

NAMING THE SENSUOUSLY UNOBSERVABLE

There is a second defining theme of scientific realism over the last half century: while the investigations of science are always empirically grounded, it is a mistake to suppose them narrowed to observable phenomena as these present themselves to us. The radiator that has boiled over on a lonely Nevada road does not get refilled by hurrying off to the nearest mirage. Instead the microstructures that determine membership in a kind are often characterized by features that are sensuously unobservable – the quarks that make up the particles of an atomic nucleus would be an example. Thus the causally potent entities to which we accommodate our social practice are not exhausted by what can be seen, felt, tasted, touched, or smelt. That is, our grasp of what is real is necessarily confirmed by what we sensuously experience, but it cannot be reduced to that. For example: for a good part of the last century it was a matter of dispute in the philosophy of science whether atoms could be treated as real entities, but as I write a photo of a single molecule of the compound pentacene circulates on the internet, and the atoms that make it up are clearly delineated. Logical positivists recognized the need to appeal to theoretical constructs such as the atomic constitution of the molecule, but understood such appeals heuristically – these were conceptual models helpful in guiding research; nothing meaningful could be said about whether or not things that could not be observed could claim real existence. Indeed, faced with the pentacene photo defenders of such a view would have said, ‘okay, but we’re entitled to treat this as real now because the microscope has allowed us to see the molecule – it has extended our senses’. And yet if you ‘see’ by means of an electron microscope, or even a simple telescope, or, as in this case, atomic force microscopy, you then rely for your conclusions on theories about things like electrons and photons that you can’t observe.

But now we’re faced with a problem. When we use a term to refer we want to pick a thing out, point at it and distinguish it from its surroundings. But how do we mark out entities that escape our ability to point? How do we pick out the unobservables to which both philosophical realism and ordinary scientific practice are committed? Naming may work when we can point, but how do non-ostensive terms, those which do not point, identify for us things like electrons or fields or relational entities? How do we point at capital? Do we point at the boss? Point when she is in conversation with a worker? Point at the factory? At the machines? A balance sheet? Means of production? Products? Money?

Brian Enc (1976) makes clear that the only way we pick out unobservable entities is by means of theory. We start with the phenomena to be explained and postulate a theoretical entity that we propose accounts for them. We then identify the properties associated with the postulated entity as well as the explanatory mechanisms that work to explain. The burden of reference is carried by the identified properties and the explanatory mechanisms. Notice, however, a precision not developed by Enc: we can be quite wrong in our theory and successfully target important causal relations nonetheless – Boyd suggests that

18th century biologists were extremely good at distinguishing between cases in which structures in two different species are homologous and cases in which they’re analogous, and thus good at using the terms “analogy” and “homology” with their standard (contemporary) referents even though their conception of homology focused on

questions of design [by the deity] rather than of common evolutionary origin (forthcoming: 28; bracket added).ⁱ

That is, because “natural kinds are features, not of the world outside our practice, but of the ways in which that practice engages the rest of the world” (forthcoming: 19), even if we track causal structures imperfectly, reference may succeed.

Scientific realism’s attention to the sensuously unobservable challenged pervasive assumptions that the things of the world are either tangible or conceptual so that if a thing was not empirical it had to be an idea. According to such assumptions, when Marx spoke of the commodity as a thing that “transcends sensuousness” (1990: 163 [I.1.4]), the reader seemed forced to understand this as conceptual or ideal because it appealed to something beyond the empirical. For example, Louis Althusser (who remained trapped between the palpable and the conceptual) wrote of the historical significance of goings on in Louis XV’s bedroom by saying, “[a]s a general rule, concepts are not hidden in beds” (1979: 112). Indeed. But no doubt social kinds sometimes are, and Marx would have none of it:

Where the purely general form of capital as self-preserving and self-valorising value is being considered, it is declared to be something immaterial, and therefore, from the point of view of the political economist, a mere idea; for he knows of nothing but either tangible objects or ideas – relations do not exist for him (1988 MECW 30: 150).

