of Viennese positivism. Many of the positivists' critical writings are indeed devoted to the attempted refutation of claims made on behalf of intuition as a means of gaining knowledge in favour of the (public, scientific, repeatable) 'observation' for which the positivists themselves had opted. Schlick, too, in chapter two of his *General Theory of Knowledge*, criticises what he takes to be Brentano's (and Stumpf's and Husserl's) views concerning intuition and evidence. If, however, one looks more closely at Schlick's own theory of

'observation statements', one discovers that he has himself presupposed precisely the views that he had earlier criticised.⁵⁵

For Schlick, in contrast to a relativist such as Neurath, believes that there are foundations for knowledge, that is, that there are statements which are self-evident, i.e. not such as to derive their evidence from some other sphere. The process of understanding such statements is therefore 'at the same time the process of verifying them; I grasp their meaning at the same time as I grasp their truth'.⁵⁶ Such observation statements are therefore like simple tautologies in that our knowledge of their truth is immediate, so that there is no room for our being deceived. But they differ from tautologies in that they supply us with 'genuine knowledge of reality'.

Schlick's own preferred example of an observation statement is '[There is] yellow here now'. As Chisholm points out however, if this statement is to be immune to deception then it can involve no reference to any external yellow sensum, but must involve reference only to our own present way of experiencing, so that it might best be rendered 'I am-appeared-to-yellowly'. But now, as Chisholm shows, this is to imply that Schlick's observation statements belong to the class of statements expressing experiences which are immediately evident in precisely the Brentanian sense.

The Brentanian method of intuition and deduction is, be it noted, prior to experimentation in the familiar sense. Brentano held that, while experimentation may occasionally lead to new or more adequate intuitions, it must none the less be the case that a properly experimental science can arise only when its basic concepts and laws have been established by intuition and deduction in the way suggested. For the experimental scientist who has not first established the nature of the entities with which he deals is in a certain sense experimenting in the dark. Measurement for measurement's sake and the blind formulation of purely functional correlations may, by accident, lead to predictions of future particular facts. But it cannot lead to the kind of deductive luminosity which, as Brentano insisted, is the hallmark of a scientific law in the fullest sense.

There is of course much in the above brief statement of Brentano's position that is in need of further clarification. What has been said should however suffice to establish one central feature of Brentano's thinking, namely his high

estimation of the importance and of the powers of science — to the extent that he saw science as embracing philosophy itself as a proper part. And it is perhaps this vision of the great unitary edifice of science which did most to colour the thought of his Austrian successors.

Notes

1. I should like to thank Heiner Rutte, Karl Schuhmann, Peter Simons, Jan Woleński and also the editor for helpful comments on an earlier version of this paper.

2. While Vienna and Budapest were the twin *Imperial-and-Royal* (*k.u.k.*) capitals of the Habsburg Empire as a whole, the ruler of the non-Hungarian *Imperial-Royal* (*k.k.*) part of the Empire was at one and the same time Emperor of Austria and King of Bohemia.

3. These were often dedicated to no one single area of interest, reflecting the unofficial interdisciplinary ethos of Austrian university education in the period in question (See Smith 1981 for some indications of the workings of this ethos in the specific case of Kafka.)

4. See, again, Smith 1981, which also contains some discussion of the ways in which Brentanian ideas may have influenced Kafka's writings.

5. See Haller and Rutte, 1977, p. 25.

6. Another native Austrian who deserves mention in this connection might be Edmund Husserl, author *inter alia* of important early works in the philosophy of logic and language. One might mention also Hayek, himself a distant cousin of Wittgenstein, who was the author not only of now familiar works in political economy but also of a Mach-inspired treatise on the foundations of psychology (1952a: the initial draft dates from around 1920), as also of a work in the history and philosophy of the social sciences (1952b). Or one might mention the Hungarian philosopher and social theorist Karl Mannheim, regarded by many as the initiator of the so-called 'sociology of knowledge'.

