

GHE030-P03

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Scientific realism debate and geosciences

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In this presentation, I try to apply "the scientific realism debate" to geosciences.

Scientists sometimes use non-ordinary vocabularies and make scientific statements such as "Neutrinos have some quantity of mass". This statement has a theoretical entity "Neutrino" of which we can never have any direct perceptions. This debate deals with such theoretical entities and theoretical statements. Does science reveal reality of the world which our human can't directly experience? Those who answer "Yes" to this question are scientific realists, and scientific anti-realists answer "No".

Scientific realists accept scientific claims literally, and have strong belief that those are truth of the world. Their claim is this. We now rely on many scientific products and they work well. How can we explain these facts? The answer is, scientific theories are just true and theoretical entities in them really exist in this world. We can't have any other reasons.

Scientific antirealists (especially, constructive empiricist) don't deny that actual scientific practices involve theoretical entities. And they never deny the possibility that theoretical entities exist in this world. But they don't have belief that scientific theories are true or these say much about unobservable world. There are two reasons. The underdetermination of theories: given certain set of data, we can make infinitely many theories in principle. The possibility of theory change: even if we accept some theories to be true, it is possible to revise (or what's more, abandon) it later. For scientific antirealist, scientific theories are not to be true. They need only empirically adequate theories.

Philosophers argue realism debate since ancient Greek. And it is not surprising for philosopher to examine science. Philosophy and sciences are both our epistemic activities whose purpose is to know this world. They are continuous (of course, scientists maybe more interested in experimental design or data analysis). Philosophy of science examines actual scientific practices and one aspect of it is scientific realism debate. Given that so many philosopher of science come from scientific ground, I think scientists rather than philosophers can deal with this problem.

Philosophers often argue scientific realism debate in terms of physics. The point of their argument is human's sense perceptions. For example, while we can't see subatomic particles with our eyes, we think these are the most fundamental units of this world. But do you think their study of a real investigation? The point here is (1) "observability depending on spatial restriction".

A second observability is relevant to theoretical entities in science. For example, think about paleontology and geology. Do you think that snowball-earth and dinosaur's skin color are real? Can we go past to see these phenomena or objects? The point here is (2) "observability depending on time restriction".

Think about an outstanding example in geosciences the core of the earth. We can see it with our eyes when it is in front of us. But we have no technique to pick out just the core. All we can do is to construct some models of it based on indirect information, such as geomagnetisms or earthquake waves. In comparison with ordinary entities, how much reality do you give it? The point here is (3) "observability depending on technical restriction".

The term "observe" is very vague and troublesome for not only the scientific realism debate but philosophy of science as a whole. In the scientific realism debate, philosophers have great attention to observability of (1). But in comparison with it, observability (2) and (3) are not discussed enough which are typically to geosciences. Dare to say, untouched. So, consideration on these should be very important to the scientific realism.