

METAPHYSICS OF SCIENCE

There is a resurgence of interest in the metaphysics of science, and Australasian philosophers have done much to help bring this about. This conference is being called to bring together philosophers from around the world who have worked on various aspects of this movement to discuss their findings, and consider new directions.

In the first half of the twentieth century, the dominant philosophy of science was logical empiricism. The logical empiricists were committed to:

- (1) a verificationist theory of meaning,
- (2) making a clear distinction between fact and convention,
- (3) discovering the empirical truth conditions for scientific theories, and
- (4) the rejection of all speculative metaphysics.

But, by the nineteen seventies, the dominant philosophy of science had become scientific realism, and the logical empiricist program had begun to fall apart. Falsifiability replaced verifiability as the principal criterion of empirical significance; the fact-convention distinction was undermined by Quinean holism; the search for empirical truth conditions was abandoned in favour of truth conditions across all possible worlds; and the demand for metaphysical explanation became respectable once more, although in a way that it had never been before. For acceptance of scientific realism required the development of an ontology fit to accommodate it: ‘What would the world have to be like fundamentally’, it was being asked, ‘for it to be able to accommodate the things, properties or processes discovered by modern science?’

Scientific realism became an important topic in Australasian philosophy with the publication of Jack Smart’s *Philosophy and Scientific Realism*. It led immediately to an exciting debate in the philosophy of mind, because of Smart’s defence of the then seemingly indefensible mind-brain identity thesis that had been proposed earlier by Ullin Place. Smart’s scientific realism was otherwise just a kind of commonsense realism about the substantive theoretical entities of physics, chemistry and biology, which, in itself may not have caused much of a storm. In defence of scientific realism, Smart argued that if things do in fact behave as if theoretical entities of these kinds exist, then the best explanation of this fact is that they really do exist. Therefore, he

concluded, if we are to have a rational system of beliefs about what there is in the world, it had better be one that admits things of these kinds. Any scepticism about the existence of such substantive theoretical entities as these, e.g. of the kind expressed by Mach and Östwald early in the nineteenth century was irrational, he thought: the only rational course would be to embrace an ontology that admits the existence of most of these theoretical entities, i.e. some kind of physicalism. The outstanding question, he thought, is whether a physicalist ontology can adequately accommodate our mental experience. Smart thought it could, and the philosophy of scientific realism that he developed became known as ‘Australian materialism’ – or the ‘Australian heresy’, depending on your point of view.

Interest in Australian materialism was reinforced, but taken in a new direction, in David Armstrong’s *Universals and Scientific Realism*. Armstrong argued that the arguments for scientific realism were also good arguments for realism about the kinds of properties that scientists need to postulate to describe the theoretical entities that they believe in. For these properties had to be natural properties, i.e. properties that things had by nature. They could not be thought of just as predicates. For predicates are human inventions, linguistic entities, not fundamental existents. Inevitably, this led to a whole new debate about the ontology of scientific realism – about what kinds of things natural properties really are. Armstrong argued that natural properties had to be considered to be universals – a status he would deny to mere predicates. And, working from an Aristotelian perspective, Armstrong developed his own unique theory of universals, known as ‘the sparse theory’. In his book *What is a Law of Nature?* Armstrong took the argument for universals an important step further by attempting to show that universals could do some real work in philosophy.

Elaborating the theories that had been proposed by Fred Dretske and Michael Tooley a few years earlier, Armstrong developed his own theory of laws of nature as contingent relations of necessitation between universals – a theory which he claimed could adequately explain all of the most important properties of laws, viz. their contingency, universality and natural necessity.

In his two recent books, *Scientific Essentialism* and *The Philosophy of Nature*, Brian Ellis took the debate about the ontology of scientific realism in another direction, breathing new life into the ancient theory of essentialism. Ellis argued, as Rom Harré

and Edward Madden had before him, that the arguments for scientific realism require that one should be a realist about many of the causal powers and other dispositional properties that are postulated as existing in nature. For the most fundamental properties in nature other than the relational ones all appear to be dispositional, and, as Ellis and Lierse argued in their joint paper 'Dispositional Essentialism', the case against dispositional realism is unsound. Ellis argued that if the basic properties in nature really are dispositional, then the most fundamental things in nature must be identified, not by their shape, size or any other categorical properties, but by how they dispose their bearers to behave. Moreover, if the most fundamental things in nature are all members of natural kinds, as indeed they would all appear to be, then these things must be bound to behave as they always do in the circumstances in which they find themselves. For they could not behave otherwise without ceasing to be things of the kinds they are. And, if this is the case, then the laws concerning the behaviour of such things are not contingent, as Armstrong and others have assumed, but metaphysically necessary.

