

Mathematical Colloquia

Monday, 27 September 2021

17:15 h, lecture room 119 (ExWi)

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The logic of the quantum mechanics: New perspectives on some old problems

Abstract: Following the influential work of John von Neumann in the 1920s and 1930s, the mathematical foundation of quantum mechanics is typically described using certain complex Hilbert spaces. In this formulation, testable propositions are associated with closed subspaces of these Hilbert spaces, and the set of closed subspaces of a given Hilbert space form an ordered algebraic structure. This has opened the door to studying the logical structure of quantum mechanics by using such algebras of closed subspaces in place of Boolean algebras (which give an algebraic formulation of classical logic).

The resulting quantum logic has been vigorously studied, and presents numerous challenging problems from both algebraic and logical points of view. For instance, although there is an algorithm for determining the tautologies (or "logical truths") of classical logic, it is not known whether this problem is algorithmically decidable for quantum logic. This talk will survey quantum logic generally, as well as progress on this decades-old decision problem. In particular, we will discuss some recent work shedding new light on the decision problem, and hinting at a possible solution.

CORONAVIRUS SAFETY MEASURES:

From September 20, 2021, the certificate requirement applies to all activities that take place within the framework of the University of Bern, regardless of the number of participants. Compliance with the certificate requirement will be checked by means of random sampling.

All other measures, especially the social distancing rules and hygiene recommendations, remain in place and apply until further notice.