7. For a bibliography of Fleck's writings see Schnelle, 1982.

8. This thesis can be extended, with a pinch of salt, even to the case of Frege, whose importance for logic was in no small part established through the mediation of Wittgenstein (as also, of course, through the work of Russell, Carnap, and others). The thesis applies also to the case of Hermann Weyl, whose philosophy of science was strongly influenced by the work of Husserl, and Reichenbach, too, was a student of Husserl in the period 1914–15. The thinking of other German philosophers in the area of the philosophy of science, for example that of Wilhelm Ostwald or of Natorp, Rickert and the lesser Neo-Kantians, has, in contrast, been rightly forgotten.

9. A complete list of the publications of the circle is given in Soulez, pp. 346f, which also contains other useful supplementary material on

the wider Austrian background of the Vienna positivists.

10. J. C. Nyiri has indeed argued that there is a conservative and traditionalist current running through the whole of Austrian philosophy of science. See his 1986.

11. See Neurath, 1973, esp. chs.5, 8 and 11.

12. On Schlick's political opinions see, again, the interview with Heinrich Neider:

Schlick was a man who had no sympathy at all for politics and the state; he was a liberal in the old sense, for whom the fire brigade and the police were admitted as at best a necessary evil. Otherwise one did not need the state at all. (Haller and Rutte, 1977, p. 24)

13. See especially his just-mentioned essay of 1986, by which the present paper has been heavily influenced.

14. Nyiri, 1986, p. 143.

15. See Haller, 1986, and the references there given.

16. Weiler, 1986, is a strong statement of this thesis, and of its implications for an understanding of the peculiarities of Austrian philosophy. For criticisms of the thesis see Grassl and Smith, 1986.

17. K. L. Reinhold, on the other hand, was an Austrian renegade metaphysician who fled Vienna for Weimar. (What is said in the text should not, of course, be taken to imply that there is a complete absence of metaphysical system-building in Austria (or indeed in England and Scotland): system-builders of the worst and most unreadable kind have indeed come to dominate in the University of Vienna itself in recent decades.)

18. See Grassl, 1986, for further references.

19. Neurath, 1973, p. 303. A comprehensive discussion of this aspect of the development of positivism in Austria is provided by Stadler, 1982, which deals also with the social and political attitudes of Mach.

20. Menger's 'exact method' in economics in fact manifests a number of parallels to the method of Franz Brentano in philosophy, and there were considerable reciprocal influences between the Menger circle on the one hand and the Brentano school on the other. See the papers collected in Grassl and Smith (eds.), 1986.

21. The volume in question is a collection of Mill's writings on female emancipation, socialism and Plato. It is worth mentioning here also that Brentano was no less responsible than Mach for the strong reception of the ideas of the British empiricists in Austria. This is seen for example in his own work on Reid, and on the psychology of Hamilton and the Mills, Bain and Spencer; and it is seen also in the work of Meinong on Hume or in the work of Husserl on Locke and Berkeley.

22. The Philosophical Society published also Höfler's *Prefaces and Introductions to Classical Works on Mechanics* (1899), as well as works of Bolzano (edited by Höfler in 1914 and by Hahn in 1921).

23. See especially section 3 of Carnap, 1928.

24. More than 100 pages of his *On Knowledge* (1925) are devoted to

a critique of Kant entitled 'Down With Prejudices! A Warning to the Present in the Spirit of Bacon and Descartes to Free Itself from All Blind *A Priori*'.

25. Compare also Rutte, 1977, and Bergmann, 1967, esp. pp. 4ff.

26. Collected as Haller, 1979; see also his 1981 and the (in many respects definitive) essay of 1986.

27. Further details of Brentano's life are given in ch.1 of Rancurello, 1968.

28. It is for this reason that it is preferable to speak not of 'Brentanian philosophy' but of 'Brentano-inspired philosophy' or of the 'descendants' and 'heirs' of Brentano.

