What is scientific realism?

An important strand in the story of the philosophy of science in the past three decades has been a struggle between realists and anti-realists. The debate turns around the most adequate way of interpreting scientific theories that refer to unobservable entities, processes, and properties. Realists maintain that the entities postulated by scientific theories (electrons, genes, quasars) are real entities in the world, with approximately the properties attributed to them by the best available scientific theories. Instrumentalists, on the other hand, maintain that theories are no more than instruments of calculation, permitting the scientist to infer from one set of observable circumstances to another set of observable circumstances at some later point in time. (Important recent contributions to the theory of scientific realism include (Miller 1987), (Leplin 1984), (Putnam 1984), (Putnam 1982), and (Boyd 1984), (Van Fraassen, Churchland, and Hooker 1985), and (Gasper 1990).)

It is worth noting at the outset that scientific realism emerges from a tradition of thought in empiricist philosophy of science; but that it provides the basis for a cogent critique of many early positivist assumptions. In particular, scientific realists have rejected (obviously) the instrumentalism associated with logical positivism; the assumption that all scientific knowledge takes the form of empirical regularities; the assumption that the ultimate goal of scientific research is the formulation of lawlike generalizations; and, to some extent, the assumption that the hypothetico-deductive model is the unavoidable foundation of empirical reasoning in the sciences. Scientific realism is therefore a sympathetic basis in the philosophy of social science for those philosophers and sociologists who are most concerned to put aside the positivist origins of both philosophy of science and sociology. Mario Bunge argues strongly that scientific realism is most suited to an appropriate methodology for the social sciences; (Bunge 1993).

The issue of scientific realism has been one of the central hinges of debate within the philosophy of science for the past thirty years. The central issue is this: Do scientific theories and hypotheses refer to real but unobservable entities, forces, and relations? Or should we interpret theories and hypotheses as convenient systems through which to summarize the empirical regularities of observable entities and processes, with the apparent reference to unobservables as simply a "façon de parler" with no greater significance than the imagined can opener in the classic joke about the economist and the accountant? Scientific realism maintains that we can reasonably construe scientific theories as providing knowledge about unobservable entities, forces, and processes, and that understanding the progress of science requires that we do so. Instrumentalism denies that it is reasonable to interpret hypotheses as referring to real unobservable entities; instead, a scientific theory should be understood as an instrument of calculation, permitting the scientist to make predictions about one set of observable variables on the basis of knowledge of the current state of another set of observable variables. We may take Jarrett Leplin's formulation (Leplin 1984, pp. 1-2) as a representative statement of scientific realism:

1. The best current scientific theories are at least approximately true.
2. The central terms of the best current theories are genuinely referential.

3. The approximate truth of a scientific theory is sufficient explanation of its predictive success.
4. The (approximate) truth of a scientific theory is the only possible explanation of its predictive success.
5. A scientific theory may be approximately true even inferentially unsuccessful.
6. The history of at least the mature sciences shows progressive approximation to a true account of the physical world.
7. The theoretical claims of scientific theories are to be read literally, and so read are definitively true or false.
8. Scientific theories make genuine, existential claims.
9. The predictive success of a theory is evidence for the referential success of its central terms.
10. Science aims at a literally true account of the physical world, and its success is to be reckoned by its progress toward achieving this aim.

Debates about scientific realism most commonly derive their scientific examples from the natural sciences. The entities in question are such things as quarks, genes, quasars, and superfluids. But social theories too involve concepts that appear to refer to unobservable entities: classes, systems of norms, and scissors crises, for example. So the issue of realism arises in the social sciences as well. If we have an empirically well-confirmed theory that invokes the concept of an X (a hypothetical social entity or force), is this a reason to believe that X's exist? Or is there some reason to suppose that the ontological assumptions of scientific realism are justified in the natural sciences but not in the social sciences?

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