Different Ways to be a Realist: A Response to Pincock

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In his chapter in this volume, Christopher Pincock develops an argument for scientific realism that incorporates what is required for scientific understanding and, then, what is required for that understanding to suffice as a basis for scientific knowledge. He then argues that Giere's (2006) and my (2017, 2020) commitment to the context-dependence of scientific understanding or knowledge renders our views unable to account for an essential step in how scientists come to know, namely, the extrapolation of findings from specific experimental and observational contexts.

Meanwhile, in my chapter in this volume, I focus on the apparent challenges to scientific realism introduced by scientific modeling and, especially, idealization. I use these challenges to motivate a scientific realism according to which the objects of scientific knowledge are causal patterns. Knowledge of causal patterns in turn provides understanding of the phenomena embodying these patterns. Let's call this 'causal pattern realism.' In this response, I will sketch a revised version of Pincock's proposed argument for realism that is consistent with causal pattern realism. Then I will respond to Pincock's concern that the context-dependence of understanding on my view would, if true, interfere with the scientific community's ability to extrapolate from specific experimental and observational contexts as needed to develop knowledge. My goal is not to convince anyone to be a causal pattern realist but rather to create the space for such a view, taking into account the concerns motivating Pincock.

1. Different Kinds of Realism

Christopher Pincock and I are both scientific realists. Further, I accept something like Pincock's proposed argument for realism. A good starting point for determining the alignment and differences between our versions of realism is, I suggest, to ask *about what* we are realists. In my chapter in this volume, I urged careful consideration of what is taken to be the target of scientific realism, i.e. the objects of scientific knowledge.

I'll begin by characterizing what Pincock's chapter is advocating realism *about* (on the basis of our best scientific findings). In several places, Pincock indicates this is a question of the reality of unobservable objects. For instance, in the conclusion of his enumerated argument from understanding to knowledge: "Therefore, the agent knows of the existence and character of some unobservable entities." This is a classic focus of debates about scientific realism: whether scientific findings suffice for us to know of the existence of, e.g., subatomic particles. Yet, earlier in the paper, when introducing the experiment demonstrating Coloumb's law, Pincock offers what I take to be a different target for realism. He says, "the best explanation of the experimental manipulation of the gold leaves is that these theoretical claims are true, and that the mechanisms in question really are operating to produce the experimental effects."

So, here are four candidates for what Pincock thinks we should be realists about:

1. Existence of unobservable entities
2. Character of unobservable entities
3. Truthmakers of theoretical claims
4. Mechanisms under investigation

Of course, one might hold a realism that combines these: perhaps what it is to have knowledge of the existence and character of unobservable entities just is to know theoretical claims bearing on

those instances, and perhaps knowledge of these theoretical claims just is to possess knowledge of the mechanisms in which they participate.

However, in my view, these four candidates for objects of scientific knowledge do not align so neatly, and most are not apt targets for scientific realism. Regarding (1), the existence of unobservable entities is only very occasionally what is at issue in scientific discovery. Consider the extraordinary amount of scientific research conducted on Covid-19 in the early 2020s. Scientists determined quickly that SARS-Cov-2 was the novel coronavirus responsible for Covid-19. At that point, research turned toward downstream questions bearing (variously) on understanding and controlling the spread and effects of this virus.

Regarding (2) and (3), scientific discoveries do, arguably, more often bear on knowledge of the character of unobservable entities, and such knowledge plausibly consists of theoretical claims. But knowledge of the character of some entity is open-ended in a way that knowledge of its existence is not. How many theoretical claims must be known to suffice for realism about the character of an entity? Merely requiring knowledge of one theoretical claim in which the entity factors is surely too weak, but knowledge of all true theoretical claims in which the entity factors seems too formidable a standard. For this reason, (3) might be a preferable candidate. We can speak of knowing theoretical claims, even if we are uncertain about whether these claims suffice as a basis for knowing the character of some (unobservable) entities. (Of course, there's also the well-worn issue of how to meaningfully distinguish between observable and unobservable entities. Sidestepping this issue is another advantage to focusing on the objects of theoretical claims as a target for scientific realism.)

Regarding (4), many theoretical claims in science arguably do not regard, or at least do not directly regard, mechanisms. Above I indicated that existence of entities is a narrow segment

of the targets of scientific investigation, and the same is so for repeat processes carried out by the coordinated activity of some entities (the sense of 'mechanism' emphasized by the 'new mechanists', e.g. Machamer et al., 2000). Perhaps by 'mechanisms under investigation,' Pincock instead means something more generic like 'how this entity behaves.' In that case, though, mechanisms under investigation as a target for realism has the same difficulty as does targeting the character of entities: how much knowledge of a mechanism suffices for us to be realists about that mechanism? Surely knowledge of mere existence or a sliver of knowledge of its workings isn't sufficient but complete knowledge too high a standard. A related downside to (2) the character of unobservable entities and (4) mechanisms under investigation as targets for scientific realism is that whether something is posited as real does not seem like it should be a vague category, yet each of these targets requires judgment calls regarding how much knowledge suffices for realism.