29. Twardowski's move to Lemberg is significant: in Lemberg, 'as in Cracow, under liberal Austrian rule, Poles were allowed to go to their own universities and to be taught by their own lecturers and professors, while in other parts of partitioned Poland they were engaged in a most savage struggle for national and economic survival' (Jordan, 1945, p. 39: this passage not included in the reprint). On Twardowski's thought and influence, especially in the field of logic, see Damska, 1978.

30. Fleck's relations to Polish Brentanism have recently been made the object of a special study by Thomas Schnelle, 1982.

31. Ajdukiewicz studied with Husserl in Göttingen from 1912 to 1914.

32. Carnap, 1963, p. 31.

33. On the early history and philosophy of Gestalt psychology, see Smith (ed.), 1987.

34. See Smith 1984 and also the papers collected in Mulligan (ed.), forthcoming.

35. The two were colleagues in Berlin and retained their contacts when both had emigrated to America. See the chapter 'Albert Einstein and Max Wertheimer: A Gestalt Psychologist's View of the Genesis of the Special Relativity Theory' in Miller, 1984. All four of the Berlin Gestalt psychologists — Wertheimer, Köhler, Koffka and Lewin — had an interest in physics.

36. Bergmann, 1929, p. 395 of translation.

37. See Ash, 1982, pp. 30–62 for an extensive treatment of this matter, and of the political machinations in favour of the new 'scientific philosophy' which led to Stumpf's appointment in Berlin.

38. See Schlick, 1925, pp. 23, 154, 157, 373 of the translation.

39. See Musil, 1908; the work is highly critical of Mach in particular and of positivistic philosophy of science in general, so that it would be wrong to describe Musil himself as an advocate of positivist ideas: see Mulligan and Smith, 1987.

40. Carnap, 1963, pp. 14, 30.

41. Thus Koffka could write at the close of his *Principles of Gestalt Psychology*:

If there is any polemical spirit in this book, it is directed not against persons but against a strong cultural force in our present civilisation for which I have chosen the name positivism. If positivism

can be regarded as an integrative philosophy, its integration rests on the dogma that all events are equally unintelligible, irrational, meaningless, purely factual. Such an integration is, however, to my way of thinking, identical with a complete disintegration. (Koffka, 1935, pp. 684f)

42. See Carnap, 1963, p. 16, and compare his 1928, pp. 109, 122 of the translation.

43. A similar thesis as to the compatibility of positivism and Gestalt theory was defended also by R. von Mises, 1939, ch.22. The Gestalt problem played an important role in the thinking of Gustav Bergmann, as also in the work of Eino Kaila (see his 1979), a Finnish thinker who is one of the four foreign philosophers (neither Austrian nor German) mentioned in the Appendix to the *Wissenschaftliche Weltauffassung* as 'sympathetic to the Vienna circle' or to the 'scientific world-conception'.

44. The remaining two papers — 'Logical Analysis of "Gestalt" as "Functional Whole"', and 'A Logical Theory of Dependence' were scheduled to appear in volume 9 of *Erkenntnis* in 1939, an issue not distributed due to war conditions. These two papers, together with an English translation of the earlier work and a commentary by P. M. Simons, have now been published in Smith (ed.), 1987.

45. Grelling and Oppenheim, 1938, p. 211.

46. This point of view is belied, at least to some extent, by the fact that Carnap, having earlier studied under Frege in Jena, participated for a term in Husserl's seminar in Freiburg, before going to Vienna in 1925 at the suggestion of Schlick. He was later invited by Frank to come to Prague, where he held a chair in 'natural philosophy' for four years from 1931.

47. See Ingarden, 1936.

48. Lübke, 1960, p. 91 of translation. The affinities between Machian positivism and early phenomenology are illustrated clearly by the case of Alexander Pfänder, senior member of the Munich school of phenomenologists, whose early thinking is heavily influenced by that of Mach.

