

London studies in the history of philosophy

Series editors: Tim Crane, Thomas Pink, M. W. F. Stone
and Jonathan Wolff.

London Studies in the History of Philosophy is a unique series of tightly-focused edited collections. Bringing together the work of many scholars, some volumes will trace the history of formulations and treatment of a particular problem of philosophy from the Ancient Greeks to the present day, while others will provide an in-depth analysis of a period or tradition of thought. The series is produced in collaboration with the Philosophy Programme of the University of London School of Advanced Study.

1 Humanism and Early Modern Philosophy

Edited by Jill Kraye and M. W. F. Stone

2 The Proper Ambition of Science

Edited by M. W. F. Stone and Jonathan Wolff

The Proper Ambition of Science

*Edited by M. W. F. Stone and
Jonathan Wolff*



London and New York

First published 2000 by Routledge
11 New Fetter Lane, London EC4P 4EE

Simultaneously published in the USA and Canada
by Routledge
29 West 35th Street, New York, NY 10001

Routledge is an imprint of the Taylor & Francis Group

© 2000 selection and editorial matter, M. W. F. Stone and Jonathan Wolff;
individual chapters, respective contributors

Typeset in Times by Curran Publishing Services Ltd.
Printed and bound in Great Britain by
St Edmundsbury Press, Bury St Edmunds, Suffolk.

All rights reserved. No part of this book may be reprinted or reproduced
or utilised in any form or by any electronic, mechanical, or other means,
now known or hereafter invented, including photocopying and recording,
or in any information storage or retrieval system, without permission in
writing from the publishers.

British Library Cataloguing in Publication Data
A catalogue record for this book is available
from the British Library

Library of Congress Cataloging-in-Publication Data
The proper ambition of science/edited by M. W. F. Stone and Jonathan
Wolff.

240 pp. 13.8 x 21.6 cm (London studies in the history of philosophy: 2)
I. Science – Philosophy. II. Science and civilization. I. Stone, M. W. F.
(Martin William Francis) 1965–. II. Wolff, Jonathan. III. Series.
Q175.3.P786 2000
501–dc21

99 39024
CIP

ISBN 0-415-18617-X

Contents

<i>List of contributors</i>	vii
1 Introduction	1
JONATHAN WOLFF	
2 Science, philosophy and human life in the Ancient World	7
R. W. SHARPLES	
3 Theology, philosophy and ‘science’ in the thirteenth century: the case of Albert the Great	28
M. W. F. STONE	
4 The seventeenth century and the reconstruction of knowledge	56
G. A. J. ROGERS	
5 The end of hierarchy: physics and metaphysics in the scientific revolution	76
J. R. MILTON	
6 Science in the service of life: Nietzsche’s objectivism	91
AARON RIDLEY	
7 Pragmatism: commonsense and the limits of science	103
CHRISTOPHER HOOKWAY	

vi	<i>Contents</i>	
8	Husserl and the crisis of the European sciences DERMOT MORAN	122
9	Some scientism, some historicism, some critics: Hayek's and Popper's critiques revisited THOMAS E. UEBEL	151
10	The rise of physicalism DAVID PAPINEAU	174
11	Against the completability of science NANCY CARTWRIGHT	209
	<i>Index</i>	223

Contributors

Nancy Cartwright is Professor in the Department of Philosophy, Logic and Scientific Method at the London School of Economics (part-time), Professor of Philosophy at the University of California at San Diego, and Director of the LSE's Centre for Philosophy of Natural and Social Science. Her books include *How the Laws of Physics Lie* (1983), *Nature's Capacities and Their Measurement* (1989), *Otto Neurath: Philosophy Between Science and Politics*, with Thomas Uebel *et al.* (1996) and *The Dappled World: A Study of the Boundaries of Science* (1999).

Christopher Hookway is Professor of Philosophy at the University of Sheffield, having previously taught at the University of Birmingham. His publications include *Peirce* (1985), *Quine: Language, Experience and Reality* (1988), *Scepticism* (1990) and *Truth, Rationality and Pragmatism: Themes from Peirce* (2000). He was President of the Peirce Society for 1995.

J. R. Milton is a senior lecturer in the Department of Philosophy, King's College London. He is interested in late medieval and early modern science and philosophy, and is currently working on a biography of John Locke.

Dermot Moran is Professor of Philosophy at University College Dublin. A graduate of University College Dublin and Yale University, he has taught at Yale University, Connecticut College, Queen's University of Belfast, and Maynooth College. He is the author of *The Philosophy of John Scottus Eriugena: A Study of Idealism in the Middle Ages* (1989) and other studies in medieval and contemporary European philosophy. He is currently Editor of the *International Journal of Philosophical Studies*.

David Papineau is Professor of Philosophy of Science at King's College London, having previously taught at Cambridge and Reading

8 Husserl and the crisis of the European sciences

Dermot Moran

In this essay I want to sketch Husserl's general philosophical concerns, focusing in particular on his contribution to the critical evaluation of the scientific enterprise. There is the widespread belief that the philosophical traditions in Continental Europe in the twentieth century have been broadly anti-scientific in orientation, and, therefore, it is assumed that Edmund Husserl (1859–1938), since he influenced such European philosophers as Gadamer, Heidegger, Marcuse, Horkheimer, Merleau-Ponty, Sartre, Levinas, Ricoeur, and Derrida, among others, must be an historical source of this anti-scientism.¹ On the other hand, Husserl was initially primarily known for his *Logical Investigations* (1900–1), which, in Germany, provided the deathblow to then current psychologistic interpretations of logic, Frege's own efforts in the same area being in obscurity at that time.² Students of the history of analytic philosophy recognise Husserl's refutation of logical psychologism and his strong defence of the ideal objectivity of propositional contents as on a par with the contribution of Frege in the clarification of the essential nature of logic. Moreover, Husserl belonged to the new wave of logicians at the end of the nineteenth century who fully acknowledged that logic was actually a part of mathematics.³ Thus Richard Rorty correctly links Husserl and Russell together as two paradigmatic figures seeking to recapture the mathematical spirit in philosophy (Rorty 1980: 166).⁴ But even those who acknowledge Husserl's historical contribution to modern logic hold that, in his later works, he failed to take advantage of the mathematical formalisation of logic in order to analyse the nature of language and thought, and, indeed, strongly opposed the growing technicisation (*Technisierung*) of the discipline of logic. Furthermore, Husserl's antipathy to psychologism and to reductive naturalism led him to question the impact of modern mathematical sciences on the human cultural world, so that, in his later work at least, he can be seen as inviting and encouraging the anti-scientism which has come to characterise recent Continental philosophy in general.

It is certainly true that, in his later writings, especially the *Crisis of European Sciences* (1936), Husserl proposed a radical rethinking of the manner scientific practice was distorting our normal engagement with the familiar 'life-world' (*Lebenswelt*). His aim was not to reject science in favour of the '*Schwärmerei*' of some kind of irrationalist existentialism, but rather to make the sciences more fully and self-consciously rational, to separate pure science from an ideologically distorted scientism. Husserl always opposed irrationalist *Lebensphilosophie* and, in opposition to the existential deformation of phenomenology proposed by Martin Heidegger, declared: 'For me, philosophy, as an idea, means universal, and in a radical sense, "rigorous", science' (Husserl 1989: 406, Hua V 139). Indeed, Husserl was driven to breaking his ties with his favoured successor, Martin Heidegger, after the publication of *Being and Time* (1927), precisely because the latter had misunderstood the scientific nature of Husserl's project and had reduced it to 'anthropology'.

Husserl's entire working life was a struggle to make sense of what *science* (*Wissenschaft*) means, both as a *practice* and as an *ideal*. For Husserl, science is an open field of 'infinite tasks' standing before us (Husserl 1970a: 279, Hua VI 324). But one must carefully distinguish between the motivating and guiding *ideal* of science and its various actual historical forms of practice. Even when he enigmatically declared in 1935 that for philosophy as science 'as serious, rigorous, indeed apodictically rigorous science – *the dream is over* (*der Traum ist ausgeträumt*),' this must be understood not as Husserl's abandonment of his ideal, but rather, as his recognition that the ideal itself now needed to be understood and located in history and its motivating force clarified, since it had been effectively abandoned by *Existenz* philosophers such as Jaspers and Heidegger (Husserl 1970a: 389, Hua VI 508). Husserl himself would have been shocked to be considered anti-scientific in his philosophical outlook, since, for him, science was the embodiment of rational practice and, as such, the only hope for the salvation of humanity.

Husserl's scientific formation

Husserl's own background was steeped in the sciences. While still a Gymnasium student at Olmütz and Vienna, Husserl displayed an aptitude for mathematics and expressed an interest in studying astronomy. At the University of Leipzig, he studied mathematics, physics and astronomy; before moving to Berlin, where he studied mathematics with some of the leading mathematicians of the day, including Leopold Kronecker (1823–1891) and Karl Weierstrass (1815–1897). It was Weierstrass who introduced Husserl to Bolzano's *Paradoxes of the Infinite*. Throughout his

life, Husserl constantly cited approvingly the formative influence of Weierstrass, and even remarked that he had intended to do for philosophy what Weierstrass had done for mathematics. In 1882 in Vienna, Husserl submitted his doctoral thesis on the calculus of variations, a branch of differential calculus, supervised by Leo Königsberger, another student of Weierstrass.

