

Workshop : The Dynamics of Reason
Amsterdam, December - 11 - 2004

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Title: "Intelligibility and revolution in science"

In his 2001 book *Dynamics of Reason* Michael Friedman presents a Kant-inspired view of the development of science that accounts for the existence of Kuhnian revolutions. Central to Friedman's account is a distinction between three levels: (1) empirical laws; (2) constitutive a priori principles; (3) philosophical meta-paradigms. Empirical laws at the first level are constituted by principles at the second level. These principles are a priori in the sense of constitutive but not in the sense of immutable: they can change in the course of a scientific revolution, and such changes are inspired by the third, philosophical level.

Friedman's prime example of such a philosophically inspired change of constitutive principles is the Einsteinian revolution. In my presentation I will consider another famous revolution in physics: the transition to quantum mechanics. I will show that also in this case (contrary to what Friedman thinks) a change of constitutive a priori principles was inspired by debates at the level of philosophical meta-paradigms. Central issue in these debates was the question of *Anschaulichkeit*: Is intelligibility in the sense of visualizability a necessary condition for (explanatory) scientific theories? While Erwin Schrödinger answered this question in the affirmative, Wolfgang Pauli argued that theories can be intelligible without being visualizable. Pauli claimed: "Once the new conceptual systems are settled, then also these will be *anschaulich*."

Diehard empiricists (such as Philip Frank in his 1957 *Philosophy of Science: the Link between Science and Philosophy*) have rejected intelligibility as an outdated requirement, a relic of the bygone days of rationalist philosophy. Contrary to this view, and complementary to Friedman's analysis, I will argue that a generalized, relativized idea of intelligibility is crucial to scientific practice.