49. Sommer, 1985, p. 13.

50. On Wittgenstein and phenomenology in general, see Spiegelberg, 1968. On positivism, Husserl and the *a priori*, see Delius, 1963, ch.1, and also Visser, 1979. Smith, 1986, contains a more detailed elaboration of the early Husserlian notion of the *a priori*.

51. Such examples were drawn, too, from the domain of economics, as is shown above all by the writings on economic methodology of Felix Kaufmann (for example his 1937). Kaufmann, a devotee of Husserl who belonged to the fringes of both the Schlick and Mises circles, published not only on the foundations of economics and on the philosophy of law and mathematics, but also on the foundations of science in general.

52. See Brentano, 1869. Brentano's piece itself echoes J. S. Mill's *Auguste Comte and Positivism* of 1865, and Brentano laments at the beginning of the work the extent to which the new ideas of positive

philosophy developed in France and England had remained almost unnoticed by his German contemporaries.

53. This is thesis IV. See Brentano, 1929, pp. 137ff.

54. The caveat 'nisi intellectus ipse' was added by Leibniz.

55. My present remarks are indebted to Chisholm's important study of Schlick and Brentano, published in 1982.

56. Schlick, 1934, trans. p. 385; quoted by Chisholm, 1982, p. 152.

References

- Ash, M. G. (1982) *The Emergence of Gestalt Theory: Experimental Psychology in Germany, 1890–1920*, Dissertation, University of Harvard.
- Ayer, A. J. (1936) *Language, Truth and Logic*, Gollancz, London.
- (1977) *Part of my Life*, Collins, London.
- Berghel, H., et al. (eds.) (1979) *Wittgenstein, the Vienna Circle and Critical Rationalism*, Hölder-Pichler-Tempsky, Vienna.
- Bergmann, G. (1967) 'Logical Positivism', as repr. in *The Metaphysics of Logical Positivism*, University of Wisconsin Press, Madison and London, pp. 1–16.
- Bergmann, H. (1929) *Der Kampf um das Kausalitätsgesetz in der jüngsten Physik*, Vieweg, Braunschweig; Eng. trans. as 'The Controversy concerning the Law of Causality in Contemporary Physics', in Cohen and Wartofsky (eds.), 1974, pp. 395–462.
- (1974) 'Personal Remembrances of Albert Einstein', in Cohen and Wartofsky (eds.), 1974, pp. 388–94.
- Brentano, F. (1869) 'Auguste Comte und die positive Philosophie', *Chilianeum. Blätter für katholische Wissenschaft, Kunst und Leben, N.F.*, 2, 15–37. Repr. in Brentano, *Die vier Phasen der Philosophie*, Meiner, Hamburg, 1968, pp. 99–133.
- (1874) *Psychologie vom empirischen Standpunkt*, Duncker, Leipzig. Eng. trans. by A. C. Rancurello, D. B. Terrell and L. L. McAlister as *Psychology from an Empirical Viewpoint*, Routledge and Kegan Paul, London, 1973.
- (1925) *Versuch über die Erkenntnis*, Meiner, Leipzig.
- (1929) *Über die Zukunft der Philosophie*, Meiner, Leipzig.
- Carnap, R. (1928) *Der logische Aufbau der Welt*, Weltkreis, Berlin; Eng. trans. by Rolf George, *The Logical Structure of the World*, Routledge and Kegan Paul, London, 1967.
- (1963) 'Intellectual Autobiography', in P. A. Schilpp (ed.), *The Philosophy of Rudolf Carnap*, Open Court, La Salle, pp. 3–43.
- Chisholm, R. M. (1982) 'Schlick on the Foundations of Knowing', in R. Haller (ed.), *Schlick und Neurath — Ein Symposium (Grazer Philosophische Studien, 16/17)*, Rodopi, Amsterdam, 1982, 149–58.
- Cohen, R. S. and Wartofsky, M. W. (eds.) (1974) *Logical and Epistemological Studies in Contemporary Physics*, Reidel, Dordrecht/Boston.
- Dambaska, I. (1978) 'François Brentano et la Pensée philosophique en Pologne: Casimir Twardowski et son Ecole', in Chisholm and