Soon after completing this doctorate, Husserl was converted from a career in mathematics to philosophy by the charismatic Franz Brentano, whose lectures he attended in Vienna from 1884 to 1886. Brentano's ideal of exact philosophy, philosophy as a rigorous science, strongly appealed to the young mathematician, who himself had become interested in foundational questions concerning mathematics and logic. Originally, Husserl was particularly drawn to Brentano's programme for the reform of Aristotelian syllogistic logic, but he was soon completely won over to Brentano's anti-speculative conception of philosophy including a strong preference for Hume and Berkeley over and against the 'mysticism' of the German Idealists (a preference which is still present in Husserl's *Crisis*). Brentano also greatly admired the positivists, especially Auguste Comte, and Husserl too closely followed the work of Ernst Mach and Avinarius, as well as Brentano's students Carl Stumpf, Ehrenfels and Anton Marty.⁴ Thus, the philosophical atmosphere Husserl encountered in Austria was strongly realist, with huge respect for the achievement of the positive sciences. The *Ernst Mach Verein*, and later the Vienna circle, also grew from the same philosophical sources. Indeed, the Manifesto of the Vienna Circle, in its section on historical influences, cites Brentano approvingly for his project of the reform of logic and his opposition to Neo-Kantian idealism. Having spent two years with Brentano, Husserl then moved to Halle to habilitate with Carl Stumpf who was intent on developing Brentano's descriptive psychology through careful analysis of sense perception and spatial awareness. With Stumpf, Husserl wrote his Habilitation thesis, *On the Concept of Number, Psychological Analyses*. Georg Cantor, the founder of set theory, was one of the examiners for this thesis.

During his *Privatdozent* years at Halle (1887 to 1901), while continuing to investigate the foundations of mathematics and logic, Husserl became personally close to Cantor, but also corresponded with prominent mathematicians and logicians, including Gottlob Frege.⁵ Indeed, Husserl was one of the few German philosophers at that time to acknowledge and critically discuss Frege's work on arithmetic. Later, from 1901 to 1916, as professor at Göttingen, a renowned centre of mathematics at that time, Husserl belonged to a group of distinguished researchers which included David Hilbert (1862–1943), Hilbert's assistant Richard Courant (1888–1972) and Felix Klein (1849–1925), and shared with them the view of the goal of

nomological science as universal formal axiomatisation.⁶ The historian of science, Alexandre Koyré, also studied with Husserl at that time, and may have later influenced Husserl's conception of modern science as a Galilean enterprise. Husserl made the acquaintance of many of the important scientists of his day, including the mathematician Brouwer and the physicist Hermann Weyl, and his Freiburg seminars drew such visitors as Rudolf Carnap (in 1924–5) and the logician William Kneale. Even though Husserl was preoccupied with developing his new science of phenomenology, throughout his entire career he continued to think critically about the nature of mathematics and geometry, as well as the origin of our spatial and temporal concepts. In his post-retirement years (1928–38), he revisited his original problematic concerning the nature of logic (e.g., *Formal and Transcendental Logic*, 1929), and, in the thirties, began a new exploration of the manner in which modern science, in carrying out the scientific programme first proposed by Galileo, idealised and objectified the world of nature and contributed to the divorce between science and the human life-world. There is a sense, then, in which Husserl's entire life's work can be seen as a meditation on science, and specifically on the nature of logic as providing the framework for science as such. Indeed, Husserl, following Bolzano, initially took logic to express the very essence of science, though he later came to see philosophy as fulfilling that role.

The ideal of scientific knowledge

For Husserl, the philosophical life, the life of contemplation, *theoria*, is the scientific life *par excellence*. Philosophy, therefore, is not only deeply and self-consciously scientific, but it is also the science which 'satisfies the loftiest theoretical needs and renders possible from an ethico-religious point of view a life regulated by purely rational norms' (Husserl 1965: 71, Hua XXV 30). Philosophy is 'humanity struggling to understand itself' (Husserl 1970a: § 5 p. 14, Hua VI 12), and science is the 'self-objectivation of human reason' (Husserl 1969 Intro p. 5, Hua XVII 4). Philosophy aims to 'elevate mankind through universal scientific reason' (Husserl 1970a: 283, Hua VI 329). Husserl's philosophical orientation was rationalist in the deepest sense of the term, aiming to achieve 'a life of universal self-responsibility' (Husserl 1970a: 338, Hua VI 272). Thus, at the end of his life, he claimed to speak as one 'who had lived in all seriousness the fate of a philosophical existence' (Husserl 1970a § 7 p. 18, Hua VI 17).

Husserl, following in the German tradition, understands by 'science' (*Wissenschaft* or, in Greek, *episteme*) all intellectually-grasped, organised knowledge, and, all through his life, he held an ideal of science as a systematically, internally related series of propositions expressed with

clarity and exactness. Furthermore, science as such includes both the natural and the cultural sciences. Husserl was well aware of the disputes going on in German thought (in Rickert, Windelband and Dilthey) regarding the status of the human sciences versus the natural sciences, but, for Husserl, this particular dispute was misconceived and symptomatic of a deeper issue which had to be resolved, namely, the clarification of the ideal of science in general and the fight against a *naturalistic* misinterpretation of the natural sciences which has also distorted the understanding of the social sciences. Husserl not only wanted to avoid the split between the natural and the social sciences, he also wanted to overcome the even more pernicious gap between everyday life and the increasingly powerful knowledge of the specialised sciences. The distinction between natural and cultural sciences was itself a product of a certain institutionalisation of a schism between subjectivity and objectivity which Husserl wished to challenge through his new science of phenomenology. The central aim of Husserl's new science of phenomenology was to allow theoreticians of all kinds to see the true nature of the insights of their disciplines in an unprejudiced manner and thus phenomenology would provide a ground (*Boden*) for modern objective science. For the early Husserl of the *Logical Investigations*, phenomenology offers a critique of science through the clarification of its essential concepts. The aim is to make science more consistently and transparently scientific, removing all reliance on confused and unclear concepts. Later on, as phenomenology came to be equated with the whole of philosophy, Husserl's phenomenology sought, in the words of Merleau-Ponty, to measure the distance between human experience and science (Merleau-Ponty 1964: 29).

Husserl's concept of science as an *ideal* was an amalgam of Platonic and Bolzanian conceptions. Philosophy, for Husserl, is in essence 'theory of science' (*Wissenschaftslehre*), a term taken from Bolzano, used to express the view that philosophy is a systematic reflection on the meaning of science as such (Husserl 1969: 13, Hua XVII 127). Husserl was not alone in adopting Bolzano's conception of *Wissenschaftslehre*; indeed this term appears in Carnap's earlier works, before being replaced by the term 'logic of science' (*Wissenschaftslogik*). Husserl's conception of 'genuine science' (*echte Wissenschaft*) or 'full science' (*volle Wissenschaft*), and his understanding of the relation between philosophy and the sciences, offers a powerful alternative to the naturalistic view (expressed by Quine and his followers) of philosophy as continuous with science (Husserl 1970a: § 34 p. 124, Hua VI 127). Husserl was critical of prevailing naturalistic programmes found in *positivism* (Comte, Mach, Avinarius). But his anti-naturalism did not push him in the direction of historical *relativism*. He was implacably hostile not only to emotional, irrationalist life philosophy, as

we have seen, but also to various forms of historicism which led, in his view, to cultural relativism, to the collapse of the scientific ideal, and hence – in his view – to barbarism.

For Husserl, the ideal of genuine science – first formulated in philosophy but still requiring to be exemplified by philosophy – must provide the guiding idea (*telos*, *Zweckidee*) for all knowledge which seeks universality (Husserl 1973; Hua XIII 214, 217). For Husserl, science is universal, and as such intersubjectively graspable; what is true must in principle be knowable 'by anyone' (*für Jedermann*) (Husserl 1973: 293, Hua VI 329). There is no room in any science (and especially not in philosophy which gives birth to and sustains the very idea of a science) for private opinions, for individual standpoints and constructions (Husserl 1965: 74, Hua XXV 5). Science is a *Lehrsystem*, a system of teachable truths (Husserl 1970b: 250, Hua XIX/I A5).⁷ Science is stored up in a system of interconnected theoretical propositions or statements, and of course, in the normal run of events, scientists merely manipulate these theoretical truths without insight (Husserl 1983: § 66 p. 152, Hua III/I 124). Thus, in calculation one is able to manipulate symbols without giving thought to what they stand for. The key to genuine scientific knowledge, however, is that all the essential insights or rational commitments which gave birth to the knowledge must in principle be reiterable (Husserl 1970a: 304, Hua VI 281). Genuine science must be able to trace back any set of claims to the original acts of evident cognition which engendered them in the first place. This is one of the Cartesian elements in Husserl. But not only must it be possible to recover the founding insights of a discipline; these insights must be intersubjectively communicable and shareable. Science lives on only in the community of practitioners of science.

In talking about scientific knowledge and cognition (*Erkenntnis*), there is always an ambiguity between the 'body of knowledge', that is, the *set of theoretical propositions* which set out the scientific knowledge, and the *cognitive acts* that grasp this knowledge. While Husserl, with his critique of psychologism and later of naturalism, is emphatic on the need to distinguish carefully between these two domains, he also wants to account for their interconnection. A complete science must have an account of how acts of cognition *grasp* their theoretical objects, and this science is what Husserl calls 'phenomenology'. Husserl's aim in fact sounds somewhat paradoxical to ears which associate pure objectivity only with natural science: Husserl wished to achieve a genuine science of subjectivity, a fully grounded objective science of the subjective, one which recognised the meaning-constituting role of subjectivity as well as the objectivity of constituted meanings in themselves. In other words, Husserl's point, against Daniel Dennett and other 'heterophenomenologists' who deny the explanatory value of first-person experience (what Husserl calls the

'subjective relative'), is that true objectivity is found not by excluding subjectivity but precisely by taking it into account. Husserl wanted scientific knowledge grounded and clarified by a fundamental science of the act of cognition itself, without lapsing into psychologism: that is, without reducing cognition to a natural process in the world.

