Metascience (2018) 27:371–378
https://doi.org/10.1007/s11016-018-0343-x

SYMPOSIUM

Explanation and reality: comment on Chakravartty

Anjan Chakravartty: Scientific ontology: integrating naturalized metaphysics and voluntarist epistemology. New York: Oxford University Press, 2017, 296pp, US$74.00 HB

Michael Strevens[1]

Published online: 10 July 2018
© Springer Nature B.V. 2018

Chakravartty's naturalized metaphysics

The title of Anjan Chakravartty's fine new book, *Scientific Ontology*, works in two ways. On the one hand, Chakravartty's topic is, as you might expect, the metaphysics of science in a broad sense: both the reality of unobservable entities and the nature of laws, causes, and probabilities are topics for discussion. On the other hand, the approach to resolving these questions is naturalistic, meaning that scientific reasoning takes the lead in guiding philosophers toward the answers. The ontology of science, then, done scientifically.

In deciding what entities to commit to—dark matter, neutrinos, relations of nomological necessitation—Chakravartty's "naturalized metaphysics" instructs us to consider just two factors. The first is our ability to test a metaphysical hypothesis empirically. If we have many highly discriminating tests for dark matter, then it is the sort of thing that we might commit to, provided those tests yield positive results. Chakravartty calls this factor *vulnerability*; I call it *testability*, because that is what it is. The second factor is explanatory power. If positing relations of nomological necessitation greatly enhances our ability to explain the observable, then necessitation is the sort of thing we might commit to; if it outshines its rival explainers, then actual commitment will follow.

As a consequence of the two-factor view, an entity whose existence is difficult to test and that does not offer much explanatory leverage is the sort of thing that, as naturalized metaphysicians, we should regard with philosophical suspicion.

✉ Michael Strevens
strevens@nyu.edu

[1] Department of Philosophy, New York University, New York, NY, USA

A putative unobservable or metaphysical entity will belong, then, in one of three categories:

1. Things whose existence we ought in the end to commit to.
2. Things that are scientifically respectable, but which we do not in the end commit to because of the outcome of various empirical tests or evaluations of comparative explanatory power.
3. Things that are not scientifically respectable because, due to a lack of testability and explanatory power, science is not in a position to speak on their existence. For the naturalist, if science has nothing to say, there is nothing that can be said (to human ears at least). Concerning the existence of these things, we should as a matter of principle suspend belief.

Scientific investigation will play the leading role in placing putative entities into the first two classes, but a not so coveted place in the disreputable third class can typically be assigned without much in the way of empirical activity, and thus by philosophers working from the comfort of their offices. And indeed, much of the philosophical literature on scientific realism and metaphysics ought to be understood, Chakravartty thinks, as an argument about what, on the grounds of inadequate testability and unimpressive explanatory power, belongs in the third class.

Perhaps for the sake of simplicity, Chakravartty treats testability and explanatory power as simple magnitudes: An entity avoids falling into the disreputable class by marshaling a sufficient combined quantity of testability and explanatory power. Even if testability and explanatory power are objective matters—and Chakravartty has his doubts, especially about the latter—what are definitely not objectively or even intersubjectively prescribed are: (1) the relative weighting of testability and explanatory power in determining a putative entity's aggregate respectability score, and (2) the threshold that the score must surpass if the entity is to avoid being declared disreputable.

Much philosophical disagreement in the scientific realism and metaphysics literature can be understood as a consequence, Chakravartty believes, of different standards for weighting and for the respectability threshold. Empiricists and other metaphysical skeptics have a relatively high threshold for respectability and most likely a relatively low weighting for explanatory power. Ontological enthusiasts have a lower threshold and tend to weight explanatory power more heavily. A definitive resolution to these disputes would therefore require some sort of philosophical argument for setting these epistemically all-important numbers at certain levels.

