UCLouvain

FIAL
Un éventail de formations, une multitude d'horizons

Scientific Realism

LFILO2602 – Philosophy of Science
Session 7

The Logical Positivists

In general: Anti-realists, given that the fundamental level of all our experience is **sense data** (and we have no direct experience of electrons or wave functions)

> As for the “reality” of atoms: I have no doubt that, if atomic theory corresponds to the reality given by the senses, the conclusions drawn from it will also bear some relation to the facts – though what relation remains unclear. […] The findings of atomic theory, likewise, can undergo a variety of convenient reinterpretations, even if we are in no great hurry to take them for realities. So all honor to the beliefs of physicists! But I cannot share them myself. (Mach 1910)

The Logical Positivists

But that implies a complex **semantics** : you have to **logically define** the unobservable vocabulary of science (like “electron”) in terms of the observable vocabulary (like “point on the screen”).

That semantics simply doesn’t work. For two reasons.

Anti-Realist Semantics

First: There is no guarantee that the logic that results from this kind of replacement of terms is actually going to be useful! More precisely, there's no guarantee that it will be **axiomatizable** in a non-trivial way.

If the set of axioms is too big, the science that results will be useless for prediction and explanation!

Anti-Realist Semantics

Second: It's doubtful that there is a clear distinction between **observable** and **unobservable** or **theoretical** entities.

Here's where we bring in Maxwell's argument.

Observable and Unobservable

The point I am making is that there is, in principle, a continuous series beginning with looking through a vacuum and containing these as members: looking through a windowpane, looking through glasses, looking through binoculars, looking through a low-power microscope, looking through a high-power microscope, etc., in the order given. The important consequence is that, so far **we are left without criteria which would enable us to draw a non-arbitrary line between "observation" and "theory."** (Maxwell, 7)

Observable and Unobservable

First move: Maybe it's only the things that are impossible to observe **in principle?**

> By trying to show that we can talk about the *possibility* of observing electrons without committing logical or conceptual blunders, I have been trying to support the thesis that any (nonlogical) term is a *possible* candidate for an observation term. (Maxwell, 11)

Observable and Unobservable

Second move: Maybe we just need to replace all our theoretical terms by terms that refer to sense experience?

> ...the fact remains that the referents of most (not all) of the statements of the linguistic framework used in everyday life are *not* sense contents but, rather, physical objects and other publicly observable entities. ...[A]lthough there is good reason to believe that they play an indispensable role in observation, we are usually not aware of [sense data] when we visually (or tactilely) observe physical objects. (Maxwell, 13)

A Defense of Realism

> The only reasonable explanation for the success of theories of which I am aware is that well-confirmed theories are conjunctions of well-confirmed, genuine statements and that the entities to which they refer, in all probability, exist. (Maxwell, 18)

The “No Miracles” Argument

We want our theory of the scientific process not just to tell us what theories are, but **why theories work.**

This becomes the **“no miracles”** argument for realism (following Putnam): if something like realism was not true, **the success of science would be a miracle.** If we don’t want to allow miracles, we have to accept scientific realism.

Classic Realism

From the 1950s to the 1980s, most philosophers of science accepted a kind of “classic realism”:

1. Scientific theories are approximately true, and new theories are more true than older ones.
2. Scientific terms (even the theoretical or unobservable ones) really refer to objects in the world.
3. New theories can explain the success of old theories, often by including them as “limiting cases.”

In 2020, 72% of philosophers said that they “accept or lean toward” scientific realism.

Classic Realism

This position reads the “no miracles” argument as an abductive argument, or an “inference to the best explanation” (Laudan, 21):

1. If scientific theories are approximately true, then they will usually be empirically successful.
2. If the central terms of scientific theories refer, those theories will usually be empirically successful.
3. Scientific theories are, in fact, empirically successful.
4. **Thus (probably),** scientific theories are approximately true and their central terms refer.

Laudan's Challenge

Laudan offers a version particularly poignant of what has come to be known as the **pessimistic meta-induction** against classic scientific realism.

In short: Given that the majority of theories in the past have been (at least, according to us now) false, why thing that our current theories are different or better?

The argument is taken to contradict the inference to the best explanation for realism. Let's see how.

Reference and Success

1. The realist argues that the fact that the central terms of a theory refer makes that theory more likely to succeed.

Objection: We have lots of examples of theories that we think now have indeed referred, but were not at all successful (early versions of atomic chemistry or plate tectonics).

And this is to be expected! We can pick out the right objects in the world, but be totally wrong about how they behave.

Reference and Success

1. The realist argues that the fact that the central terms of a theory refer makes that theory more likely to succeed.

Objection: We have many examples of theories that were successful, but of which we now believe that they made no reference whatsoever to the external world (phlogistic chemistry, the theory of the ether, fluid theories of heat and electricity).

Approximate Truth and Success

2. The realist argues that the fact that a theory is approximately true makes that theory more likely to succeed.

Objection: But does a realist really want to say that a theory could be approximately true if its central terms **didn't refer at all?** We have (again) may examples of theories that we now think were totally confused about their ontology (Ptolemaic astronomy, phlogiston, ether...).

Preservation and Convergence

3. The realist argues that, in one manner or another, the success of former theories should be preserved by new theories.

Objection: That often doesn't happen; many theory changes leave aside lots of content and predictive power of old theories (see Kuhn).

Inference to the Best Explanation

4. The form of the realist argument is that of an inference to the best explanation.

Objection: But anti-realists often reject this form of inference entirely! So this begs the question.

A new anti-realism

Wait. Even if we accept all these arguments, this isn't actually a new kind of anti-realism that could respond to the other worries that we've already talked about. Where's the positive side of the theory?

Constructive Empiricism

Thus enters the **constructive empiricism** of van Fraassen. He argues that the most important failure of classic realism is that it is confused about the **goal of science.** Science is a practice that aims at **prediction and control of the world around us,** that is, of medium-sized objects in everyday life.

If postulating unobservable entities helps us do that, all the better – but we shouldn't take our ontology from science, **because that's not the aim of science.**

There's thus no need to "reinterpret" the observations of science, as the logical positivists did. We can accept them in their everyday meaning, just change their intention or their goal.

Saving Realism

One approach we didn't read: **selective realism**

Here, the problem with Laudan's argument is that he demands that **all** of the content of a theory refers, is preserved during theory change, etc.

We need to find **which parts of the theory are really important,** and then show that they (and only they) have been preserved over time. And (according to the defenders of this approach) we can do that.

Saving Realism

Aside: Many philosophers have also responded to Laudan's argument by reworking the idea of "approximate truth." There's a number of ways to rethink that concept.

Saving Realism

Another approach we didn't read: **structural realism**

Maybe the problem is that we're so worried about the status of **entities.** Can we build a concept of scientific realism that takes as fundamental the **structures and relations between entities** and thus doesn't need to defend a fundamental ontological status for scientific objects?