Though philosophy had contributed to Western culture both the ideal of objectivity and the related conception of knowledge as science, Husserl had to confront two significant problems: philosophy has failed to become a science; and the special sciences have cut themselves adrift from the philosophical ideal of universal knowledge.⁸ Husserl shared with Kant the conviction that philosophy to date had failed to live up to its own self-declared aim of becoming a science and remained mired in competing systems, disputation and confusion, which could lead only to moral degeneration and cultural collapse (Husserl 1970a: § 7 p. 17, Hua VI 15). In the *Crisis* Husserl again notes the repeated failures of metaphysics versus the steady march of positive sciences (Husserl 1970a: § 4 p. 11, Hua VI 8–9). Husserl's response is also articulated in Kantian terms: the achievement of a *critique of reason* (Husserl 1994: 493, Hua XXIV 445).⁹ The foundations of reason (e.g., the fundamental nature of logic and ethics) remained unclarified and hence left room for endless misinterpretation. Husserl was convinced that partisan philosophy was at an end and that there was no going back to selfish business of constructing philosophies as world-views. Hume and Kant sought the reasons for the failure of metaphysics. For Husserl, Hume was the first transcendental philosopher (Descartes discovered the transcendental domain but did not enter into it) because he more than anyone else recognised how naively we assume objectivity (e.g. of the causal connection) without considering the manner it is constructed by us (Husserl 1970a: § 26 p. 96, Hua VI 99). For Husserl, it is Hume more than Kant who shows causation to belong to the form of subjective experience rather than to the objective world.

The emergence of the scientific ideal

Husserl had a strong appreciation of the specifically theoretical orientation of pure science, remote from practical or applied interests. Indeed Husserl recognised that the '*theoretical praxis*' of philosophy and the sciences emerges quite late in the historical evolution of humanity and its nature is as yet little understood (Husserl 1970a: § 28 p. 111, Hua VI 113).¹⁰ For Husserl, the guiding ideals of scientific *praxis*, i.e. truth in itself, pure objectivity, have been distilled from the philosophical tradition. These ideals of objectivity and truth are essential to conceiving a new and higher

level of human life, universal life guided by rational ideas (Husserl 1970a: 336, Hua VI 270).¹¹ It was the ancient Greeks who first proposed a 'humanity which seeks to exist, and is only possible, through philosophical reason' (Husserl 1970a: § 6 p. 15, Hua VI 13). For Husserl, the Greek Enlightenment presents the first breakthrough into what is essential to humanity as such. Philosophy, then, is not an inevitable outpouring of the human spirit, but a specific, and fragile, Western European accomplishment. The Greek experience constitutes an essential part of humanity's self-awakening, and this Greek world is not merely just one form of humanity (*Menschheit*) among others, not just an empirical, anthropological type like China or India (Husserl 1970a: § 6 p. 16, Hua VI 14). The Europeanisation of other societies bears witness to this; indeed in essays written in the twenties Husserl acknowledged Japan as having joined the European scientific outlook (Husserl 1981: 326, Hua XXVII 3). According to Husserl's version of this oft-told story, the ideal of science had first been mooted by Socrates and Plato in their revolution of Greek thinking and again by Galileo, Descartes, Leibniz and others at the beginning of our era.¹² Plato, in the face of scepticism about the very possibility of attaining knowledge (Husserl refers to Gorgias's second proposition: nothing can be known), first articulated the ideal of science as a practice dominated by a purely theoretical interest which seeks to justify each step as valid in accordance with principles which have been secured in advance (Husserl 1969: 1, Hua XVII 1; 1970a: 313, Hua VI 291). Indeed, this ideal objectivity came to provide a norm for all forms of knowledge (Husserl 1970a: § 3. p. 121, Hua VI 124), but it was not until modernity that this sense of objectivity eventually produced a transformation or 'upheaval' (*Umstellung*) of our very conception of the world (*Weltbegriff*) (Husserl 1970a: 344, Hua VI 358).

For Husserl, for philosophy to come into full possession of itself, it must interrogate the manner in which this ideal of objectivity came to dominate the entire domain of human rationality, to understand the nature of its impact on our sciences, and to correct any distortions and so prevent a slide back into scepticism and irrationalism. Husserl is suspicious of Enlightenment rationality which emerged in tandem with the scientific revolution of the seventeenth century. He finds this form of rationalism naive and ungrounded and proposes its philosophical critique. But a critique of a particular form of rationality can never mean the abandonment of rationality as such (Husserl 1970a: § 6 p. 16, Hua VI 14). One must never relinquish the challenge of philosophy to be the 'possibility of universal knowledge', the vision of philosophy in the service of mankind, and philosophers as the 'civil servants of humanity' (*Funktionäre der Menschheit*) (Husserl 1970a: § 7 p. 17, Hua VI 15).

The critique of positivism, empiricism and naturalism

To achieve genuine progress through scientific knowledge, all distortions and misunderstandings of scientific reasoning must be exposed and eliminated. Just as nineteenth-century mathematics had been in crisis because it relied on different, indeed conflicting, theoretical insights to explain its various accomplishments, so too the sciences needed to be put on a secure conceptual footing. Husserl opposed two different misinterpretations of science: on the one hand, *positivism and naturalism*; and, on the other, *cultural relativism and irrationalist mysticism*. As we have seen Husserl admired positivism for its anti-speculative moment and for its attempt to remain true to the things themselves. Thus, in *Ideas I* (1913), he appropriated the term 'positivism' for his own phenomenological philosophy: phenomenologists are the true 'positivists' if 'positivism' means 'an absolutely unprejudiced grounding of all sciences on the 'positive', that is to say, on what can be grasped *originaliter*' (Husserl 1983: § 20 p. 39, Hua III/I 38). Nevertheless, Husserl was a severe critic of the manner in which a deficient positivism had come to dominate the scientific outlook and had rigidified into an ideology among scientists in his time. Positivistic and naturalistic interpretations of science have reduced the objective validity of knowledge to subjective strings of appearances and factual inductive generalisations. Husserl claims that such 'positivism, in a manner of speaking, decapitates philosophy' (Husserl 1970a: § 3 p. 9, Hua VI 7). What was the motivation for scientists to espouse positivism? Positivism wants to be loyal to experience but misconceives the nature of that experience. When Husserl latterly became aware of the programme of the Vienna Circle, he regarded it, while a healthy bulwark against the crisis of irrationalism, as nevertheless a flawed philosophy because it had not undergone critical self-interrogation of the manner Husserl required of all philosophy.

In analysing the success of the positive sciences, Husserl is struck by the fact that these successful sciences, when seeking a philosophical elucidation of their nature, are drawn to empiricism as their 'dominant conviction . . . the solely dominant one among empirical investigators' (Husserl 1983: § 18 p. 34, Hua III/I 34). Why should this be so? Why does science feel comfortable with the denial of essences and repudiation of the cognition of essences? Empiricism 'springs from the most praiseworthy motives', but it too carries a conceptual and unexamined baggage (Husserl 1983: § 18 p. 35, Hua III/I 34). Husserl acknowledges that empiricism is 'a radicalism of philosophical practice', setting itself against all idols of superstition, including Scholastic entities such as 'ideas' and 'essences' (Husserl 1983: § 19 p. 35, Hua III/I 35). Empiricists start from 'unclarified preconceived opinions' (Husserl 1983: § 20 p. 38, Hua III/I 38). Husserl believes empiri-

cism must eventually endanger the progress of science as such. For Husserl, empiricism is absurd because the claims it makes are not justified by its own standard of what constitutes meaningful expression. Thus, *avant la lettre*, Husserl was already in possession of the standard criticism of logical positivism, namely, that its criterion of meaningfulness is not in conformity with the conditions laid down by the criterion itself. *Logical Investigations* § 26, 'On Certain Basic Defects of Empiricism', characterises extreme empiricism as just as 'absurd' as scepticism. Indeed Husserl sees empiricism as a kind of scepticism. How does empiricism arrive at its general statements, such as, all meaningful judgements relate to experience? Empiricism puts its trust in singular judgements of experience, yet it justifies its principles and universal laws mediately through induction (Husserl 1970b: *Prolegomena* § 26 p. 116, Hua XVIII A85). What guarantees the truth of these inferences? What principles justify such induction, what principles govern this mediate inference? Empiricists are forced to appeal to psychological regularities in Humean fashion. Empiricism thus confuses the psychological origin of judgements with their validity and becomes a form of psychologism. Incidentally, Husserl absolves his hero Hume of such an absurd radical empiricism; he sees Hume rather as a 'moderate empiricist' who retained logic and mathematics and gave them a priori justification (Husserl 1970b: *Prolegomena* § 26 p. 117, Hua XVIII A86). Empiricism confuses return to things themselves with a demand for the legitimisation of all cognition by *experience* (Husserl 1983: § 19 p. 35, Hua III/I 35). The radical empiricist assumes that the only access to things themselves comes through immediate sensory experience. But, for Husserl, natural things do not constitute the whole set of kinds of things, and thus empiricism at best only reveals things of nature. Husserl claims not all kinds of judgements get their intuitive fulfilments from sensory experience; the empiricists have not understood the whole range of judgements. We cannot simply postulate or dictate in advance the range of forms of judgements and their manner of fulfilment. We can only gather this through 'insight' (Husserl 1983: § 19 p. 36, Hua III/I 36). Immediate seeing is not merely sensuous; it is original presentive (*gebende*) consciousness of any kind. Husserl wants to substitute 'intuition' in a broader sense for 'experience' so that, as he had already seen in *Logical Investigations*, we can have genuine non-sensuous intuitions with the absolute apodictic certainty of eidetic truths, such as the principle of non-contradiction (Husserl 1983: § 20 p. 37, Hua III/I 37).

