Truth re-nomination and the Lotka-Volterra-model

Tim Räz, Philosophy, University of Konstanz, Konstanz, GERMANY
Raphael Scholl, Pittsburgh Center for Philosophy of Science, Pittsburgh, USA

Idealizations in scientific models are strategic misrepresentations of a model’s target system: they are known to be false, yet many of them are retained not despite their falseness but because they can support a model’s representational aims. This raises a conundrum: How is it possible for us to interpret a model realistically in spite of such strategic misrepresentations? One account proposes that idealizations need to undergo a process of “truth-renomination” (this has been developed by Uskali Ma’ki in a series of papers). In some instances, truth re-nomination makes it possible to interpret idealizations realistically. For example, in modeling movement on an inclined plane it is false to assume that there is no friction. Yet if we paraphrase the assumption as “friction is negligible”, it is transformed into a potentially true claim. Similarly, a paraphrase may restrict a problematic assumption’s applicability to a range where it is actually true. However, other types of truth re-nomination are not easily squared with a realistic interpretation, and these indicate that a model is in need of refinement. Such idealizations involve “meta-claims”: they may be introduced as early steps that will require reworking later on; they may make the model more tractable; or they may serve pedagogical purposes. Thus, truth re-nomination offers a framework for classifying idealizations and for assessing their claim to realism. However, careful case studies are needed to determine whether the framework can illuminate substantial idealizations in actual scientific models. Two questions are pressing. First, does the epistemic practice of scientists mirror the above categories – or is the framework a mere philosophical gloss on actual science? Second, how does the classification of idealizations change over time? In particular, one would expect a shift from problematic “meta-claim” idealizations to “paraphrase” idealizations, as scientists develop a model and try to apply it to real-world systems. Is such a shift discernible? We will study these and related questions using the Lotka-Volterra predator-prey model. Beginning with the publications by Vito Volterra and Umberto d’Ancona in the 1920s, and continuing on to the further development of the model, we will offer a sketch of the medium-term dynamics of idealizations in the predator-prey model.
Philosophical Models - Their Structure and Function

Lukáš Bielik, Department of Logic and Methodology of Sciences, Comenius University in Bratislava, Bratislava, SLOVAKIA

There are various methods of analytic philosophizing. My aim is to outline a general structure of philosophical models and argue for their considerable role in discovering and testing philosophical theories. Firstly, I discuss a general structure of philosophical modeling. I propose to treat philosophical models as abstract (fictional) entities with various epistemic and ontological statuses. I take them to be the products of well-developed thought experiments representing some (logically or nomologically) possible or counterfactual situations. (A useful theoretical framework for thinking about thought experiments is found in R. Cooper, “Thought Experiments”, Metaphilosophy 36, 2005, No. 3, pp. 328-347.) I argue that, unlike many (kinds of) scientific models (cf., e.g., M. Weisberg, Simulation and Similarity, Oxford University Press 2013), philosophical models do not primarily aim at representing some actual phenomena (i.e., target systems). Rather they point out to those possible aspects of entities which have not yet been considered or reflected relative to an actual situation (or target system).

Secondly, by analyzing several examples of philosophical models (e.g., Strawson’s hypothetical case of purely auditory experience; Goldman’s fake barns), I distinguish two of their fundamental functions in relation to philosophical theories: i) the constructive function (e.g., to establish that such-and-such is possible); and ii) the destructive function (e.g., to falsify that such-and-such is necessary or that such-and-such is possible).

Manipulationist Account and Unificationist Model

Wei Wang, Institute of Science, Technology and Society, Tsinghua University, Beijing, CHINA

Chuang Liu, Department of Philosophy, Shanxi University & University of Florida, Gainesville, USA

In this paper we provide a critical discussion of James Woodward’s manipulationist account, which has become one of the most promising accounts in the recent decade on scientific explanation. Woodward suggests (1) Explanations involve the counterfactual dependence rather than nomic subsumption. (2) Explanatory generalizations describe the invariant relations between explanans variables and explanandum variables under some range of interventions on the explanans. (3) The requirement of invariance, which admits of degrees, is very different from the traditional demand that explanatory generalizations must be laws.

We criticize Woodward in the following four aspects. Firstly, his preference of invariance put too strong a restriction on the concept of laws. If we take the paradigmatic or pragmatic approach to laws of nature, there should be no significant difference between invariance and laws, especially if laws are regarded as ceteris paribus laws. Secondly, we can add a holistic
way of thinking to Woodward’s modularity of causal relationship. Thirdly, scientists in special sciences seldom achieve manipulation or intervention, therefore it would be implausible to demand for the invariant relations. Finally, we argue that the manipulationist account should be regarded as a complement or improvement, especially in causal explanations, rather than a replacement, of lawful explanation account.

Our paper suggests a peaceful coexistence of lawful explanation and the manipulationist account, especially within the unificationist model. The lawful account is helpful for us to “Think Global”, while the manipulationist account is good to “Act Local”.

Keywords: scientific explanation, manipulationist account, unificationist model, invariance

Scientific Modeling and Fictionalism

Chuang Liu, Philosophy, Shanxi University & University of Florida, Gainesville, USA
Wei Wang, Institute of Science, Technology, and Society, Tsinghua University, Beijing, CHINA

Synopsis: This paper mounts an objection to the new fictionalism on models in science (or in general) that is based on a fundamentally different conception of how the reference (or denotation) relation works in modeling. New fictionalism contends that the correct way to view models from an ontological point of view is to view them as fictional entities. Scientists in the practice of modeling reality create with their power of imagination a fictional world of abstract entities; and it is through the study of these entities, such as Rutherford’s model of hydrogen atom or the molecular model of DNA, scientists gain knowledge about the real systems that the models represent. In addition, it is said that even though this new fictionalism appears to be against realism, it is in fact compatible with it.

In objecting to this view, we first argue that most scientific models (with the exception of a few more exotic kinds) are not to be seen as imaginary systems but rather as assemblages of abstract or concrete/physical elements (basic or simpler parts or modules for jobs of modeling), and when these assemblages are given referring terms (names or labels or even descriptive phrases) that connect them to the corresponding components of the target systems, the elements and their relational structures in the models show what the target systems are like in the relevant aspects. This combination of the symbolic and the modelistic elements and the division of labor of referring and showing is a typical, if not universal, feature of scientific modeling. It captures the most common types of modeling jobs in the practice of science. (The exceptions are briefly discussed in a footnote, but the lack of space prevents me from treating it properly. It is thoroughly dealt with elsewhere.)
Therefore, there is no need for a fictionalist approach to modeling and my account is clearly compatible with realism. It is also compatible with a truly fictional account of modeling; but it is an anti-realist fictionalist account for representing the unobservable entities. We discuss an interpretation by Rosen on van Fraassen’s constructive empiricism, which argues that CE is best understood as a fictional stance on the unobservable. We explore this option in the backdrop of our objection to the new fictionalism, and we defend van Fraassen on one particular criticism of Rosen, which threatens to undo van Fraassen’s CE. The upshot of this defense is that there are abstract entities that make a difference to empirical adequacy if treated as real and there are abstract entities that do not. One can be a Platonist/realism about the latter sort of entities and still be a good constructive empiricist who embraces fictionalism.