



## *The notion of proof*

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### **Introduction**

We already witnessed the moment where chess computers surpassed humans. It might seem to be only a question of time that computers will also surpass humans in mathematical theorem proving. In fact, the traditional notion of mathematical proof faces in the beginning 21st century what we will call "the computer challenge". There are, however, three different aspects to consider:

- i) proof search;
- ii) proof check;
- iii) proof representation.

Proof search has its known limitations due to undecidability and complexity results. However, special areas, like semi group theory is already subject to computer generated proofs. Proof check is recently the "hottest" area, not least due to the attempt to formally verify the proof of the Kepler conjecture by its author Hales. Proof representation seem currently be the stumbling block for convincing the mathematical community to accept computer aided theorem proving as a viable alternative.

In this symposium we like to discuss the current state of the art of computer aided theorem proving, approaching the topic from the philosophical and mathematical side as well as from computer science. Special focus is put on the last two items mentioned above, addressing the more concrete question: a) in which way can (will) proof check convince the mathematical community from the correctness of a proof? b) does computer generated proof representations match with our intuitive notion of mathematical proof. The answers to both question should give us a deeper insight in the challenges and tasks for mathematical proofs and computer aided theorem proving in the 21st century.

### **Program**

Reinhard Kahle (Lisbon, Portugal): **Introduction: the notion of proof**

Jesse Alama (Vienna, Austria): **Proof Checking**

Alexei Angelides (Stanford, USA): **Hilbert, intuition, and mathematical proof**