Perhaps the strongest critique of *naturalism* written in the first half of the twentieth century is Husserl's essay *Philosophy as a Rigorous Science* (1911), commissioned by Heinrich Rickert for his new journal, *Logos*. Husserl saw his era as caught in two post-Hegelian developments. On the

one hand, Hegel's notion that every philosophy was an expression of its own time, and hence somehow right for it, had seriously weakened the demand for scientific philosophy, and had eventually led to the development of a sceptical historicism typified by Dilthey (Husserl 1965: 77, Hua XXV 7). Similarly, in reaction to the kind of speculative system of Hegel there developed a renewed interest in Eighteenth-century materialism leading to positivism which gave rise to scepticism. Naturalism does have the ideal of philosophy as a strict science (Husserl 1965: 78, Hua XXV 8). So, for Husserl, 'it is important to engage in a radical criticism of naturalistic philosophy' (ibid.). Positivism, for Husserl, emerges from a naturalised reading of Kant or from Hume (Husserl 1965: 80, Hua XXV 9). For naturalism, physical nature is grasped as a complex of sensations. Indeed naturalism includes the project of 'naturalising' consciousness. Husserl argues that naturalism is self-refuting. In his critique of naturalism, Husserl refers to *Logical Investigations* §§ 25–9 and indeed he always looked back at these sections as an effective philosophical refutation of naturalism and positivism.¹³ Similarly, Husserl recognised the positive aspiration of naturalism in that it sets out to achieve philosophy as a rigorous science (Husserl 1965: 78, Hua XXV 8). As such naturalism would always be the most enduring temptation for scientists, but nevertheless, he also criticised its 'naturalistic objectivism' as containing an inbuilt absurdity (*Widersinn*). This absurdity consists in the attempt to naturalise consciousness. Indeed, in the *Crisis*, despite his antipathy to German idealism of a speculative kind, Husserl acknowledged that transcendental idealism was the only philosophy to have successfully resisted the lure of naturalism (Husserl 1970a: 337, Hua VI 271).

The clarification of the scientific ideal

Husserl's first major attempt to clarify the nature of the ideal of science was in the *Logical Investigations* (1900–1). Here, Husserl sharply distinguished between the human methodologies and processes involved in winning scientific insights and the ideal nature and unity of scientific knowledge in itself. As Husserl puts it in the First Logical Investigation § 29:

All theoretical science consists, in its objective content, of one homogeneous stuff: it is an ideal fabric of meanings (*eine ideale Komplexion von Bedeutungen*). We can go even further and say that the whole, indefinitely complex web of meanings that we call the theoretical unity of science, falls under the very category that covers all its elements: it is itself a unity of meaning.¹⁴

(Husserl 1970b: § 29 vol. 1 p. 325, Hua XIX/I A95)

In *Formal and Transcendental Logic* (1929) Husserl speaks in positive terms about science as a closed system of statements. As late as the *Crisis* Husserl still clings to the view that mature science is a single system of interconnecting 'truths in themselves' or 'propositions in themselves', demonstrating that Husserl never completely abandoned Bolzano's conception of science.¹⁵ This led Max Horkheimer in his 1937 lecture 'Traditional and Critical Theory,' a manifesto for the newly founded Frankfurt School, to characterise Husserl as 'traditional' rather than 'critical'; he exemplifies a bourgeois, passive standpoint towards scientific knowledge (Horkheimer 1972). Husserl himself was fully aware of the distinction between the theoretical *ideal* of a domain of fixed truths and the discursive, critical, intersubjective *practices* which humans carry on in order to achieve scientific knowledge. Indeed, it is these latter aspects which came to feature more and more in Husserl's work culminating in his analysis in the *Crisis* and which was strongly influential on Habermas' critique of instrumental reason.¹⁶

Husserl's conception of scientific *practice* has not received as much attention as it ought, due to Husserl's own heavy emphasis on science as pure *theoria*. But Husserl recognised that scientific practice was constituted by consensus among a *community* of free rational inquirers, 'a community of purely ideal interests' (Husserl 1970a: 287, Hua VI 334). Although Husserl's goal of universal science and of *mathesis universalis* today sounds rather remote, given the diversity of scientific methods which now flourish side by side, his account of scientific practice has a much more contemporary ring. There is no science without humans engaging in co-operative, intersubjective practices and today, in the wake of Wittgenstein, Kuhn, and Feyerabend, on the one hand, and Habermas, Apel and Gadamer, on the other, there is much more interest in how these practices come to be validated.¹⁷

Actual discoveries must be repeatable (at least in principle), and science modifies its truths over and over again. There is in all scientific endeavour, Husserl claims, both the *ideal* of a convergence towards the truth, and also the recognition that such convergence is the result of human consensus and intersubjective agreement among agents. The key point is that humans recognise the essential truths and are able to carry out and repeat for themselves the insights leading to the scientific discoveries. This communication and iterability is enabled by the use of symbols and written signs which, as it were, strip the personal occasion from utterances and make something in principle intersubjectively graspable. Humans gain mastery over the infinite world of appearances through symbolisation. For Husserl the scientific impulse is quickened by the ability to operate with symbols. The problem is that this symbolic approach to knowledge has not itself been interrogated.

For Husserl, the individual special sciences, even in their success pursuant upon their very emancipation from philosophy, also suffered from a deformation in their development because they had abandoned the philosophically generated *ideal* of genuine science and had naively seized on individual methods and practices as self-justifying. Though technically productive, these practices had never been theoretically interrogated and thus remained 'one-sided', prone to accepting ideologically distorted conceptions of their nature and practice (Husserl 1969: 3–4, Hua XVII 3). Natural science's bracketing of everything subjective leads to a 'bad theory regarding a good procedure' (Husserl 1965: 105, Hua XXV 28).¹⁸ This lack of reflection meant that the European sciences had lost their belief in themselves and in their absolute significance; that is, the sciences in their practices have become utterly divorced from the ideals of a genuinely human way of life (Husserl 1969: 5, Hua XVII 5). They have been reduced from theoretical insight (*Einsicht*) to mere technological practice, a process which Husserl calls the 'technicisation' (*Technisierung*) of method involving an emptying out of meaning (Husserl 1970a: § 9g p. 46, Hua VI 45). In fact, Husserl took the view that the developing formal logic of his day (which he called *Logistik*) suffered from being merely a theoretically 'naive' technology rather than a fully transparent theoretical practice since its grounding in the life-world was unclear (Husserl 1970a: § 36 p. 141, Hua VI 144).¹⁹ Husserl remained unconvinced of the philosophical advantages of mathematical logic for the clarification of thinking because he could not see the relation between a calculus or set of algorithms and the theoretical insights which would justify them. But, as Herbert Marcuse points out, the inherently instrumental character of science is something which Husserl diagnosed as coming before any technical application, and to be due to the process of symbolisation itself (Marcuse 1965, especially p. 286).

In the face of this lack of rational self-reflection, Husserl's whole philosophical career was motivated by the project of *clarification* of the grounding concepts of the sciences and philosophy. In a private diary from 1906 he remarks 'I simply cannot go on without clarity (*Klarheit*). I will – I must – approach these sublime goals, through self-sacrificing labor and purely disinterested absorption in the work. I am fighting for my life, and because of this have confidence that I will be able to make progress. . . . Only one thing will fulfil me: I must come to clarity!' (Husserl 1994a: 494 Hua XXIV 445). This Holy Grail of 'clarification' was understood by him as a challenge to make all human life and action, including our entire commitment to theoretical knowledge, transparently rational and self-consciously affirmed as such. To achieve this clarification nothing less than a thorough-going critique of normative reason was required, a critique of

logic and knowledge and of the whole sphere of human awareness, including not just cognition but all our pre-cognitive commitments including our spatial, temporal and bodily awarenesses as well as our insertion into a flowing unified, conscious, emotional life, both individually experienced and understood from the viewpoint of culture and the life of 'spirit'.

For Husserl this clarification came only from a *general phenomenology* of knowledge and consciousness, from what he called 'radical investigations of sense' (*Besinnungen*), deliberations which attempt to grasp and theoretically reconstruct the 'sense fulfilments' (*Sinnerfüllungen*) constitutive of knowledge in its highest form. All genuine knowing, for Husserl, consists of a kind of evident cognition or self-evident insight. Thus, in perception, a cognitive act of perceiving is evident if the object is present in full bodily givenness (*Leibhaftigkeit*) and this is recognised to be so. Phenomenology, as the investigation of the structural characteristics of intentionality, was to provide an account of different kinds of intuitive fulfilment, how 'objectivities' (*Gegenständlichkeiten*) come to be framed in the different disciplines. For Husserl, phenomenology must always proceed through winning insights and was never to a deductive system based on consequential logic.

