Topos Theory as a Framework for Partial Truth

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Abstract

This paper develops some ideas from previous work (coauthored, mostly with C.J.Isham). In that work, the main proposal is to assign as the value of a physical quantity in quantum theory (or classical physics), not a real number, but a certain kind of set (a sieve) of quantities that are functions of the given quantity. The motivation was in part physical---such a valuation illuminates the Kochen-Specker theorem; in part mathematical---the valuations arise naturally in the theory of presheaves; and in part conceptual---the valuations arise from applying to propositions about the values of physical quantities some general axioms governing partial truth for any kind of proposition.

In this paper, I give another conceptual motivation for the proposal. I develop (in Sections 2 and 3) the notion of a topos (of which presheaves give just one kind of example); and explain how this notion gives a satisfactory general framework for making sense of the idea of partial truth. Then I review (in Section 4) how our proposal applies this framework to the case of physical theories.

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