The alternative Marx had in mind here invites vindication, and there is a mistake we can trace back at least to Hume. Science studies things and their interconnections, but interconnections, relations, are accessible to us only by means of thought: you can bump into a stone; you can’t bump into a relation, even one like adultery that might be hidden in bed. Thus from the fact that patterns -- such as the tendential patterns of necessity that exist between cause and effect -- can be discovered only *by* thought, Hume drew the conclusion that they exist only *in* thought, and he denied the existence of relations of natural necessity. That is, he subjectivized the relation between the dispositional powers of things and their material consequences. And the same dilemma was replayed with emphasis in social science: because social relations can be discovered only by thought, it was assumed they existed only in thought. But notice: while concepts, metaphysically innocent, crumple no bed sheets, and while no one bumps into a relation, it is nonetheless true that relations, materially instantiated, are causally potent. Arrange furniture in a room one way and you can walk through it; arrange it another and you can’t. To be, as Bhaskar (1989: 69) observes, is just to be able to do, but in our experience things exist and do only by taking form. That is, just as we cannot imagine the causal potency of things without matter, neither can we imagine the causal potency of things without taking into account their form, and taking account of form means grasping relation. In consequence, scientific realism’s vindication of the reality of unobservables led to a vindication of the reality of that which was relational – in addition to the empirically perceptible, the furniture of the world must comfortably include relations which, though discoverable only by thought, were materially instantiated, causally potent, and thus did not exist only in thought. Indeed, feedback was inevitable: the way opened to appreciating how relational interconnection is pervasive in all science, natural and social.

Epistemic access to relational interconnection depends on the power of abstraction. Here is Marx from the first Preface to *Capital*: “in the analysis of economic forms neither microscopes nor chemical reagents are of assistance; the power of abstraction must replace both”ⁱⁱ (1990: 90). Recall Enc’s point just referred to: we access the sensuously unobservable by postulating an explanatory mechanism connected by a causal chain to the event to be explained. The power of abstraction plays a critical role in both picking out the mechanism and tracing the interconnection to that which we observe. But too often Marxists and others suppose that abstraction means a retreat from specific properties considered concrete to an ideational space of empty generality. To abstract, the person supposes, means to look for something common, but this is done in a way that avoids or blurs properties that characterize a thing distinctively. Abstracting from all properties of a thing but color, for example, usually tells us little about what we may expect of it. Marx’s manuscripts are filled with examples of the way the concept of capital was diluted by ignoring its distinctive specificity: “*nothing is easier than to prove that capital is a necessary condition for all human production*. We have only to abstract from the specific characteristics of capital which make it into a moment of a particularly developed *historical* stage of human production” (1986 MECW 28: 189; 1973: 258 [emphasis in original]). By defining capital as stored labor, for example, we make it possible for the extension of the term to include the hunter-gatherer’s spear. Marx’s use of abstraction is instead like that of the experimental scientist -- a way of disregarding one specific thing to focus on another. Consider the way a natural scientist uses experimental design: she tests the force of gravity by dropping objects in a tube from which air has been removed; that is, she abstracts physically from one concrete feature of how an object falls in order to isolate another specific feature, which, though unobservable, she is able to confirm by its causal effect.ⁱⁱⁱ Marx looks for features common to instances of the social relation he studies, but these are particular properties that are concretely distinctive to it, and he scoffs at a search for common features empty of any distinctively specific content.

Two different forms of the power of abstraction can be usefully distinguished. First, by means of *selective attention* we abstract from all features of a thing except those which are the particular target of inquiry. As I’ve just explained, this is the kind of thing a natural scientist accomplishes by the way an experiment is designed. Marx abstracts from competition to consider the causally distinctive features that account for the resort to exchange in the first place. Second, by means of *dialectical attention* we grasp the interconnection of things – a physicist, for example, notices how the strong force binds subatomic particles to form protons or neutrons. When we say commodity producers produce use values useless to them for private exchange, we grasp the form of interconnection among producers that accounts for value. Notice: whether in the study of nature or social life, if materialism is to grasp interconnection, it must be dialectical.