Chakravartty thinks it cannot be done. Different philosophers will inevitably take different "stances" to metaphysics, which will lead to different settings for explanatory weighting and the respectability threshold. A stance is not merely a set of numbers; you can take a deflationary stance, for example, that dismisses the entire enterprise of scientific ontology and the respectability threshold along with it. Or you can be an empiricist in some matters and an unapologetic metaphysician in others, as are "Humeans" in the vein of David Lewis, who dismiss necessary

connections but embrace quantum fields as the fundamental constituents of reality (Lewis 1994). What matters for Chakravartty's argument is that the weightings and thresholds in metaphysical reasoning are largely determined by stances. Stances are in turn largely determined by values or value-like states of mind, such as an appetite for ontological risk. Concerning these values there can be no disputing, thus, there are no right or wrong stances, beyond minimal standards of logical consistency and a certain "pragmatic coherence." Science's great metaphysical arguments are therefore largely irresolvable.

But that is just fine. We should take our stances and stand by them, even though we know that other stances are permissible. Chakravartty invokes a trenchant stance voluntarism in defending this position, speculating—rather implausibly to my mind—that the values underlying our stances are not "unconsciously absorbed" but are rather in some sense "chosen" (221). At the same time, we should stop pretending that we can settle our differences through philosophical argument. We might, as a consequence, find an inner intellectual peace.

Three sources of explanatory doubt in ontology

My principal criticism of Chakravartty's book is that, by treating explanatory power as a single magnitude, he has flattened the philosophical dialectic in a way that unduly favors his rather defeatist, if cheerful, attitude to scientific ontology. Once some of the character and grain of explanation's role in metaphysical reasoning is brought out—a task I attempt in what follows—it will be seen, I hope, that although "stances" may play a role in guiding our ontological deliberation, they do not dominate our judgments.

I will examine three different ways in which thinking about an entity's putative explanatory power might lead you to suspend belief about its existence:

1. The entity is not, on close examination, doing any explanatory work.
2. The explanatory work done by the entity is real but, in a sense to be explained, "one note".
3. The entity is doing explanatory work only on a dubious conception of the nature of explanation.

In each case, I will argue, explanatory power cannot be weighed separately from other considerations; consequently, an ontologist cannot simply add the impact of explanatory factors to the impact of testability using some freely chosen weighting scheme. More generally, the role of "values" in explanatory deliberation is, though real, far less important than Chakravartty makes out. I conclude that Chakravartty has more work to do if he is to convince the rest of us to follow him into ontological quietism.

Explanatory idlers

A theoretical entity that does no explanatory work has no explanatory power, in the sense relevant to determining how likely the entity is to exist, that is, determining what subjective probability to attach to the entity's existence, or more crudely, whether to believe in the entity. Frequently, however, explanatory power in this sense figures directly in the logic of theory testing rather than as a consideration quite separate from testability. I suspect that Chakravartty would not dispute this, so I will be brief.

One way for a putative entity to find itself doing no explanatory work is for it to be supplanted as an explainer by some new discovery. Vitalism suffered this fate; as biological knowledge increased, entelechy or vital spirit was left with nothing to do. Its ejection from science was accomplished not by some separate department of explanatory deliberation, but by inductive logic. As rival explainers came to light, the existence of entelechy was disconfirmed, as the existence of Bigfoot is disconfirmed when various supposed sightings are debunked.

In this mode of thinking explanatory power and testability are joined in an inductive tango, moving together as one. What is (putatively) explanatorily relevant to a phenomenon are the (putative) causal difference-makers for the phenomenon. The elements of a causal model for a phenomenon that make a difference to the phenomenon are just those things that make a difference to the fact of the model's predicting the phenomenon (modulo a few niceties; Strevens 2008). What is confirmed when a predicted phenomenon is observed, and disconfirmed when it is not, are the things that played a role in the prediction. Inductive reasoning in science is therefore in great part reasoning to the explainers of what is observed. A credible theoretical entity is consequently one that does a lot of explaining, but in coming to be convinced of its existence, there is no decision to be made as to how heavily to weight empirical testing against explanatory power. There is a single, unified deliberation in which confirmation and explanation are two facets of a single line of thought.

Explanatory monotony

A credible theoretical entity will do a lot of explaining, I wrote in the previous section. That is true, but in deciding whether to commit to the entity's existence, it matters a great deal what kind of explaining it does—a point often neglected in the literature on scientific realism.