The constitution of objectivity

After the *Logical Investigations*, Husserl's interests broadened beyond the clarification of logic and mathematics to an attempt at a general theory of knowledge as such, including all normative knowledge, the foundations of value, and so on. This 'constitutive' phenomenological inquiry eventually needed to be complemented by an 'archaeology' of the history of cultural development, which he called 'genetic phenomenology'. But, even in this attempt in his late writings to locate science within history, Husserl is not surrendering to an anti-scientific historicism whereby scientific achievement is considered merely as the expression of a world view or *Weltanschauung*. Quite the opposite. Husserl wanted to rescue philosophy from mere changing 'world views'. He was suspicious of the neo-Hegelian 'sceptical historicism' of the cultural sciences, espoused by Dilthey and others, seeing in it a kind of creeping relativism which would inevitably lead to moral nihilism and irrationality. He saw the need for a questioning back; first to uncover pre-scientific life and then to uncover transcendental subjectivity. But as for the phenomenal progress of the individual sciences in themselves, he says in *Ideas I* (1913): 'When it is actually natural science that speaks, we listen gladly and as disciples' (Husserl 1983: § 20 p. 39, 1950: III/I 38). But often it is not natural science in a

pure form which 'speaks' rather some form of prejudice is being articulated. This is especially true when scientists talk about their own work, they often assume a current ideology (e.g., positivism in Husserl's day, or perhaps, the manner in which Popperianism is a dogma among practising scientists today).

Like Kant, Husserl himself entertained no sceptical doubts about the possibility of objective knowledge. Rather his problem was to understand how this objectivity is 'constituted' in and through the acts of subjects. Philosophy must inquire into the 'subjective conditions of the possibility of an objectively experienceable and knowable world' (Husserl 1970a: § 29 p. 112, Hua VI 114). Indeed, both his early and his late texts – *On the Concept of Number; Psychological Analyses* (1887) and *Origin of Geometry* (1936) – show fascination with the same problem, the single enduring problem of his philosophy. This for Husserl is 'the miracle', 'the mystery of mysteries', 'the enigma' of philosophy. Indeed he is puzzled that traditional philosophy has been so lax in studying this area, thereby allowing a deficient naturalism to claim that the encounter with objectivity is a factual physical process. For Husserl, objectivity involves notions of self-identity, continuity over time (even atemporality), and universality: features which he accepts, with Hume and Kant, are not given in sensuous intuition.

In opposition to all forms of sensualism and atomistic empiricism, Husserl accepts that in acts of intuiting (perceiving, remembering, imagining, knowing) essences are presented. This is Husserl's central conception of *Wesensschau*, the viewing or inspection of essences. To understand the nature of objectivity one had to get over the 'Humean confusion' whereby it is thought that in intuition one grasps not the essence but mere factual details corresponding to essences (Husserl 1965: 115, Hua XXV 36). Initially, in the *Logical Investigations* he talked about the manner in which we have a 'categorical intuition' of these idealities, and later situated these as transcendental structures of the transcendental ego. Here, the manner of his relation to Descartes and Kant becomes crucial. Leaving aside the difficult and problematical issues surrounding Husserl's positing of a transcendental ego, Husserl's central concern was that science should be concerned with essences, with a priori universal, and hence necessary, knowledge. For Husserl, justification depends on on-going acts of insight or evidence, acts in which matters are seen just as they are.²⁰

Already in his *Habilitationsschrift* written under Carl Stumpf, Husserl had attempted to explain the origin of mathematical objects in subjective acts. He employed Brentanian descriptive psychology to explain the origins of the number concepts in our conscious acts. How do the concepts of number arise for us? His answer differs significantly from the traditional

empiricist account given by Mill and others. The number concepts, for Husserl, are specifications and differentiations between concepts of multiplicities. Husserl maintained, as Gestalt psychologists such as Ehrenfels did, that we see not just individuals, but groups and collectivities. Selecting the items we will include in a specific group depends on our interests and is not a purely passive experience. Collective combination of items in a group is a matter of seeing relations of a special type. In order to form concepts of multiplicity, we abstract from the individual properties of the items and treat each member of the group merely as a 'something' (*etwas*). That is to say, invoking a version of Brentano's distinction between physical and psychical relations, we grasp the items not on the basis of any 'physical' or 'content' relations between them but solely on the basis of making a psychic connection. The notion of number is based on the ability to relate together objects from different categories simply by abstracting from their specific characteristics and treating them as unities. Thus, we can see that a pen, an apple and a painting as a multiplicity of 'a something and a something and a something', from which the number 3 derives. This seems to suggest that numbers are properties of groups, for Husserl. For Frege, on the other hand, numbers are not properties of groups of objects, but *extensions* of concepts. Diverse entities can only be counted together if they are brought under a concept, e.g., the number of *cities*. Husserl's account of numbers, Frege says in his sharp review of the *Philosophy of Arithmetic*, since it confused the objective validity of logical and mathematical truths with their modes of givenness is consciousness, amounted to *psychologism*.

Though Husserl acknowledged the force of Frege's criticisms, he had already moved beyond the psychologistic elements in the *Philosophy of Arithmetic* as is evident from his 1891 critique of Schröder's *Algebra der Logik* (a pre-Fregean German attempt at mathematical logic) and from his unpublished review of Brentano's Polish student, Kasimir Twardowski's *On the Content and Object of Presentations* (Husserl 1994: 52–92, 388–95). Furthermore, in his private correspondence with Frege, and also because of his reading of Lotze and Bolzano, two logicians who also influenced Frege, Husserl was already clearly distinguishing between the psychological act and its objective (or ideal) content. In other words, Husserl was already developing a theory of sense (*Sinn*), later to become the theory of the noema in *Ideas I* (1913). He differs from Frege in seeing *Sinn* in all intentional acts, not just in linguistic sentences. There is a perceptual *Sinn* in seeing, in remembering and so on. As a matter of fact, Husserl never completely rejected the *Philosophy of Arithmetic* in later life and came to see it as constitutive analysis which had phenomenological aspects rather than being a psychologistic treatise. After all, it was a central

insight of Husserl's all through his life that ideal meanings (such as *the square root of 9*) signify independent ideal objectivities which nevertheless are brought to appearance in human, temporal, finite acts of consciousness. Furthermore, Husserl's recognition that human thinking can only come to grips with the infinitely large domain of numbers by moving to symbolisation, a position expressed in the *Philosophy of Arithmetic*, was to become a foundation stone for his analysis of both the success and the distorting impact of the mathematical sciences of nature in the modern period.

After 1894 Husserl's task was to see a way of grounding human scientific knowledge by exploring the nature of the relation between acts of consciousness and the domain of ideal meanings. The first outcome of this exploration was the huge *Logical Investigations* of 1900–1 which aims at the 'epistemological criticism and the clarification of pure logic' (Husserl 1970b: vol. I p. 249, Hua XIX/IA3). Here Husserl laid to rest the ghost of his earlier psychologism and undertook a number of studies of elements in logic and semantics, including an attempt at a phenomenological account of signification and signs (not unlike Peirce). The task of the *Logical Investigations* was to trace the manner in which these objectivities (*Gegenständlichkeiten*) are constituted. The *Prolegomena* to the *Logical Investigations* is a sustained critique of psychologism and naturalism. Thus for Husserl, Newton's law of universal gravitation is true whether or not anyone ever discovers it. This led Husserl to further studies in logic and epistemology and the announcement of the project of phenomenology, understood at this time as the study of essences.

According to the *Prolegomena*, the dominant fashion of nineteenth-century theorists of science, had conceived of the discoveries of science as mere factual, empirical generalisations. Husserl, on the other hand, conceived of sciences as a fixed, unified domain of ideal theoretical truths, interconnected by ideal laws. Such was logic and mathematics, and such as he conceived it, would be physics and the other sciences.²¹ Quite separate from this domain of ideal laws, were the various technical disciplines (*Kunstlehre*) which applied these ideal laws as norms for the regulation of behaviour. But in the *Logical Investigations*, Husserl, influenced primarily by Lotze's interpretation of the Platonic forms and applying Lotze's view to the interpretation of Bolzano's 'propositions in themselves' (*Sätze an sich*), sharply distinguished between the domain of ideal theoretical truths and the behaviour-guiding norms which derive from them.²² To collapse one into the other would lead to the danger of psychologism. This is precisely what happens when an ideal objective truth, e.g., the Principle of Non Contradiction, is interpreted as merely a norm guiding human thinking or as a psychological, empirical law governing the association between actual thought processes. Right through to the *Crisis* Husserl was

emphatic about the need to differentiate between a normative practice, what the Greeks called *techne*, and genuine theoretical knowledge (*episteme*). Husserl wanted to preserve the domain of the ideal as a genuine domain of which we can have scientific knowledge without relapsing into Platonism. Ideal objectivities are constituted through repeated acts and are grasped as the self-same in those acts. But they are not to be thought of as independently existing objects in a Platonic sense, they are abstract, ideal entities which underwrite 'unities of meaning' (*Bedeutungseinheiten*). Clearly to believe that we can have knowledge of the 'ideal' in this sense means that Husserl may be construed as an idealist, but he rejected the label of 'Platonism' for his view, as much as he denied that he was a subjective idealist about the nature of ideal truths. He seemed to regard Platonism as committed to a belief in the immaterial existence of these ideal objectivities. Husserl's specific contribution was to recognise the multiplicity of kinds of ideal objects, mathematical, musical, aesthetic, and so on. For example, in aesthetics, Husserl distinguished between the kind of ideal meaning which is bound to a single unique artwork (Raphael's *Madonna*) and those which can be instantiated over and over again (e.g., Goethe's *Faust*) (Husserl 1973a: § 65 p. 266).

