▶ MICHAEL RATHJEN, *Well-ordering principles in proof theory and reverse mathematics.*

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Several results about the equivalence of familiar theories of reverse mathematics with certain well-ordering principles have been proved (Friedman, Marcone, Montalban et al.) by recursion-theoretic and combinatorial methods and also by proof theory (Afshari, Girard, R, Weiermann et al.), employing deduction search trees and cut elimination theorems in infinitary logics with ordinal bounds.

One goal of the talks is to present a general methodology underlying these results which in many cases allows one to establish an equivalence between two types of statements. The first type is concerned with the existence of ω-models of a theory whereas the second type asserts that a certain (usually well-known) elementary operation on orderings preserves the property of being well-ordered. These operations are related to ordinal representation systems (ors) that play a central role in proof theory. The question of naturality of ors has vexed logicians for a long time. While ors have a low computational complexity, their "true" nature evades characterization in those terms. One attempt has been to describe their structural properties in category-theoretic terms (Aczel, Feferman, Girard et al.). Some of these ideas will be discussed in the talks.

A second goal is to present rather recent developments (due to Arai, Freund, R), especially work by Freund on higher order well-ordering principles and comprehension.