Consider the cautionary tale of Newtonian gravity, the force posited by Newton by which massive bodies attract one another. In 1846, when the planet Neptune was discovered by using Newton's theory to compute its position from observed perturbations in Uranus' orbit, the existence of gravity might have seemed indubitable. Seventy years later it was on the way out. Einstein had given the world good reason to believe that there was no such thing as gravitational force, that celestial bodies such as Neptune were tracing geodesics through curved space–time almost entirely free of any direct dynamic influence.

Was Nature toying with the nineteenth-century physicists, giving them compelling reason to believe in gravity then cruelly snatching it away? Or was there something about gravity that should have set off a little epistemic alarm? The explanatory power of Newtonian gravity could hardly be questioned: When doing celestial mechanics, it is the F in the $F = ma$ that disclosed Neptune's existence and much else besides. Yet there is all the same something a little explanatorily shallow about gravity. It only does one thing: tug. That tug explains an enormous range of phenomena, but in every one of those explanations the role of gravity itself, as opposed to other aspects of Newtonian theory, is identical and extremely simple. It might not have been so difficult for a thoughtful nineteenth-century physicist to see that gravity could be replaced, that something of quite different character might account for the same patterns of acceleration. This philosophical scientist would have been shocked had Newton's physics turned out to be quantitatively badly off in normal contexts—and indeed, its deviation from relativistic physics outside of extreme situations is microscopic. But that those quantitative predictions should have been implemented by something other than a Newtonian force: that should have seemed not so outlandish.

Compare gravity in the nineteenth century with microorganisms such as *E. coli* in the twenty-first century. Only an idiot or an extremist would deny the existence of those little friends and troublemakers. Even empiricists maneuver mightily to allow them into the ontological fold. What makes us so sure of their existence? I suggest that it is the multivalence of their explanatory role. Like gravity, they explain many things. Unlike gravity, they explain these things in many different ways. To account for illness, digestive function, the kinds of DNA found in various biological preparations, and the pictures of clusters of rod-like things seen through microscopes, *E. coli* must be attributed a wide range of different properties: a certain shape, size, internal molecular configuration, the ability to implement numerous biological mechanisms. An adequate scientific replacement for *E. coli* would have to replicate all of these properties, or something like them. What could do the job? Only something much like *E. coli* itself.

What, by contrast, could do Newtonian gravity's job? Like a nineteenth-century scientist, I might not be able to conceive of the Einsteinian story, but it is reasonable nevertheless for me to think that there might be some alternative. I do not mean that the scientist should expect it to be replaced; rather, they should stop a couple of steps short of enthusiastically endorsing the force's existence. The same goes for ether and dark energy. Even in the best theories in which they find themselves, they are one-note explainers. Thus, they are far easier to replace than the unassuming *E. coli*.

Note that the importance of microscopy on this way of thinking is not that it harnesses our visual capacity in a sophisticated fashion, but rather that it allows *E. coli* to express themselves explanatorily in so many different ways, because it picks up so many different, and differently explained, features of the things on the microscope's stage. What matters is not whether we see something, but how many aspects of it we detect. The same goes for the ontologically revealing power of telescopes. Likewise, the importance of our ability to "intervene" on a putative entity is indirect: Intervention provokes many more behaviors that may each, for their explanation, require the entity to act in certain specific ways (Hacking 1982).

To sum up, explanatory multivalence is a powerful consideration in favor of ontological commitment; ceteris paribus, there is more reason to believe in entities that explain in many ways than those that explain in just one way. As with explanatory idlers, this form of explanation-driven reason for belief is tightly integrated into inductive reasoning; it is as much about testability or testedness as it is about explanatory power. Again, then, there is limited scope for values or "stances" to do more than put a finger on the scale.

Explanatory changelings

According to Armstrong (1983) and Dretske (1977), we should posit nomic necessitation relations between properties in order to explain the regular patterns we see in the world around us. In response, some empiricists have called into question the very enterprise of explaining regularities with necessities. The most famous of such arguments is Hume's case that our thoughts about nomic necessitation concern no such thing. What we take to be a force of necessity capable of stamping regularity onto the world is in fact an internal experience of succession, or something like that. An entire mode of explanation is therefore invalid, and cannot be used to infer the existence of unseen explainers.