To sum up the last two sections: initially words we use to refer to natural kinds must be thought of non-definitionally; in our investigations they function at first ostensibly rather than semantically. As Marx understood, this is a methodological point essential to materialism: meaning follows reference rather than the other way around. Second, the things of the world include entities discoverable only by thought insofar as they are sensuously unobservable or relational – the furniture of the world is not exhausted by the palpable and the conceptual. Third, the power of abstraction is both a necessary complement to scientific experiment and is also indispensable to the social sciences where ordinary experimental methods are usually

unavailable. By means of the power of abstraction we focus selective attention on the causal properties of things and dialectical attention on their interconnection.

THE OBJECT OF MARX'S *CAPITAL*

Let me emphasize the three points I've just summarized; they include: (1) a materialist imperative with respect to the use of language -- that a precondition of a terminology adequate to the investigation of social kinds is that it approach meaning through reference; (2) an ontological imperative that among the things of the world are entities not fully accessible to the senses, including relational composites such as capital; and (3) a methodological imperative that the power of abstraction is indispensable to identifying relational social kinds and their kind constitutive properties. Appreciating the power of abstraction makes possible the identification of capital as a labor-form composite and the identification also of its simplest properties in their interconnection. Though these are discovered and expressed by definite categories of thought, they do not exist in thought. Thus equally essential is the recognition that it is not possible to reduce relational composites such as capital to either the empirical or the conceptual. Nevertheless, by recognizing that even the sensuously unobservable can be a real object, we can refer to such things by means of theory, work out their real definition by attention to the causal features that distinctively characterize them, and allow these features to regulate our beliefs about them. We persist in approaching meaning through reference.

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ⁱ Features that are homologous reflect a common evolutionary origin like the wings of a bat and the flippers of a whale; features that are analogous are similar in function but have evolved differently such as the wings of insects and the wings of birds. In (2003: 540) Boyd gives a different example that may be used to make the same point: Renaissance scientists used the term 'acid' to refer to reagents with an acrid smell, sour taste, and so on without anything approximating theoretical understanding of the unobservable properties that account for these empirical features; today we would refer to substances that are electron pair acceptors. Nonetheless, though theoretically superficial, Renaissance usage referred and we may speak of referential continuity. Issues concerning the continuity of scientific reference surface in considering Marx's relation to Ricardo, and I take these up briefly in Chapter Two.

ⁱⁱ Marx understated his point. Because the power of abstraction is essential to grasping interconnection, it is an important complement to experiment and essential to all science.

ⁱⁱⁱ Ian Hacking (1991) underscores that

Debugging is not a matter of theoretically explaining or predicting what is going wrong. It is partly a matter of getting rid of "noise" in the apparatus. . . . The instrument must be able to isolate, physically, the properties of the entities that we wish to use, and *damp down all other effects* that might get in our way (252; emphasis added).

Some features of an experiment you physically abstract from so they do not interfere; others you take precautions to eliminate to prevent any possibility that they do. Hacking offers an example from the 1970s of an instrument called PEGGY II that made use of electron spin to focus magnetically a stream of polarized electrons. This required using a laser beam to kick electrons off a particular crystal. Potentially disruptive features of the experiment included (1) jitters of the laser beam itself, (2) backscattering of dislodged electrons, and (3) the potential for dust particles in the apparatus polarizing as well. All these had to be controlled for so that they would not distort or falsify results and this was done by means of experimental design. Boyd (1985: 5; 8-9) shows how experiments that investigate

electrical phenomena must shield off the electrical hum that occurs at 60 Hz as a result of alternating current used in electric wiring in order to avoid distorting experimental results. Sampling also suggests an analogy to abstraction insofar as steps must be taken to ensure that the experiment is designed so that it will generate relevantly representative data.