- Haller (eds.), *Die Philosophie Franz Brentanos (Grazer Philosophische Studien, 5)*, Rodopi, Amsterdam, 117–30.
- Delius, H. (1963) *Untersuchungen zur Problematik der sogenannten synthetischen Sätze apriori*, Vandenhoeck und Ruprecht, Göttingen.
- Fleck, L. (1935) *Entstehung und Entwicklung einer wissenschaftlichen Tatsache. Einführung in die Lehre vom Denkstil und Denkkollektiv*, Schwabe, Basel; Eng. trans. by T. J. Trenn and R. K. Merton, *Genesis and Development of a Scientific Fact*, University of Chicago Press, Chicago and London.
- Grassl, W. (1986) 'Markets and Morality: Austrian Perspectives on the Economic Approach to Human Behaviour', in Grassl and Smith (eds.), pp. 139–81.
- Grassl, W. and Smith, B. (1986) 'A Theory of Austria', in Nyíri (ed.), pp. 11–30.
- Grassl, W. and Smith, B. (eds.) (1986) *Austrian Economics: Historical and Philosophical Background*, Croom Helm, London and Sydney.
- Grelling, K. and Oppenheim, P. (1937/8) 'Der Gestaltbegriff im Lichte der neuen Logik', *Erkenntnis*, 7, 211–25; Eng. trans. by P. M. Simons as 'The Concept of Gestalt in the Light of Modern Logic', in Smith (ed.), 1987.
- Haller, R. (1979) *Studien zur österreichischen Philosophie*, Rodopi, Amsterdam.
- (1981) 'Wittgenstein and Austrian Philosophy', in Nyíri (ed.), pp. 91–112.
- (1986) 'Zur Historiographie der österreichischen Philosophie', in Nyíri (ed.), 41–53.
- Haller, R. and Rutte, H. (1977) 'Gespräch mit Heinrich Neider: Persönliche Erinnerungen an den Wiener Kreis', *Conceptus*, 1, 21–42.
- Hayek, F. A. von (1952a) *The Sensory Order. An Inquiry into the Foundations of Theoretical Psychology*, Routledge and Kegan Paul, London.
- (1952b) *The Counter-Revolution of Science: Studies on the Abuse of Reason*, Free Press, Glencoe.
- (1966) 'Diskussionsbemerkungen über Ernst Mach und das sozialwissenschaftliche Denken in Wien', in *Symposium aus Anlass des 50. Todestages von Ernst Mach*, Ernst-Mach-Institut, Freiburg i.Br., pp. 41–4.
- Hempel, C. G. and Oppenheim, P. (1936) *Der Typusbegriff im Lichte der neuen Logik*, A. W. Sijthoff's Uitgeversmij, Leiden.
- Ingarden, R. (1936) 'Der logistische Versuch einer Neugestaltung der Philosophie', *Actes du VIII-ième Congrès international de Philosophie à Prague 1934*, Comité d'Organisation de Congrès, Prague, pp. 203–8.
- Jordan, Z. (1945) *The Development of Mathematical Logic and of Logical Positivism in Poland between the Two Wars*, Oxford University Press (*Polish Science and Learning*, no. 6), Oxford; partially reprinted in S. McCall (ed.), *Polish Logic 1920–1939*, Clarendon Press, Oxford, 1967, pp. 346–97.
- Kaila, E. (1979) *Reality and Experience. Four Philosophical Essays*, ed. by R. S. Cohen, Reidel, Dordrecht/Boston/London.

