HPSC 1001/1901/2101/2901

WHAT IS THIS THING CALLED SCIENCE?

Semester 2, 2020

Lecture 10: Karl Popper (Continued)

A summary of how Popper wants things to go:

• Scientific theories are falsifiable in principle, and non-scientific theories are not.

• Falsification is deductive. If you observe something incompatible with the theory, the theory is falsified.

• When we try and fail to falsify a theory, it is not confirmed. It has survived testing so far – that is all we can say. Is this a threat to the rationality of science? No. It is fine if we can only ever show theories to be false. As we do this, knocking out one theory after another, we are learning at each step. This is a kind of progress.

Criticism

1. *Holism and falsification*

Popper on Einstein, who he saw as an outstanding case:

"… the impressive thing about this case is the *risk* involved in a prediction of this kind. If observation shows that the predicted effect is definitely absent, then the theory is simply refuted. The theory is *incompatible with certain possible results of observation* - in fact with results which everybody before Einstein would have expected." ("Science: Conjectures and Refutations")

What about the holistic nature of testing? As we saw earlier, only a theory together with various other assumptions has consequences for what we should observe. When a test comes out in an unexpected way, we always have choices about where to put the blame – on the theory itself, or on some other assumption.

This suggests that falsification as not as simple as Popper would like.

His response ("C&R," near end of s. 1)

> Some genuinely testable theories, when found to be false, are still upheld by their admirers - for example by introducing *ad hoc* some auxiliary assumption, or by reinterpreting the theory *ad hoc* in such a way that it escapes refutation. Such a procedure is always possible, but it rescues the theory from refutation only at the price of destroying, or at least lowering, its scientific status.

Popper seems to move from describing a feature of *theories* to a feature of scientific *behavior*. He is talking about how a scientific theory is handled by people. He is saying now that ideas can be handled more or less scientifically.

This seems different from what he said before about demarcation.

Maybe it's better?

Think again about Popper's examples of pseudo-science – Marxism and Freudianism. I think these are ideas that can be handled in more and less scientific ways. To handle ideas scientifically is to look for ways to expose them to observational test, and being willing to discard or modify them if they fail these tests.

Another problem with Popper's views of falsification: what about theories that do not say that some observation *can't* occur, but do say that something observable is very *unlikely*?

Lots of science is like this. In medical testing, for example, often the argument made is that if some new drug did not work, we would be very unlikely to see the test results we actually saw.

In cases like these, falsification is not deductive.
Unlikely ≠ impossible.

Popper's response was to say that if a theory says some observation is extemely unlikely, and we do make that observation, then we can *decide* that the theory is falsified. This is close enough to a normal falsification.
Is this an acceptable reply?

Next: a closer look at Popper's rejection of induction and confirmation.

From above:

How Popper wants things to go:

• When we try and fail to falsify a theory, the theory is not confirmed. It has survived testing so far – that is all we can say. Is this a threat to the rationality of science? No. It is fine if we can only ever show theories to be false. As we do this, knocking out one theory after another, we are learning at each step. This is a kind of progress.

Further: we can say of the method of C+R: *there is no better method available*. And we can say of a scientific theory in the textbooks that has survived testing so far: *we have no reason to switch to some other theory*.

Problems with this view

Popper seems to think of science *entirely* as a search for understanding. How bad would it be, for Popper, if a field was unable to come to any consensus? Suppose a scientific field has a collection of unrefuted conjectures on the table, proposed and explored by different people. Is this a problem according to Popper? No, it seems. And in some ways, it's

indeed not a problem. If we are curious about the world, it's good to consider lots of options.

But there is also the side of science that involves the application of theories.

Suppose we want to build a bridge, or work out a new energy policy, or work out which vaccines to give children. How should we choose which theories to use as the basis for action in cases like these?

It seems that the obvious thing to do is choose well-tested theories. Popper agrees. But why should we do this?

It is easy to say why we should not use *falsified* theories. Those theories have been shown to be false. (Here I set aside issues about holism.) It is harder to say why we should use a theory that has survived testing rather than a brand new theory that has never been tested. Either theory might be true – neither has been shown false.

What can we say in favor of a well-tested theory that we can't say about the untested one?

Popper did introduce an idea he called "corroboration." This is a measure of the extent to which a theory has survived

critical testing. He said: when working out which theories to use, choose corroborated theories. That seems to make sense, but why? Is a corroborated theory more likely to be true than an untested one? (It's perhaps more likely to be true than a *falsified* one, but that's not the only question we have to ask.)

Popper battled with this question. See *Theory and Reality* p. 68 for more detail.

Here is another angle on this question. Above, when summarizing Popper's view, I said this:

> We can say of the method of C+R: *there is no better method available*. We can say of the theory we have "on board" that has survived testing: *we have no reason to switch to some other theory*.

OK, but is this enough? It doesn't seem to be.

Suppose we are comparing a well-tested theory with a brand-new one. Both theories *might* be true. We have no reason to switch from the well-tested one, Popper says. But that seems to be because there is a "tie" between them. Both are unfalsified, and might be true. One has survived testing, but it is not *confirmed*, or *more likely to be true* than the other.

What is Popper's best reply to this objection?
Stick to his guns? I think so.
Popper can say: don't pretend we *know* which theory is right or which bridge will stay up. We don't know. It's uncertain. Science is full of surprises.
Popper was more radical than he often appears (and more radical than many of his admirers realize). But maybe a radical view is something we should take seriously?

Certainly it has been very hard to give a theory of induction, and the support of theories by observations. Popper shows us how a view of science that abandons those ideas might look.