Therefore, (1)-(4) identified above are not, I think, interchangeable targets for scientific knowledge. And, in my opinion, (3)—theoretical claims—is the most promising candidate on the list.

I'll now briefly explore how this relates to the causal pattern realism I outlined in my chapter in this volume. There I emphasized the divide between knowledge of theoretical claims and knowledge of the character of entities (or mechanisms) under investigation. I think we should be realists about—that is, posit that we have scientific knowledge of—the objects of well-corroborated theoretical claims. But those objects are not unobservable entities, mechanisms, or even the phenomena under investigation. Rather, science's theoretical claims (when successful) often yield knowledge of *causal patterns*. Causal patterns—real patterns à la Dennett (1991) involving manipulability relations à la Woodward (2003)—are embodied by specific

phenomena. However, claims about causal patterns are by and large not (strictly) true of the phenomena embodying them due to widespread idealization, and bear on only some limited aspects of the phenomena (Potochnik, 2017). So, I endorse Pincock's focus on theoretical claims as a target for realism, but I have suggested that this target diverges from the entities and mechanisms under investigation.

Only minor revisions to Pincock's argument for realism from understanding are required to bring it in line with the causal pattern realism I have motivated. In Pincock's summary, "the agent believes their theory, and deploys their belief in these charged particles when they build and manipulate their experimental apparatus." In this statement, the beliefs in question regard both theoretical claims and existence of unobservable objects. Alternatively, it may be that an agent takes their theory or model to adequately capture the target phenomenon for the purposes at hand, i.e. the agent believes that the theory or model is true *of a causal pattern* embodied by the phenomenon. I have argued in previous work (2017, 2020) that this can suffice for scientific understanding (of the target phenomenon) and scientific knowledge (of the causal pattern).

2. Different Roles for Context

I have suggested that minor edits make something like Pincock's understanding-based argument for realism available for my causal pattern realism as well. But a primary aim of Pincock's paper is to show that an argument for realism such as he deploys is not available to perspectivalists, a camp in which he includes me. Indeed, Pincock argues that an element of my view is inconsistent with essential requirements for the scientific community coming to know. To have any hope of maintaining my causal pattern realism, I must address that criticism.

The trouble, as Pincock sees it, regards the context-dependence of understanding on my account. This is a version of what he takes to be a general difficulty with perspectival realism, including Giere's (2006), that any scientific knowledge qualifies as such merely from the perspective of a particular scientific context. Pincock summarizes how this falls short of realism thusly: "What is known here is a genuine feature of the world. It is not qualified or conditioned by the context that enabled its discovery." H correctly points out that I have argued for a similarly perspectival character to scientific explanations (and understanding). In my view, the character of an explanation depends not just on the explanandum but also on the occasioning research interests—the context in which the explanation is formulated. The problem with this is, according to Pincock, as follows:

> The agent may come to know that a given causal pattern is embodied in their phenomena, but this knowledge is insufficient to defend scientific realism. The understanding achieved from within one research community involves knowledge that is restricted by the aims of that community. So there is no way for an agent in one community to draw any conclusions about what would occur if their research interests changed or if they aimed to study the phenomenon in a fully objective fashion.

I agree with Pincock's interpretation of my view that a causal pattern's ability to explain (or, equivalently, to engender understanding) depends on the research interests of those seeking explanation; see (Potochnik, 2016) for my fullest defense of this idea. One scientist's or lab's or scientific field's explanation may well not be an explanation for a scientist, lab, or field with different questions, even regarding the very same phenomenon.

However, there is a distinction available that can protect my view from the conclusion scientific knowledge cannot transcend the specific research context of its discovery. In my view,

if knowledge of some causal pattern discovered in a particular research context is unenlightening in a different research context, this is not because it ceases to obtain but simply because it no longer engenders understanding. Other researchers may well have different questions about the phenomena under investigation, questions that are answered with information about different causal patterns. On my view, and in agreement with Pincock's line quoted earlier, causal patterns are "genuine [features] of the world". Their existence "is not qualified or conditioned by the context that enabled its discovery." Yet the content of our scientific knowledge nonetheless does depend on the research interests that occasion this knowledge. This combination is possible because phenomena investigated in science embody many, even countless, causal patterns—by and large more than scientists will ever seek to know. One can have some (objective, context-independent) knowledge of some phenomenon without having the right knowledge for one's purposes.

To summarize, for my causal pattern realism, the context-dependence of scientific knowledge consists not in whether a causal pattern exists but merely in whether a causal pattern is of interest—and thus properly explanatory. Different scientific communities will disagree about the importance of some causal patterns, while other causal patterns will never come to be investigated by any practicing scientists. Our scientific knowledge is thus always partial and bears the indelible mark of our interests. Yet it is still full-fledged knowledge. This form of context-dependent explanation does not result in a merely contextual definition of scientific knowledge, for the context-relativity does not regard the truth (of causal patterns) but the cognitive value to the explainers or knowers.

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