- Kaufmann, F. (1937) 'Do synthetic propositions a priori exist in economics?', *Economica*, N.S.4, 337–42.
- Koffka, K. (1935) *Principles of Gestalt Psychology*, Kegan Paul, Trench and Trubner, London.
- Köhler, W. (1920) *Die physischen Gestalten in Ruhe und im stationären Zustand. Eine naturphilosophische Untersuchung*, Vieweg, Braunschweig.
- Küng, G. (1975) 'The Phenomenological Reduction as *Epoché* and as Explication', *The Monist*, 59, 63–80.
- Lübbe, H. (1960) 'Positivismus und Phänomenologie. Mach und Husserl', in H. Höfling (ed.), *Beiträge zur Philosophie und Wissenschaft. Wilhelm Szilasi zum 70. Geburtstag*, Francke, Munich, pp. 161–84; Eng. trans. in T. Luckmann (ed.), *Phenomenology and Sociology*, Penguin, Harmondsworth, 1978, pp. 90–118.
- Miller, A. I. (1984) *Imagery in Scientific Thought: Creating 20th-Century Physics*, Birkhauser, Boston/Basel/Stuttgart.
- Mises, R. von (1939) *Kleines Lehrbuch des Positivismus*, Von Stockum and Son, The Hague; Eng. version trans. by R. G. Newton and J. Bernstein as *Positivism: A Study in Human Understanding*, Harvard University Press, Harvard, 1951.
- Mulligan, K. (1986) 'Exactness, Description and Vagueness: How Austrian Analytic Philosophy was done', in Nyíri (ed.), 86–97.
- Mulligan, K. (ed.) (forthcoming) *Mind, Meaning and Metaphysics. The Philosophy and Theory of Language of Anton Marty*, Nijhoff, Dordrecht.
- Mulligan, K. and Smith, B. (1987) 'Mach and Ehrenfels: Foundations of Gestalt Theory', in Smith (ed.).
- Musil, R. (1908) *Beitrag zur Beurteilung der Lehren Machs*, Dissertationsverlag Carl Arnold, Berlin; Eng. trans. by K. Mulligan with an Introduction by G. H. von Wright, *On Mach's Theories*, Philosophia, Munich and Vienna, 1982.
- Neurath, O. (with R. Carnap and H. Hahn) (1929) *Wissenschaftliche Weltauffassung: Der Wiener Kreis*, Wolf, Vienna; Eng. trans. as 'The Scientific Conception of the World: The Vienna Circle', in Neurath, 1973, pp. 299–318. The translation lacks the biographical supplement: see Soulez (ed.), pp. 105ff.
- Neurath, O. (1973) *Empiricism and Sociology*, ed. by M. Neurath and R. S. Cohen, Reidel, Dordrecht.
- Nyíri, J. C. (1986) 'The Austrian Element in the Philosophy of Science', in Nyíri (ed.), pp. 141–6.
- (ed.) (1981) *Austrian Philosophy: Studies and Texts*, Philosophia, Munich.
- (1986) *From Bolzano to Wittgenstein: The Tradition of Austrian Philosophy*, Hölder-Pichler-Tempsky, Vienna.
- Polak, E. (1932) *Kritik der Phänomenologie durch die Logik*, Dissertation, University of Vienna.
- Rancurello, A. C. (1968) *A Study of Franz Brentano. His Psychological Standpoint and His Significance in the History of Psychology*, Academic Press, New York and London.
- Rutte, H. (1977) 'Positivistische Philosophie in Österreich. Nachwort

