

## **An Introduction to Formal Proof**

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A formal proof is a proof in which every logical inference has been checked all the way back to the fundamental axioms of mathematics. The number of primitive inferences can run into the millions, even for a traditional proof of modest size. A number of noteworthy theorems have now been checked formally, including the four-color theorem, the Jordan curve theorem, and the prime number theorem (both the elementary and analytic proofs). This talk will describe the current stage of development of formal theorem proving technology. It will describe some research projects aimed at bringing formal theorem proving to every mathematician's desktop.

### **Brief Bio:**

Thomas Hales is Mellon Professor of Mathematics at the University of Pittsburgh. He received his PhD from Princeton University under the supervision of Robert Langlands, and has held positions at MSRI Berkeley, Harvard University, University of Chicago and University of Michigan as well as membership at the Institute for Advanced Study, Princeton. He is best known for his (computer-aided) proof of the Kepler's conjecture, one of the oldest problems in discrete geometry, as well as the honeycomb conjecture. Hales advocates the formalization of mathematics to ensure rigor in an era where proofs are becoming increasingly complex and computers are becoming necessary to perform verification. He has received many prizes and honors for his work, including the Chauvenet Prize (2003), the R. E. Moore Prize (2004) the Robbins Prize (2007), the Lester Ford Prize (2008) and the Fulkerson Prize (2009). Hales has been invited to speak at many international meetings and conferences, including the Institute for Advanced Study, Public lecture series (1999), the National Academy of Science, Frontiers of Science Symposium (1999), the Joint Mathematical Meetings, AMS-MAA-SIAM (2000), the Euler Lecture at Berlin (2000), the International Congress of Mathematicians (2002), the Institute for Math and its Applications (IMA), Public Lecture Series (2005), the Institute for the Mathematical Sciences (PIMS) Distinguished Chair lectures (2006) and the Arnold Ross Lecture of the AMS (scheduled October 2010).