

# The Convergence of Mathematics Computer Science Logic

A Public Symposium and Reception

UCLA

## Speakers and Abstracts

### Martin Davis

#### Hilbert's Tenth Problem

**Abstract:** I will discuss various aspects of the work that led to a proof that Hilbert's Tenth Problem (Diophantine Equations) is unsolvable. The unsolvability result is a consequence of the equivalence between two notions, one from logic/computability theory, the other, from number theory. Interesting and curious applications of this equivalence will be discussed including a universal polynomial equation, a prime representing function, and Diophantine form of famous problems.

### Michael O. Rabin

#### Novel Concepts of Proof and Their Applications

**Abstract:** Over the past 30 years computer scientists have created new revolutionary notions of mathematical proofs. The introduction of randomness created proofs that allow for a probability of error. Zero Knowledge Proofs (ZKPs) enable a demonstration of a mathematical truth without revealing any information beyond the claimed truth. I will discuss these concepts, present a new practically efficient method for ZKPs, and describe applications to business transactions such as the secure and secrecy preserving conduct of auctions. The talk will be self contained and readily accessible.

### Moshe Y. Vardi

#### From Aristotle to the Pentium

**Abstract:** Logic started as a branch of philosophy, going back to Greeks in the classical period. Computers are relatively young, dating back to the middle of the 20th century. This talk tells the story of logic beget computers, tracing the path from Aristotle to the Pentium. This is a story full of both intellectual drama, as well as real-life drama, with most of the characters dying young, miserably, or both.

## Biographies

**Martin Davis** is a professor emeritus of mathematics and computer science at New York University, where he spent over 30 years on the faculty and helped to found the computer science department. Davis is renowned for his work on the unsolvability of Hilbert's Tenth Problem. He is the recipient of the American Mathematical Society's Leroy P. Steele Prize, the Mathematical Association of America's (MAA) Chauvenet Prize and Lester R. Ford Award, the Townsend Harris Medal, and the Herbrand Award for Distinguished Contributions to Automated Deduction. He is also the 1976 MAA Earle Raymond Hedrick Lecturer, a Guggenheim Fellow and a fellow of the American Association for the Advancement of Science. Davis has served as a consultant for IBM Research Laboratories, Rand Corporation, Bell Labs, and Microsoft Corporation, among others. He is the author of several well-known books, including *Computability and Unsolvability*, which first appeared in 1958 and became a classic in theoretical computer science, and more recently *The Universal Computer: The Road from Leibniz to Turing* (also appeared in paperback under the title *Engines of Logic*), a popular book published in 2000.

**Michael O. Rabin** is the Thomas J. Watson Sr. Professor of Computer Science at Harvard University and currently a visiting researcher at Google, Inc. Rabin's research interests include complexity of computations, efficient algorithms, randomized algorithms, DNA to DNA Computing, parallel and distributed computation and computer security. He is the recipient of numerous awards, including the Association for Computing Machinery (ACM) A.M. Turing Award in Computer Science, the Rothschild Prize in Mathematics, the Israel Prize in Exact Sciences/Computer Science, the IEEE Charles Babbage Award in Computer Science, the ACM Paris Kanellakis Theory and Practice Award, and the EMET Prize in Exact Sciences/Computer Science. His extensive list of engagements includes invitations to give the American Mathematical Society Gibbs Lecture, the London Mathematical Society Hardy Lecture, the Association for Symbolic Logic Gödel Lecture, and plenaries at the International Congress of Mathematicians and the International Congress of Logic, Methodology, and Philosophy of Science. He is a member of the American Academy of Arts and Sciences, the U.S. National Academy of Sciences, the American Philosophical Society, the Israel Academy of Sciences and Humanities, the French Academy of Sciences, the Royal Society and the European Academy of Sciences. He holds honorary degrees from six institutions, including New York University, Ben-Gurion University and the University of Wrocław.

**Moshe Y. Vardi** is the George Professor in Computational Engineering and Director of the Ken Kennedy Institute for Information Technology at Rice University. Vardi's research interests in applications of logic to computer science include database systems, complexity theory, multi-agent systems and specification and verification of hardware and software. He is the recipient of three IBM Outstanding Innovation Awards, a co-winner of the 2000 Gödel Prize, a co-winner of the 2005 ACM Paris Kanellakis Theory and Practice Award, a co-winner of the 2006 Logic in Computer Science (LICS) Test-of-Time Award, a co-winner of the 2008 ACM Principle of Database Systems (PODS) Alberto O. Mendelzon Test-of-Time Award, a winner of the 2008 ACM Special Interest Group on Management of Data (SIGMOD) Edgar F. Codd Innovations Award, a recipient of the 2008 Blaise Pascal Medal in Computer Science from the European Academy of Sciences, and a 2008 ACM Presidential Award. He is a Guggenheim Fellow, as well as a fellow of ACM, the American Association for the Advancement of Science, the Association for the Advancement of Artificial Intelligence and the IEEE. He was designated Highly Cited Researcher by the Institute for Scientific Information, and was elected as a member of the U.S. National Academy of Engineering, the European Academy of Sciences, and the Academia Europea.