Or consider van Fraassen's argument that explanation is not a part of the scientific enterprise—that it is a matter of using scientific and other knowledge to answer questions, rather than of picking out some kind of objective structure in the world that is capable of revealing certain of its unseen foundations (van Fraassen 1980).

Unlike the explanatory arguments considered in the previous two sections, which might feature in ordinary scientific deliberation, these are full-dress philosophical arguments. But does their force rest largely on a "stance"? Surely not. The Humean argument has important psychological premises; if these were rejected, as indeed they have been, then the argument would fail. Van Fraassen's argument makes substantive claims about scientists' attitude to and practice of science; it too is empirically refutable. That is not to say that a stance, or the values underlying a stance, might not affect the force of the arguments somehow. But there is much more to their effectiveness than a weighting of explanatory power or a threshold for the acceptance of existence claims.

Simplicity

Are there any other ways that explanatory considerations militate for or against ontology? It is often said that simpler explanations should be valued more highly than complex explanations. Explanatory simplicity is the sort of virtue that, on the face of things, can be cleanly separated from questions about confirmation, and hence funneled into an assessment of the explanatory power of a metaphysical thesis that is separate from the assessment of its testability—thereby putting the weighting of testability versus explanatory power back in play as a factor through which stances can steer ontological reasoning.

On closer examination, however, many salutes to explanatory simplicity, especially those that seem to bear strongly on the strength of our commitment to some entity or other, fall under one of the categories discussed above. In one type of case, Occam's ontological razor is cutting away entities or structures that do no explanatory work. In another, such as the early twentieth-century arguments for atomism, touting the simplicity of an explanation is a way of drawing attention to how many different kinds of explanatory work are being done by a single entity or structure—how like *E. coli* it is, and therefore how worthy of our belief.

There may well be further ontologically probative work for appeals to explanatory simplicity to do. But it will be dwarfed, I think, by the explanatory considerations considered so far. So it can offer only a very limited role for stances to play in determining ontological commitment.

Risk

My target throughout this piece has been the importance of the relative weighting of testability versus explanatory power. Suppose for the sake of the argument that it has no importance at all—that all explanatory considerations relevant to ontological commitment are built, one way or another, into testability. There remains the question of the threshold: How much testability is necessary to render an entity respectable? If the threshold is set largely by stances, then there is still enormous scope for incontestable values to decide metaphysical allegiances.

I will not give an argument for dispensing with the threshold. Let me rather remark that it seems unlikely that actual philosophical disputes about ontology turn on differences in threshold. I doubt, in particular, that many empiricists' empiricism rests on their having a high personal threshold for accepting existence, that is, a high degree of ontological risk aversion. Was van Fraassen a more timid soul than David Lewis? Were the logical positivists epistemological wimps? A risk-driven account of their motivations does not ring true. Chakravartty is right to underline the role, in ontological reasoning, of affective forces such as the intimation that ontologically, you are "skating on unbearably thin ice" (215). But I suggest that these feelings are kindled not by values but rather by various philosophical and scientific arguments. Arguments can be assessed—and so, therefore, can metaphysical theses.

You might wonder in a Chakravarttian vein whether our disposition to accept such assessments and critiques, whatever the intermediary role of logic and the other canons of good reasoning, in the end depends largely on the stances we take, and thus on the values we espouse. How else to account for the enormous variation in views across so culturally homogeneous a population as Western European philosophers? I suggest as an alternative explanation the institutional pressure to diversify intellectually, along with the natural human predilection to believe whatever you are currently saying. There is voluntarism of a sort here, as you move for professional reasons into new niches in logical space, but it is hardly immune to philosophical and other forms of reasoned critique.

References

Armstrong, D.M. 1983. *What is a Law of Nature?*. Cambridge: Cambridge University Press.
Dretske, F. 1977. Laws of Nature. *Philosophy of Science* 44: 248–268.
Hacking, I. 1982. Experimentation and Scientific Realism. *Philosophical Topics* 13: 71–87.
Lewis, D. 1994. Humean Supervenience Debugged. *Mind* 103: 473–490.
Strevens, M. 2008. *Depth: An Account of Scientific Explanation*. Cambridge, MA: Harvard University Press.
van Fraassen, B.C. 1980. *The Scientific Image*. Oxford: Oxford University Press.