In fact, it was his concentration on analysing the structures in our knowing process which guarantee the objectivity of our knowledge which led many of his critics – including Heidegger – to assume that Husserl had collapsed back into psychologism in the second volume of the *Logical Investigations*. But Husserl's mature notion of *constitution* (*Konstitution*) is precisely distinguished from merely factual, empirical psychological processes. Husserl leaned more and more towards Kantian formulations which identified these constitutive structures as transcendental, that is, as conditions for the possibility of knowledge in general (*überhaupt*), though Husserl had a much broader sense than Kant of what these conditions might be. Ultimately, this led Husserl to positing a transcendental ego – not to be understood as an empirical ego writ large – as a unified condition for the possibility of objectifying structures in consciousness. By the time we get to *Ideas I* (1913), Husserl was articulating a project of a pure science of consciousness, construed in a priori terms. Husserl had been reading Kant since the 1890s but began seriously to orient himself in Kantian idealist manner after 1905. For Husserl, the a priori science of pure consciousness is a bedrock science since all other forms of knowing presuppose and utilise the very structures of consciousness itself. Husserl came to recognise that, in our ordinary relations to the world, these structures of consciousness are presupposed, and in a sense masked, and he realised that a special exercise of attention, what he called 'phenomenological bracketing' (*epoché; Einklammerung*), or putting in parenthesis,

and various forms of 'reduction' (philosophical, phenomenological, transcendental, eidetic reductions) were necessary to lay bare the a priori structures of consciousness. Husserl spent a great deal of his published works analysing how 'the natural attitude' (*die natürliche Einstellung*) needed to be suspended in order to explore the realm of ideal essences which is consciousness. Husserl was impressed by the fact that an eidetic science like geometry was able to move seamlessly from the factually given space to ideal space, whereas, in the investigation of consciousness, there is no smooth transition from the ordinary 'Heraclitean flux' of conscious life to the ideal insights concerning the essential nature of conscious forms. Hence the problem of reduction came to dominate his thinking as Husserl tried to disentangle the natural urges to objectify and to posit as real from the more neutral description of acts generating knowledge.

The role of the lived body

Somewhat paradoxically, at the same time as Husserl was laying out his transcendental idealism in *Ideas I*, he was also exploring a different direction, namely the manner the human body shapes the nature of conscious awareness and installs that awareness in the world. The living human body with its eyes and specific sense organs, located as they are with its range of motor movements and nerve endings, restricts and structures our experience in a manner which had not been adequately articulated by the prevailing mechanistic physiology and behavioural psychology. Husserl's analysis of the distinction between the incarnate animate body (*Leib*) and the inanimate physical body (*Körper*), subject to physical laws, as developed in the posthumously published *Ideas II* and as later revisited in the *Crisis of European Sciences*, had a huge impact on both Heidegger's account of being-in-the-world in *Being and Time* (1927) and on Merleau-Ponty's account of the body-subject in his *Phenomenology of Perception* (1945). The lived body experiences the world as an environment (*Umwelt*).

Husserl's discussion of the animate body (*Leib*) was groundbreaking and still presents a strong challenge to materialist and reductionist models of the body operative in conventional medicine and psychology. Husserl felt the need for a rigorous investigation which would reconnect the idealities of geometrical space to the experiential space of our lived experience. This led to his desire to see the world and our human involvements under a different eye, no longer in the natural attitude which itself was closely tied to naturalism in physics. Where do our concepts of space and time come from? How do the scientifically purified forms of these concepts relate to our pre-scientific worldly conceptions of time and space? The advances in the mathematicisation of nature had led to ideal properties of

space and of objects been seen as the 'real' properties whereas the phenomenological properties belonging to our everyday encounter with the world were somehow treated as secondary characteristics, if not as wholly illusory.

On the other hand, Husserl recognised that our bodily insertion into a spatial world was the source of a very particular and complex experience of lived space, one which had not been conceptualised. In a sense, the body is the locus of all reference, the zero-point of perceptual acts. This pre-conceptual lived space is neither Euclidean nor anti-Euclidean, but is expressed in bodily orientation, left and right, up and down, the upright posture, the experience of our bodily weight and resistance to movement, and the various forms of motility of our bodily organs. Phenomenology needs to ground scientific conception of space and time in this bodily-based lived field of experience. Thus, for example, the manner I possess my body needs to be carefully studied. To use an example which would appeal to Merleau-Ponty, the anorexic will see herself as fat even though she can recognise the look of a starving body as shown in photographs. The scientific image of the body needed to be supplemented by the lived image. To be complete, science must reconnect itself with the ground from which it first emerged, and from which, in order to develop its unique method of abstraction and symbolisation, it had to cut itself off. In part, this reconnection of science and lived experience required recognising that the processes of the objectification of meaning had a temporal or historical dimension. Husserl became interested in the 'genetic' aspect of the constitution of meaning side by side with the static model he had earlier proposed. Husserl sees the understanding of the genesis of the idealisation of science and the manner in which that has been distorted by positivism and naturalism as opening the possibility of seeing new opportunities for developing the scientific ideal in a non-distorting manner.

The Crisis of European Sciences

In his 1936 work *The Crisis of European Sciences* (only the first part was published in 1936; the manuscripts left unfinished at his death were published in full posthumously), Husserl diagnosed a general crisis evident in the sciences as a whole, including in mathematics, always considered as the model of what a science ought to be. Husserl understands a scientific 'crisis' as occurring when the manner in which that science sets its task and method becomes questionable (Husserl 1970a: § 1 p. 3, Hua VI 1).²³ Husserl's notion of crisis, then, is unrelated to the actual success of a science. Indeed, Husserl has enormous respect for the achievements of contemporary physics in particular. Rather, the crisis of science occurs

when the relation of science to its philosophical goal becomes problematic, and hence the meaning science has for human existence (*menschliches Dasein*) becomes doubtful (Husserl 1970a: § 5 p. 12, Hua VI 10). According to Husserl, the nineteenth century allowed itself to be blinded by the 'prosperity' of the positive sciences. The success of the fact-minded sciences produced a generation of fact-minded people who excluded from science all questions of human existence as a 'free, self-determining being' (Husserl 1970a: § 2 p. 6, Hua VI 4). The physical sciences' relentless quest for objectivity has led to the exclusion of everything subjective. No attention has been paid to the manner that exact objectivity arose as an ideal. Mathematical objectivity has been a transformative notion which utterly changed our relation to the world, but itself has not been interrogated. How do we move from the Heraclitean flux of individual experience, to communal mutual confirmation, to an ideal of the objective as something standing entirely independent of us? In particular, the very possibility of a science's accomplishment of objectivity has become problematic (Husserl 1970a: § 33 p. 122, Hua VI 124).

The nature of this ideal of objectivity is puzzling, the story of its genesis is complex. But it is this inquiry which Husserl seeks to carry out in the *Crisis*. Husserl proposes a kind of genetic phenomenology (what Foucault would call 'archaeology') to understand how science has come to shape our world view. He wants an inquiry into how the pre-given life-world gives rise to and provides the 'subsoil' (*Untergrund*) for the discovery of theoretical truths (Husserl 1970a: § 34 p. 124, Hua VI 127). This investigation is not empirical factual history in the usual sense, but rather, a kind of intellectual reconstruction, 'a teleological-historical reflection upon the origins of our critical scientific situation' (Husserl 1970a: § 1 p. 3, Hua VI 1).

We shall attempt to strike through the crust of the externalized 'historical facts' of philosophical history, interrogating, exhibiting, and testing their inner meaning and hidden teleology. Gradually . . . possibilities for a complete reorientation of view will make themselves felt, pointing to new dimensions.

(Husserl 1970a: § 7 p. 18, Hua VI 16)

We should not expect this intellectual reconstruction to be completely factually accurate; and Husserl has been accused of making Galileo stand for positions which should more accurately be ascribed to Descartes. But Husserl is painting a picture, showing the pattern of thinking at work, getting to what he considers to be the *essence* of modernity's conception of science: 'Our concern is to achieve complete clarity of the idea and task of a physics which in its Galilean form originally determined modern philos-

ophy' (Husserl 1970a: § 9e p. 42, Hua VI 42). In this sense, all modern science is Galilean in its mathematical conception of nature; Einsteinian physics, for Husserl, is part of 'Galilean science'.

Galilean science has idealised and mathematicised nature, leading to an abstraction from the lived, experienced world. Thus, modern science approaches nature not as a complex of individuals of infinite shadings and complexities, but conceives of 'nature as idea, as regulative ideal norm, as the logos, in a higher sense, belonging to actually experienced nature' (Husserl 1969: 292–3, Hua XVII 257).²⁴ Gradually this idealised normative conception of nature has replaced the inexact continuum of our sensory experience. The more successful the science, the more it has engaged formalisation and the 'emptying out of meaning' (*Sinnentleerung*) through relentless symbolisation. Galileo is 'the creator of the conception which first made physics possible' by taking for granted the universal applicability of mathematics (Husserl 1970a: § 9 pp. 36–8, Hua VI 35–7).²⁵ For Galileo the book of nature is written in the language of mathematics. Nature has now been understood as a 'mathematical manifold' (Husserl 1970a: § 9 p. 23, Hua VI 20). In Galilean, and hence in all modern, science, the key to the success has been to abstract from the particularities of bodies and treat them as ideal geometric shapes obeying ideally determined exact laws. Science is less interested in the empirical fact than in the formulation of ideal laws. Mathematics thus idealises the world of bodies: 'One can truly say that the idea of nature as a really self-enclosed world of bodies first emerges with Galileo' (Husserl 1970a: § 10 p. 60, Hua VI 61). For instance, in measuring falling bodies, we can abstract from their irregularities and treat them simply as centres of mass governed by the law of gravity. First there is the geometricisation of nature, and then geometry itself is construed in terms of algebra (in Descartes, Vieta and Leibniz). Shapes are transformed into purely numeric configurations. Eventually, science has replaced the experiential world completely; the world of human experience has even been assigned the value of illusion and mere appearance. All 'subjective-relative' properties, such as colour, taste, and the other so-called 'secondary qualities', have been dispensed with. The mathematically ideal world has been 'substituted' for the real world, and the mathematical garb of symbols (*Ideenkleid*) has been mistaken for the real objective world (Husserl 1970a: § 9h pp. 48–51, Hua VI 49 ff.).