- zum Gespräch mit Heinrich Neider', *Conceptus*, 1, 43–56.
- Schlick, M. (1910) 'Die Grenze der naturwissenschaftlichen und philosophischen Begriffsbildung', *Vierteljahrsschrift für wissenschaftliche Philosophie und Soziologie*, 34, 121–42; Eng. trans. in Schlick, 1979, vol.1, pp. 25–40.
- (1925) *Allgemeine Erkenntnislehre*, 2nd edn, Springer, Berlin; Eng. trans. by A. E. Blumberg as *General Theory of Knowledge*, Springer, Vienna/New York, 1974.
- (1934) 'Über das Fundament der Erkenntnis', *Erkenntnis*, 4, 79–99; Eng. trans. in Schlick, 1979, vol.2, pp. 370–87.
- (1979) *Philosophical Papers*, vol.1 (1909–1922) and vol.2 (1925–36), ed. by H. L. Mulder and B. F. B. van de Velde-Schlick, Reidel, Dordrecht/Boston/London.
- Schnelle, T. (1982) *Ludwik Fleck — Leben und Denken. Zur Entstehung und Entwicklung des soziologischen Denkstils in der Wissenschaftsphilosophie*, Hochschulverlag, Freiburg.
- Smith, B. (1981) 'Kafka and Brentano: A Study in Descriptive Psychology', in Smith (ed.), *Structure and Gestalt. Philosophy and Literature in Austria-Hungary and Her Successor States*, John Benjamins, Amsterdam, pp. 113–61.
- (1984) 'Ten Conditions on a Theory of Speech Acts', *Theoretical Linguistics*, 11, 311–30.
- (1986) 'Austrian Economics and Austrian Philosophy', in Grassl and Smith (eds.), pp. 1–36.
- (1987) 'Gestalt Theory: An Essay in Philosophy', in Smith (ed.).
- Smith, B. (ed.) (1987) *Foundations of Gestalt Theory*, Philosophia, Munich and Vienna.
- Sommer, M. (1985) *Husserl und der frühe Positivismus*, Klostermann, Frankfurt.
- Soulez, A. (ed.) (1985) *Manifeste du Cercle de Vienne et autres écrits*, P.U.F., Paris.
- Spiegelberg, H. (1968) 'The puzzle of Ludwig Wittgenstein's *Phänomenologie* (1929–?)', *American Philosophical Quarterly*, 5, 244–56, with supplement in *Journal of the British Society for Phenomenology*, 13, (1982), 296–99.
- Stadler, F. (1979) 'Aspekte des gesellschaftlichen Hintergrunds und Standorts des Wiener Kreises am Beispiel der Universität Wien', in Berghel *et al.* (eds.), pp. 41–59.
- (1982) *Vom Positivismus zur 'Wissenschaftlichen Weltauffassung'. Am Beispiel der Wirkungsgeschichte von Ernst Mach in Österreich von 1895 bis 1934*, Löcker, Vienna and Munich.
- Visser, H. (1979) 'The Empiricists' New Clothes: A Viennese Fairy Tale by Hans Hans', in Berghel *et al.* (eds.), pp. 225–30.
- Weiler, G. (1986) 'What is Austrian about Austrian Philosophy?', in Nyiri (ed.), pp. 31–40

3

Ayer and the Philosophy of Science

Mary Hesse

Positivism and scientific meaning

Positivism is a recurrent phenomenon in the history of science, but less so in the history of philosophy, where it quickly develops from the search for a firm grounding for knowledge to a scepticism about all knowledge, and thence to the revival of metaphysics in one form or another. This philosophical progression can be seen in the way logical positivism in the philosophy of science has developed in the last fifty years into a philosophical reaction back to all kinds of metaphysics: about realism, about natural kinds, about causes, about laws and necessity.

During that time, Professor Ayer has been properly critical of the more extravagant metaphysical fashions. While modifying several of his radical theses in *Language, Truth and Logic*, he has remained reasonable, clear and full of good sense in his subsequent discussions of problems in philosophy of science. His problems have been technical philosopher's problems rather than those of science itself. In the last sentence of *LTL* he says that the philosopher 'must become a scientist' in 'deploying the logical relationships of these hypotheses and defining the symbols which occur in them . . . if he is to make any substantial contribution towards the growth of human knowledge'.¹ Later, however, he has come to treat philosophical problems as independent of those of the special sciences.

In this paper I shall therefore talk as much about *LTL* and its structure and influence as about its author's later work in philosophy of science. But first let me say something about the