

First Woman to Receive ACM Turing Award

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IBM Fellow Emerita Frances Allen Responsible for Innovations to High Speed Computing; Work Inspired Generations of Computer Scientists

New York, NY, February 21, 2007 – ACM, the Association for Computing Machinery, has named Frances E. Allen the recipient of the 2006 A.M. Turing Award for contributions that fundamentally improved the performance of computer programs in solving problems, and accelerated the use of high performance computing. This award marks the first time that a woman has received this honor. The Turing Award, first presented in 1966, and named for British mathematician Alan M. Turing, is widely considered the "Nobel Prize in Computing." It carries a \$100,000 prize, with financial support provided by Intel Corporation.

Allen, an IBM Fellow Emerita at the T.J. Watson Research Center, made fundamental contributions to the theory and practice of program optimization, which translates the users' problem-solving language statements into more efficient sequences of computer instructions. Her contributions also greatly extended earlier work in automatic program parallelization, which enables programs to use multiple processors simultaneously in order to obtain faster results. These techniques have made it possible to achieve high performance from computers while programming them in languages suitable to applications. They have contributed to advances in the use of high performance computers for solving problems such as weather forecasting, DNA matching, and national security functions.

"Fran Allen's work has led to remarkable advances in compiler design and machine architecture that are at the foundation of modern high-performance computing," said Ruzena Bajcsy, Chair of ACM's Turing Award Committee, and professor of Electrical and Engineering and Computer Science at the University of California, Berkeley. "Her contributions have spanned most of the history of computer science, and have made possible computing techniques that we rely on today in business and technology. It is interesting to note Allen's role in highly secret intelligence work on security codes for the organization now known as the National Security Agency, since it was Alan Turing, the namesake of this prestigious award, who devised techniques to help break the German codes during World War II," said Bajcsy, who is Emeritus Director of the Center for Information Technology Research in the Interest of Society (CITRIS) at Berkeley.

"Fran Allen's work on the Parallel TRANslation (PTRAN) project built on her earlier work on program optimization," said Andrew A. Chien, Intel's Vice President of Research. "Over the years, this foundation has enabled the advance of programming-productivity based on the co-

evolution of higher level programming language and optimization technologies. It is particularly timely that this award comes as parallel computing is becoming an element of the most pervasive of computing platforms - laptop and desktop personal computers - and the opportunities for new and important contributions to parallel programming and efficient implementation abound," he said.

In 1989, Allen was the first woman to be named an IBM Fellow. In 2000, IBM created the Frances E. Allen Women in Technology Mentoring Award, naming her as its first recipient. As her Turing Award citation notes, she has been an inspirational mentor to younger researchers and a leader within the computing community. She is an Advisory Council Member of the Anita Borg Institute for Women and Technology, whose goal is to increase the participation of women in all aspects of technology. She also received the first Anita Borg Award for Technical Leadership, which was presented at Grace Hopper Celebration of Women in Computing in 2004.

Background

Allen joined IBM's T. J. Watson Research Center in 1957, to teach FORTRAN, a revolutionary high-level programming language, to the scientists at IBM. FORTRAN allowed scientists and engineers to write programs that closely resembled the mathematical formulas they normally relied on. Allen recognized the opportunity to address a grand challenge of high performance computers - delivering the performance potential of computers to solve problems without exposing the underlying computer infrastructure.

Allen's 1966 paper, Program Optimization, laid the conceptual basis for systematic analysis and transformation of computer programs. Her 1970 papers, Control Flow Analysis and A Basis for Program Optimization established "intervals" as the context for efficient and effective data flow analysis and optimization. Much of her early work was done in collaboration with John Cocke, an IBM computer scientist who died in 2002. Her 1971 paper with John Cocke, A Catalog of Optimizing Transformations, provided the first description and systematization of optimizing transformations. She developed and implemented her methods as part of building compilers for the IBM STRETCH-HARVEST and the experimental Advanced Computing System. This work established the feasibility of modern machine- and language-independent optimizers.

In 1984, she formed and led IBM's PTRAN project to address the emerging challenge of parallel computers, which simultaneously executes related tasks for faster results. This project led to many advances including the concept of the program dependence graph, the primary structuring method used by most parallelizing compilers today.

In 1995, Allen was president of the IBM Academy of Technology, a global organization of IBM technical leaders charged with providing technical advice to the company. Before she retired in 2002, she was a Senior Technical Advisor to the Research Vice President for Solutions, Applications and Services. She is a member of the National Academy of Engineering, the American Academy of Arts and Sciences, and the American Philosophical Society. She was named a Fellow of ACM in 1994.

Allen has been a member of the Computer Science and Telecommunications Board (CSTB), the Computing Research Association (CRA) Board, and the National Science Foundation's Computer and Information Science and Engineering (CISE) Advisory Board. Her recent professional activities for ACM include membership on ACM's Job Migration Task Force, which produced the widely reported "[Globalization and Offshoring of Software](#)" study. In addition, she was active in the ACM Special Interest Group on Programming Languages (SIGPLAN), and has served on the editorial boards of several ACM journals.

Among Allen's teaching and lecturing roles were visiting professor at New York University from 1970-73; consulting professor at Stanford University; the Chancellor's Distinguished Lecturer and Mackay Lecturer at the University of California, Berkeley in 1988-89; and Regents Lecturer at the University of California, San Diego in 1997. She was awarded Honorary Doctor of Science degrees from the University of Alberta in 1991; from Pace University in 1999; and from the University of Illinois, Urbana-Champaign in 2004. She graduated from Albany State Teachers College - now the State University of New York at Albany - with a degree in mathematics. She received a master's degree in mathematics at the University of Michigan.

ACM will present the Turing Award at the annual ACM Awards Banquet on June 9, 2007, in San Diego, CA.

About the ACM A.M. Turing Award

The ACM A.M. Turing Award was named for Alan M. Turing, the British mathematician who articulated the mathematical foundation and limits of computing, and who was a key contributor to the Allied cryptanalysis of the German Enigma cipher during World War II. Since its inception, the Turing Award has honored the computer scientists and engineers who created the systems and underlying theoretical foundations that have propelled the information technology industry. For additional information, click on amturing.acm.org

About ACM

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