If the argument for scientific realism requires a scientific ontology to be one that is realistic about causal powers, capacities and propensities, then the required theory of properties must be one that includes properties of these sorts. And several Australian philosophers have been involved in this project. In the 1990s, Charles Martin and the late George Molnar were doing pioneering work developing such theories. Phil Dowe, and Toby Handfield have pursued it further in more recent years, arguing for what they call a process theory of causation, which, they say, accounts adequately for the modality of causal laws, without denying Hume's dictum that there are no necessary connections between distinct existences. One interesting question that has arisen out of the discussion of causal powers is whether there are any basic properties that are not dispositional. Opinions are divided on this issue. Alexander Bird favours a strong form of dispositionalism, because he thinks that any admission of basic categorical properties will lead to quidditism. Ellis thinks that an ontology of scientific realism requires categorical relations, viz. spatio-temporal and numerical ones, as well as dispositional properties. If Ellis is right, then we may expect to see important developments on two fronts in scientific ontology – in the field of numerical relations and in space-time theory. In his book *The Reality of Numbers: A Physicalist's Philosophy of Mathematics*, John Bigelow has already broken new ground in

developing the required kind of theory of numerical relations.

The Australian interest in the metaphysics of science appears to reflect a broader movement that is taking place around the world. In New Zealand, where there has been a long-standing tradition of critical realism, going back to the days when Sir Karl Popper lectured in Christchurch, and Alan Musgrave and Robert Nola have been major contributors to the debate about scientific realism. In America, a new Society for the Metaphysics of Science has recently been founded with the explicit aim of promoting work in this area. John Heil, Eric Hiddleston, Jennifer McKittrick and Christopher Hitchcock, to name just a few, have all done distinguished work in this field. In Europe, there is a very active Metaphysics of Science Group led by participants from a number of British universities as well as a number of institutions on the continent. Ingvar Johansson from Sweden is involved in this area, and Helen Beebe, Hugh Mellor, Peter Simons, Alexander Bird and Stephen Mumford are some of the key figures active in this field in Britain. There has also been a major edited collection of articles that has appeared in French devoted to the re-emergence of metaphysics in the Australian school.

The aim of the Melbourne conference is to bring together many of those who have been involved in this area to take stock of what has been achieved, and to discuss new developments. Basic questions about such things as physical events and processes, properties and relations, causal powers, laws of nature, physical necessities and possibilities, kinds of realism, natural kinds and scientific essentialism are all on the agenda. But discussion will not be limited to the sorts of issues that arise out of the ontology of scientific realism. There are other aspects of the metaphysics of science, arising e.g. from truthmaker theory, that need to be considered. Also, a good metaphysical theory should have implications right across the board in philosophy, and the organizers of the conference would like to hear about what relevance the new metaphysics may have for other areas. Is James Ford right in thinking that there is an important shift occurring in the direction of philosophical thought, from 'meaning to being' – a shift that is comparable in significance to the one that Richard Rorty called 'the linguistic turn'? If so, then the revival of the metaphysics of science is indeed an important philosophical event.

Of course, one of the basic desiderata for an adequate metaphysics of science is that it not lose sight of the constraints that flow from science itself – in practice, most often, from modern physics. It is a familiar theme that physics may speak against realism about particular matters, such as absolute space, or an absolute present, or an objective flow of time. Here, too, Australasian philosophy has a distinguished tradition, dating especially from the work of Jack Smart in the 1960s. The guiding instinct of this tradition is to look to physics for answers as to what properly lies in the 'scientific image', to use Wilfred Sellars' term, and what merely in the 'manifest image'. More recently (and especially in his 1996 book, *Time's Arrow and Archimedes' Point*) Huw Price has taken up this 'Copernican' theme in scientific realism, with particular reference to the problem of the arrow of time. Price argues that physics itself has lessons to learn from this sort of philosophical enquiry: he maintains that confusions about the origins of the asymmetry of causation are impeding progress in the understanding of quantum mechanics. One thing we hope to explore at this conference is the relation of current work in the philosophy and physics of time-asymmetry to the metaphysics of causality and other modal notions. Price's *Centre for Time*, at the University of Sydney, will co-sponsor a symposium on these topics.

The Philosophy departments or programs of the University of Melbourne, Monash University and La Trobe University will jointly sponsor the conference, which will be held at the University of Melbourne in the first week of July 2009 (tentatively, from July 3rd to July 5th). These dates have been chosen to tie in with the annual conference of the Australasian Association of Philosophy, which is to be held in Melbourne from July 6th to July 13th. The Organizer for the conference is Howard Sankey, who is Associate Professor in the School of Philosophy at the University of Melbourne, and has himself been heavily involved in developing the theory of both critical and scientific realism.