

Section B1. Methodology and Scientific Reasoning

**Theory-Talk, Meta-Theory- Talk and Metaphysical-Talk:
Intricacies and Pertinence of three Levels of Discourse in the Scientific
Realism-Debate.**

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Abstract

In the scientific realism debate, various positions in their defense against the challenge from history of science (pessimistic induction (PI) articulated by Laudan) participate in three different levels of discourse. Firstly, thinkers talk about particular historical episodes of theory change and pick out the revision defiant constituents in them. They point to certain entities with their properties or certain equations. Secondly, the talk climbs to a level where general terms such as ‘structure’, ‘entity’, ‘concrete structure’ etc are employed. Thinkers at this level argue for revision-defiance in terms of such general terms rather than historical examples involving concrete cases. Thirdly, they elevate their discussion to the metaphysics of properties and relations. The debate’s focus here is about the property, intrinsic or relational, that has a stake in the architecture of reality and the ontological priority of one over the other. I argue that these three discourses are connected in an interesting way and that all the positions in the debate face a peculiar epistemological weakness in trying to evade PI by lounging solutions from any of the three levels.

Extended Abstract

What is the stuff by which successful theories are hooked on-to-the world- or are there any constituents in past theories by virtue of which they were successful? This is the central concern, based on which most of the debate over scientific realism is carried out today. Selective skepticisms, in their attempt to evade the charge leveled by Laudan (pessimistic induction (PI)) respond in the following way. They claim that past theories were successful precisely because some ‘reality-hitting’ constituents were in them, whose descriptions were ‘truth-bearing’. I identify three different levels of discourse in the scientific realism-debate with regard to PI. I argue that identifying the above discourses brings into light a peculiar epistemological weakness in all these positions in the attempt to dodge under PI. Most selective skeptics and scientific

realists in their defense against PI, engage in a discourse which is largely a talk about ‘particular entities’ or certain ‘equations’ which survived theory change. In other words, they talk about examples of historical episodes where certain entities or equations resisted theory-change. I call this the theory-talk, where thinkers identify certain entities such as electrons or some differential equations occurring in specific theories responsible for truth-preservation. A rough example would be Hacking, who elucidates his position with the case of ‘electron’. Similarly, Worrall attempts to explain his position by noting the equations involved in the Fresnel-Maxwell theory-change. Realists like Psillos, in defending his position against PI, engage in theory-talk when he argues that certain constituents in the theory are revision-defiant, that they can be singled out by their roles in respective predictive successes. But this need not be just an equation or an entity. For example, the spin or charge of a particular particle may be ascribed to have preserved truth across theory-change. It could be any constituent of the theory. Psillos sanctions such a discourse where the task of the scientific realist is to talk about truth-bearing constituents in particular past failed theories. Further he suggests a naturalistic program where current practicing scientists are in a position to pick truth-bearing constituents from past theories in their respective subject area. In theory-talk, philosophers focus on particular historical contexts of theory-change and expose components responsible for the success of theories which were later abandoned. Examples discussed by selective skeptics like Hacking and Worrall are instances of theory-talk. However, the criticism of rationalization post hoc raised by Chakravartty is applicable to all theory-talk as the current standards of rationality or perspective of the present is used in analyzing past episodes of theory-change.

At a different level, the debate is carried out with a unique terminology. This, I identify as happening at a higher level. Thinkers employ terms such as ‘structure’ and ‘entities’ (content/nature), rather than particular differential equations (or particular entities such as electrons) and argue that they are the revision-defiant constituents. I consider this endorsement of a meta-level terminology as meta-theory-talk. Selective skeptics and realists both engage in meta-theory-talk (‘structure’, ‘entity’, ‘concrete structure’ and ‘structure-nature continuum’) in defending their position against PI. Psillos metaphorically defends his position by saying that there is a structure-nature continuum in scientific theories, and that it is not possible to differentiate structure and nature from theoretical descriptions. Semirealism is an appeal to the idea of concrete structure which contains knowledge of causal properties of particulars and relations between them. Here, the scientific realism-debate is all about the stuff that is revisiondefiant, be it structure, entity, concrete structure or some parts of the theory which are both (structure-mature continuum). The debate is not about the particular equation or entity in the specific theory in a particular historical context. It is about whether the upshot obtained from such examples in history that ‘something is retained’ can be stretched to all instances of theorychange. Precisely for this reason, they employ meta-level terms in order to climb to this higher level. In this level of discourse, thinkers are definitely inspired by particular historical contexts such as the case of electrons or Fresnel’s and Maxwell’s equations in their theories of

light. But they move ahead from the theory-talk to a talk about structures and entities, which according to them preserve truth.

At a third level, thinkers are interested in the talk about a comprehensive account of the metaphysics of properties and relations hinted by theory-talk and meta-theory talk. According to structural realists, relational properties of entities are what we get right when we say that theories are right about the structure of the world. However, ontic structural realists press for the ontological priority of relational properties over intrinsic properties. Scientific realists try to counter this stance by invoking metaphysical notions such as haecceity and quiddity and lay out an object-based ontology. According to them, intrinsic properties of entities are also contained in the knowledge provided by scientific theories which are not possible to explain away by means of relational properties. I call this level of discourse in the scientific realism debate as metaphysical-talk. The emergence of ontic structural realism catalyzed metaphysical-talk. The idea that ontology of a scientific-world can do away with the notion of entities altogether is entertained by the ontic structural realist. The ontological priority of relation over relata is a central question at this level of discourse. Realists root for a more traditional metaphysics which entertains the talk of intrinsic properties of entities. Scientific realism is still in search of a metaphysics of properties and relations that will benefit their position. However, semirealism, in accordance with the idea of concrete structure propounds an ontology deep-rooted on first order relational properties which account for causal interactions. In this level of discourse, thinkers stretch their views on theory-talk and meta-theory-talk to metaphysical-talk. The worry whether the notion of structure is concrete or abstract is also entertained at this level.

Does theory-talk about a particular equation imply meta-theory-talk about structure and subsequently metaphysical-talk about relational properties? This worry can also be raised in the case of entities (or certain constituents that are both). I take this question to be of utmost importance to the scientific realism debate. Thinkers employ arguments from theory-talk in elucidating their respective positions in the meta-theory-talk and metaphysical-talk. Historical episodes are the starting points in the defense of selective skepticisms as well as scientific realism against PI. Therefore, there is an epistemological dependence on theory-talk in the constitution of the other two levels. This dependence is a peculiar epistemological weakness too. We cannot recast a lost historical episode. Theory-talk is always susceptible to the charge that what is retained across theory change is what is visible from our perspective. This charge of rationalization post hoc is applicable to the whole of theory-talk. Further, taking the first level to be justifying the other is simply absurd. For example, it is simply obscure for somebody to say that structures are revision defiant by pointing to a particular historical example. It is equally absurd to say that intrinsic or relational properties are what are obtained by mature scientific theories by paying attention to certain past scientific theories. I argue that discourse in one level cannot be used as justification for a particular position and its discourse in another level. However, these three levels if employed together, makes the various positions in the debate meaningful.

Key Words

Scientific Realism, Selective Skepticism, Pessimistic Induction, Entity Realism, Structural Realism, Epistemic Structural Realism, Ontic Structural Realism, Semirealism

Key Thinkers

Stathis Psillos, Larry Laudan, Ian Hacking, John Worrall, Steven French, James Ladyman, Anjan Chakravartty