But modern science does not merely bring about a divorce between the lived world and the world as described by mathematical science. The formalisation of nature also leads to a radical alteration in the nature of individual subjectivity. For Husserl, when a group of scientists record observations, they assume a certain *substitutability* between one observing subject and another. One human can come to stand for another. The

'subjective relative' aspect of human experience is put entirely out of account; the difference in perspectives between subjects is ignored or bracketed. When scientists think that they encounter the objective world they forget the manner in which this objectivity is ideal and constructed and is akin to experiencing of the infinite number series:

The empiricist talk of natural scientists often, if not for the most part, gives the impression that the natural sciences are based on the experience of objective nature. . . . The experienceability of something objective is no different from that of an infinitely distant geometrical construct and in general no different from that of all infinite 'ideas', including, for example, the infinity of the number series.

(Husserl 1970a: § 34d 128–9, Hua VI 131–2)

The point, for Husserl, is that physical objects are experienced in the world from a multiplicity of perspectives, but they can never be grasped all at once, which is the manner of cognising an abstract entity. The specifically human way of perceiving and engaging with the world has been excluded. Alternatively, when it is included, it is relegated to another natural science, psychology. According to Husserl's sketch of the inner working out of the conception of modern mathematical science, the splitting of the subjective-relative from the mathematical objective world inevitably led to the dualism of matter and mind found in Descartes, and thence to the conception of psychology as a split-off separate science modelled on natural science, articulated first in Locke and Hume but still prevalent (Husserl 1970a: § 22 84, Hua VI 86). Husserl correctly diagnoses that our ordinary world view has now been affected by this scientific outlook, that in our ordinary language and attitudes we reflect these scientific presumptions.

Although Husserl had identified the role of our cultural environment (*Umwelt*) in shaping our approach to knowledge, as early as *Ideas II*, it was not until the *Crisis* that he focused more specifically on what he called the 'pre-scientifically intuited nature' (Husserl 1970a: § 9h p. 50, Hua VI 50). The pre-given life world is the 'grounding soil' (*der gründende Boden*) for the scientifically true world (Husserl 1970a: § 34e p. 131, Hua VI 134). The historical and cultural life world has determined the shape of science, yet modern philosophy has forgotten the founding relation between our 'pregiven life work' and the scientific outlook; this can only lead to distortion, a 'sliding over' or 'concealing of meaning' (*Sinnüberschiebung*, *Sinnüberdeckung*), threatening scepticism. To restore the balance, Husserl wants to focus on the original 'bestowal of meaning' (*Sinngebung*) which enabled the formal system of mathematical science to be in some useful sense *about* the world (Husserl 1970a: § 9g p. 47, Hua VI 46). The genesis

of 'exact objectivity' as an ideal is a specific human 'cognitive accomplishment' (*eine Erkenntnisleistung*) (Husserl 1970a: 347, Hua VI 360). Husserl recognises this 'rational and all conclusive' goal of rationality as the beginning of science proper.

Husserl is very interested in the moment when a science releases itself from local considerations, e.g., geometry's beginning in measuring fields or areas, and recognises its universal and infinite task: 'Not until the dawn of the modern period does the actual discovery and conquest of the infinite mathematical horizons begin' (Husserl 1970a: § 8 p. 22, Hua VI 19). All through his life Husserl was deeply interested the relation between geometry and naturally perceived or intuited, lived space. Husserl had proposed to study the nature of geometry in his earliest investigations into the foundations of mathematics. In later years, his inquiry took the form of trying to understand the fateful turn taken in the seventeenth century with the geometricisation of nature and of reason in Descartes, Spinoza and others. Ancient geometry began in land surveying, and this original giving of meaning enabled the ideal mathematical vision to be accomplished. Unfortunately, Galileo never reflected on this move and hence there is the illusion that geometry as independent sphere of self-sufficient truth could be applied willy-nilly, as in the attempts by Descartes and Spinoza to found all knowledge as a deductive system from evident truths on the model of geometry (*more geometrico*). Husserl regarded this as a failure because the starting point was naive. The ideal of objectivity began in mathematics but was transformed into a new tool in the idea of 'mathematical natural science' in Galileo (Husserl 1970a: § 8 p. 23, Hua VI 20) and if the ideal has been accomplished it is precisely in mathematics and mathematical physics (Husserl 1970a: 347, Hua VI 360).

Evaluating Husserl's contribution

How should we characterise Husserl's engagement with and critique of the sciences, especially their impact on human culture? On the one hand, Husserl is a defender of science and the objectivity of science. He always retains the view that science is driven by an ideal of objective, universal truth and that, as such, there must be unity of the domain of scientific knowledge as a whole. However, though he was familiar with Hilbert's project of formal axiomatisation, Husserl's own vision of science emphasised the need to connect the system of truths with the acts of intellectual cognition and insight which gave birth to them. He, therefore, soon came to doubt that pure logic or mathematics could provide a fundamental basis for all forms of science. Rather, for Husserl, the ideal of science and its achievements can only be understood when the subjective acts giving rise

to the scientific outlook are themselves examined and clarified as to their nature, and when their subjective and cultural specificities are taken into account. Phenomenology, for Husserl, was precisely the dream of a science which would keep the guiding ideal of rationality operative in the sciences secured in the clarification of the fundamental meaning-constituting acts of human subjectivity and intersubjectivity.

Husserl has been criticised for not clearly explicating the relation between the *Lebenswelt* and the theoretical attitude of modern science. Husserl never exactly spells out the relation between the *Lebenswelt* and the scientific frame of reference. He has, for example, been criticised for assuming that scientific concepts are 'grounded' in, and gain their meaning from everyday conceptions, whereas some would argue that scientific concepts over time in fact sediment into the everyday ones (thus we talk of our blood sugar being low when we are tired, and so on). Husserl has also been accused of reintroducing relativism into his picture, since he held that diverse human communities may inhabit different life-worlds, leading to the possibility of different forms of everydayness, different kinds of *Lebenswelt*. But Husserl really wanted to overcome this relativist threat by seeking the invariant features belonging to the essence of life-world itself, invariant features which are there prior to the different particular forms the cultural environment could take in different kinds of societies (thus his interest in Lucien Lévy-Bruhl's description of the primitive mentality, for example).

In a sense, then, Husserl is a *foundationalist*, though he did not agree either with the foundational attempts of empiricism which privileged sense data, nor with the rational foundations proposed by Descartes. Husserl's foundationalism holds that all knowledge is ultimately justified by self-evident insight. But these evident insights are actually discoverable in many different kinds of acts, and the conditions of satisfaction for these evidential acts vary depending on the kind of knowledge involved. Husserl is clearly aware, however, that this self-evidence is an ideal limit to which all knowledge merely approximates. Furthermore, Husserl's inquiry into the nature of the subjectivity grounding knowledge eventually led him to intersubjective and historical inquiries about the shape of Western scientific outlook in general and the presuppositions upon which it rests. Here Husserl can be seen as identifying the theoretical problem which arises when scientific theoretical insights are translated into technological rationality. In a sense, then, it is Husserl who initiated the worries about the global entrenchment of technological reason which one finds expressed in Heidegger, in Marcuse, in the Frankfurt school and in Habermas.²⁶

As we have seen, Husserl's critique of inadequate conceptions of science moved in two different directions, attacking both *scientism* and

cultural relativism. Husserl's efforts to overcome these threats are not dissimilar to Hilary Putnam's project of humanising philosophy and science.²⁷ Both seek to understand the deep motives for science's lost role in the humanisation of society. Indeed, Putnam acknowledges the later Husserl's conception of the *Lebenswelt* as an important concept in articulating his own attempt to overcome the false dichotomy Putnam has diagnosed in contemporary philosophy between the 'furniture of the universe', on the one hand, and our projections, on the other (Putnam 1990: 50).²⁸ For Putnam, as for Husserl, science lost its leadership in the domain of cultural values when it lost its connection with the experiential world. But Husserl never wanted to oppose science itself. Rather he wanted to radicalise the very thinking about science, and in so doing draw science back into philosophy.

Notes

- 1 Sokal and Bricmont (1997) have shown the deficiencies in scientific awareness of many contemporary French philosophers. It would be wrong, however, to implicate other European philosophers such as Husserl, Heidegger, Merleau-Ponty or Oscar Becker, in this ignorance. Both Husserl and Heidegger had considerable grounding in science. Though Heidegger went on notoriously to claim that 'science does not think', he is referring there to a specific kind of radical questioning which he considers belongs to philosophy. Post-Heideggerian philosophers, however, have simply ignored the achievements of the exact sciences.
- 2 See the excellent study by M. Kusch (1995).
- 3 See Husserl, *Logical Investigations* Prolegomena §71; Hua XVIII A252–55. I shall quote from the English translation of Findlay (Husserl 1970b). References to the German editions are to *Husserliana* (abbreviated hereafter as Hua) followed by volume number and page number (e.g. Hua VI 143).
- 4 See, for example, Albertazzi, Libardi and Poli 1996 and Rollinger 1996.
- 5 On Husserl's relation to Cantor, see Hill 1997.
- 6 Husserl refers directly to Hilbert in Husserl 1969a: 96–7, Hua XVII 84–5, and indirectly to his programme in Husserl 1970a: §9f. 45, Hua VI 44–5. Husserl locates its origin in the Euclidean ideal and also in Leibniz's conception of *mathesis universalis*. On Husserl's relation to Hilbert, see Mahnke 1977 and Heelan 1989.
- 7 Husserl never departed from this conception of an achieved science in *Formal and Transcendental Logic* (1929). Husserl's view of science as a complete axiomatic system of interconnected propositions is of course challenged by Gödel's Incompleteness Theorem (1931) which shown the impossibility of Hilbert's aims at complete formalisation. On the other hand, Husserl may be defended on the grounds that he treated this merely as an ideal, and in fact acknowledged the infinite nature of scientific discovery left a great deal of room for different ways of organising the system of propositions. Husserl held that there would inevitably be material forms of relation and dependency which resisted formal axiomatisation. Thus Husserl talks of intuitive unifications which cannot be expressed in the logical calculus in *Experience and Judgment*

