

# Proof Assistants and the Dynamic Nature of Formal Theories

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## Abstract

This lecture will consider lessons from a decade long effort to explore and advance the logic of events using the Nuprl proof assistant operating in its logical programming environment. It will examine the impact of extensions to the underlying constructive type theory and the programming environment over this period, one of which led to the solution of a long standing open problem in constructive logic. I will also illustrate methods of proof exchange between versions of this theory that are based on replaying results as the theory is extended. This method seems promising for proof exchange among proof assistants based on the LCF tactic mechanism as the main method for building proofs.

Both theory exploration and proof exchange illustrate the dynamic nature of formal theories created using modern proof assistants and dispel the false impression that formal theories are rigid and brittle objects that become less relevant over time in a fast moving field like computer science.

The ideas I am discussing here are based on the work of the Cornell PRL research group, in particular our research on the logic of events by Mark Bickford, Richard Eaton, and Vincent Rahli, and by our collaboration with David Guaspari of ATC-NY corporation.