Math Over Mechanism
Proposing the Rational-Relational Theory of Scientific Explanation in Light of Impinging Constraints of New Mechanism

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Dissertation Abstract

In this dissertation I achieve the following: (1) I present motivating criteria for a general comprehensive theory of scientific explanation. I review historical approaches to modeling explanation in light of these criteria. (2) I present New Mechanist Explanation ("NME") as the leading candidate for a contemporary, complete theory of scientific explanation. (3) I present constraints on the applicability of New Mechanism in modeling biology, chemistry, and physics. I argue for the unsuitability of NME as a candidate for a general theory of explanation due to its significant omissions of explanatory content and subsequent incompleteness. (4) I present arguments for the indispensable explanatory power of mathematics in science, noting that much of NME's failures are owed to its poor integration of mathematical explanation as applied to science. (5) I propose a Rational-Relational theory of explanation("RRE"). I present RRE in detail and demonstrate it as a true working general theory of explanation which best meets the motivating criteria presented in (1). I disambiguate RRE from structural explanation ("SE"). I show that historical models of explanation, including the deductive nomological (DNE) model, statistical relevance ("SRE") model, structural model (SE) and unification model ("UE") may be successfully treated as sub-classes of explanation within the scope of RRE. I provide a rubric for selecting amongst sub-theories of explanation under RRE in the purpose of highlighting particular features of relational explanations. (6) In conclusion, I argue that philosophers of science should move forward using RRE as a general model of scientific explanation as a working alternative to the incomplete model of NME.