- (1973a), § 62: 248. For a discussion of Husserl's conception of science as formal axiomatisation in relation to Gödel, see Bachelard 1968: 52 ff.
- 9 This is from an entry in Husserl's notebook dating from September 1906.
 - 10 Husserl's recognition that theoretical knowing is itself a kind of *praxis* was developed by Heidegger into a central theme of *Being and Time* (1927).
 - 11 Throughout his life Husserl refers frequently to the formulations 'truth in itself', 'propositions in themselves' and so on, usually deliberately evoking Bolzano's project of the theory of science as a theory of objective meanings.
 - 12 Husserl gives more detail on this in his *Erste Philosophie* lectures of 1923–4, Hua VII, and in Husserl 1969a, Hua XVII.
 - 13 Husserl refers to *Logical Investigations* in Husserl 1965: 80, Hua XXV 9, and again in Husserl 1983, § 20: 37–8, Hua III/I 37–8.
 - 14 Husserl's conception here can be compared with Quine's notion of a 'web of belief', see Smith and Woodruff Smith 1995: 33.
 - 15 See for example Husserl 1970a: § 34e: 129–30, Hua VI 132–3. Bolzano's conception of science is set out in *Wissenschaftslehre* §1, translated as *Theory of Science* (Bolzano 1972: 1). Bolzano characterises the theory of science as the manner in which the various *treatises* or textbooks of the sciences are to be laid out and ordered. Husserl departs from this particular interpretation of *Wissenschaftslehre* in Husserl 1970b, *Prolegomena* § 12: 73, Hua XVII A29.
 - 16 Furthermore, Husserl encouraged student like Arnold Metzger who wanted to promote a phenomenology of revolution, for example.
 - 17 See Husserl's 1936 essay 'The Origin of Geometry,' Husserl 1970a: 353–78, Hua VI 365–86, for an analysis of how geometry as a science is made possible by intersubjective communal practices and especially 'by means of language through which it achieves, so to speak, its linguistic living body (*Sprachlieb*)' (Husserl 1970a: 358, Hua VI 369).
 - 18 In his 1925 lectures on *Phenomenological Psychology* (Husserl 1977), Husserl states that the objectivity of modern science is in fact 'an artificial product of method' (Husserl 1977: §5 pp. 39–40, Hua IX 54).
 - 19 See Husserl 1970a: § 36, p. 141, Hua VI 144. For a discussion of Husserl's criticism of formal logic, see Willard 1979.
 - 20 For a clear discussion of this point see Hanna 1993.
 - 21 For the similarity between Husserl's conception of science and that of David Hilbert and Felix Klein, see Heelan 1989.
 - 22 Frege proposed a similar distinction in his *Grundgesetze der Arithmetik* (1893), translated as *Foundations of Arithmetic*, whereby logical laws are descriptive of ideal truths which can of course be reformulated as norms. See Kusch 1995: 34.
 - 23 In a sense Husserl is carrying out a critique of the metaphysical assumptions of science, also found in Alexandre Koyré and in E. A. Burt.
 - 24 Husserl has been criticised for overemphasising Galileo's Platonism. Whereas traditional Platonists held that the world of experience cannot be forced into the straitjacket of exact quantification, Galileo believes an exact mathematical pattern is concealed beneath the sensible cloak. See Gutting 1978–9.
 - 25 It is noteworthy that historical investigation into Galileo's contribution to science has been carried out by Alexandre Koyré (1892–1964), who studied with Edmond Husserl at Göttingen from 1910 to 1912, in Koyré 1978. Husserl may have been influenced also by the discussion of Galileo in Ernst Cassirer's *Das Erkenntnisproblem*.
 - 26 Heidegger's critique of the global framework of technological reason as expressed in his essay 'The question concerning technology' (Heidegger

1978) is a clear development of Husserl's concerns.

- 27 See especially Putnam's Carus lectures, *The Many Faces of Realism* (Putnam 1987).
- 28 Putnam groups Husserl here with the later Wittgenstein and with Austin, see also Putnam 1990 p. 89.

Bibliography

- Albertazzi, L., Libardi, M. and Poli, R. (eds) (1996) *The School of Franz Brentano*, Dordrecht: Kluwer.
- Bachelard, S. (1968) *A Study of Husserl's Formal and Transcendental Logic*, trans. L. Embree, Evanston: Northwestern University Press.
- Bolzano, B. (1972) *Theory of Science*, trans. R. George, Oxford: Blackwell.
- Gutting, G. (1978–9) 'Husserl and scientific realism', *Philosophy and Phenomenological Research* 39: 42–56.
- Hanna, R. (1993) 'Logical cognition: Husserl's Prolegomena and the truth in psychologism', *Philosophy and Phenomenological Research* 53: 2 (June): 251–75.
- Heelan, P. A. (1989) 'Husserl's philosophy of science', in J. N. Mohanty and W. R. McKenna (eds) *Husserl's Phenomenology. A Textbook*, Washington, D.C.: Center for Advance Research in Phenomenology: 387–428.
- Heidegger, M. (1978) 'The question concerning technology', in D. Farrell Krell (ed.) *Heidegger. Basic Writings*, London: Routledge.
- Hill, C. O. (1997) 'Did Georg Cantor influence Edmund Husserl?' *Synthese* 113,1: 145–70.
- Horkheimer, M. (1972) 'Traditional and critical theory', trans. M. J. O'Connell, in *Critical Theory. Selected Essays*, New York: Seabury: 188–243.
- Husserl, E. (1950–) *Gesammelte Werke*, Dordrecht: Kluwer.
- Husserl, E. (1965) 'Philosophy as a rigorous science', trans. Q. Lauer, in *Phenomenology and the Crisis of Philosophy*, New York: Harper and Row.
- Husserl, E. (1969) *Formal and Transcendental Logic*, trans. Dorion Cairns, The Hague: Nijhoff.
- Husserl, E. (1970a) *The Crisis of European Sciences and Transcendental Phenomenology*, trans. D. Carr, Evanston: Northwestern University Press.
- Husserl, E. (1970b) *Logical Investigations*, trans. J. Findlay, 2 vols., London: Routledge and Kegan Paul.
- Husserl, E. (1973a) *Experience and Judgment*, trans. J. Churchill and K. Ameriks, Evanston: Northwestern University Press.
- Husserl, E. (1973b) *Zur Phänomenologie der Intersubjektivität: Texte auf dem Nachlass, Erster Teil: 1905–1920*, ed. I. Kern, Dordrecht: Kluwer.
- Husserl, E. (1977) *Phenomenological Psychology*, trans. J. Scanlon, The Hague: Nijhoff.
- Husserl, E. (1981) 'Renewal: its problem and method', in *Husserl. Shorter Works* ed. P. McCormick and F. Elliston, Notre Dame: University of Notre Dame Press.

- Husserl, E. (1983) *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy, First Book*, trans. F. Kersten, The Hague: Nijhoff.
- Husserl, E. (1989) *Ideas Pertaining to a Pure Phenomenology and a Phenomenological Philosophy, Second Book*, trans. R. Rojcewicz and A. Schuwer, Dordrecht: Kluwer.
- Husserl, E. (1993) *Cartesian Mediations*, trans. D. Cairns, Dordrecht: Kluwer.
- Husserl, E. (1994a) 'Personal Notes,' in *Early Writings in the Philosophy of Logic and Mathematics, Collected Works V*, trans. D. Willard, Dordrecht: Kluwer.
- Husserl, E. (1994b) *Early Writings in the Philosophy of Logic and Mathematics, Collected Works V*, trans. D. Willard, Dordrecht: Kluwer.
- Koyré, A. (1978) *Galilean Studies*, trans. J. Mepham, Atlantic Highlands, N.Y.: Humanities Press.
- Kusch, M. (1995) *Psychologism*, London: Routledge.
- Mahnke, D. (1977) 'From Hilbert to Husserl: first introduction to phenomenology', trans. D. Boyer, in *Studies in the History and Philosophy of Science* 8: 71–84.
- Merleau-Ponty, M. (1964) *The Primacy of Perception*, ed. J. M. Edie, Evanston: Northwestern University Press.
- Putnam, H. (1987) *The Many Faces of Realism*, La Salle: Open Court.
- Putnam, H. (1990) 'After empiricism', in *Realism with a Human Face*, Cambridge, Mass.: Harvard University Press.
- Rollinger, R. D. (1996) *Husserl's Position in the School of Brentano*, Utrecht: Dept. of Philosophy.
- Rorty, R. (1980) *Philosophy and the Mirror of Nature*, Oxford: Blackwell.
- Smith, B. and Woodruff Smith, D. (eds) (1995) *The Cambridge Companion to Husserl*, Cambridge: Cambridge University Press.
- Sokal, A. and Bricmont, J. (1997) *Impostures intellectuelles*, Paris: Editions Odile Jacob.
- Willard, D. (1979) 'Husserl's critique of extensionalist logic; a logic that does not understand itself,' *Idealistic Studies* IX:2 (May): 143–64.