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ACM TURING AWARD GOES TO CREATOR OF INFLUENTIAL INNOVATIONS IN COMPUTER SOFTWARE DESIGN

MIT's Liskov Pioneered the Standard for Modern Programming Language and Software Reliability

NEW YORK, March 10, 2009 – ACM, the [Association for Computing Machinery](#), has named Barbara Liskov of the Massachusetts Institute of Technology ([MIT](#)) the winner of the [2008 ACM A.M. Turing Award](#). The award cites Liskov for her foundational innovations to designing and [building the pervasive computer system](#) designs that power daily life. Her achievements in programming language design have made software more reliable and easier to maintain. They are now the basis of every important programming language since 1975, including Ada, C++, Java, and C#. The Turing Award, widely considered the "Nobel Prize in Computing," is named for the British mathematician Alan M. Turing. The award carries a \$250,000 prize, with financial support provided by Intel Corporation and Google Inc.

One of the first U.S. women to be awarded a Ph.D. from a computer science department (in 1968 from Stanford University), Liskov revolutionized the programming field with groundbreaking research that underpins virtually every modern computer application for both consumers and businesses. Her contributions have led to fundamental changes in building the computer software programs that form the infrastructure of our information-based society. Her legacy has made software systems more accessible, reliable, and secure 24/7.

Professor Dame Wendy Hall, ACM's President, said Liskov has played a distinguished role in the evolution of computer science and engineering to solve real problems. "Her elegant solutions have enriched the research community, but they have also had a practical effect as well," said Dame Wendy. "They have led to the design and construction of real products that are more reliable than were believed practical not long ago. In addition to her design features, she focused on engineering innovations that changed the way people thought about programming languages and building complex software. These accomplishments were instrumental in moving concepts out of academia and into the real world."

Andrew Chien, Vice President in the Corporate Technology Group and Director of Research of Intel Corporation said that "Barbara Liskov's work consistently reflects an extraordinary combination of rigorous problem formulation and sound mathematics; a potent combination she used to create lasting solutions that are

the foundations of modern software systems." He added, "It was my pleasure to learn from Professor Liskov as an MIT graduate student, and it is a continuing pleasure to admire her growing impact."

"Google is delighted to help recognize Professor Liskov for her research contributions in the areas of data abstraction, modular architectures, and distributed computing fundamentals," said Alfred Spector, Vice President of Research and Special Initiatives at Google Inc. "We are proud to be a sponsor of the ACM Turing Award to recognize and encourage the research that is essential not only to computer science, but to all the fields that depend on its continued advancement."

Advances in Software Design

Liskov's most significant impact stems from her influential contributions to the use of data abstraction, a valuable method for organizing complex programs. She was a leader in demonstrating how data abstraction could be used to make software easier to construct, modify, and maintain. Many of these ideas were derived from her experience at Mitre Corp. in building the VENUS operating system, a small, interactive timesharing system.

In another exceptional contribution, Liskov designed the CLU programming language, an object-oriented language incorporating "clusters" to provide coherent, systematic handling of abstract data types, which are comprised of a set of data and the set of operations that can be performed on the data. She and her colleagues at MIT subsequently developed efficient CLU compiler implementations on several different machines, an important step in demonstrating the practicality of her ideas. Data abstraction is now a generally accepted fundamental method of software engineering that focuses on data rather than processes, often identified as "modular" or "object-oriented" programming.

Building on CLU concepts, Liskov followed with Argus, a distributed programming language. Its novel features led to further developments in distributed system design that could scale to systems connected by a network. This achievement laid the groundwork for modern search engines, which are used by thousands of programmers and hundreds of millions of users every day, and face the challenges of concurrent operation, failure, and continually growing scale.

Her most recent research focuses on techniques that enable a system to continue operating properly in the event of the failure of some of its components. Her work on practical Byzantine fault tolerance demonstrated that there were more efficient ways of dealing with arbitrary (Byzantine) failures than had been previously known. Her insights have helped build robust, fault-tolerant distributed systems that are resistant to errors and hacking. This research is likely to change the way distributed system designers think about providing reliable service on today's modern, vulnerable Internet.

Background

Barbara Liskov heads the Programming Methodology Group in the Computer Science and Artificial Intelligence Laboratory at MIT, where she has conducted research and has been a professor since 1972. In 2008, she was named an Institute Professor, the highest honor awarded to an MIT faculty member.

A member of the National Academy of Engineering, she is a Fellow of ACM and of the American Academy of Arts and Sciences. She received the Society of Women Engineers Achievement Award in 1996, and in 2002, she was named by *Discover* magazine as one of the 50 most important women in science. She received the IEEE John von Neumann medal in 2004. In 2005, she was awarded the title of ETH Honorary

Doctor by the Swiss Federal Institute of Technology Zurich (ETH). In 2008, she received the ACM SIGPLAN Programming Languages Achievement Award.

The author of numerous publications, she wrote three books, including *Abstraction and Specification in Program Development* with John Guttag, which has educated generations of students in how to write good software. Liskov served as an associate editor for *ACM Transactions on Programming Languages and Systems* ([TOPLAS](#)) and is a member of the ACM Special Interest Groups on Programming Languages ([SIGPLAN](#)), Operating Systems ([SIGOPS](#)), and Management of Databases ([SIGMOD](#)).

Liskov has also served on the Computer and Information Science and Engineering (CISE) Advisory Committee of the National Science Foundation as well as the Computer Science and Telecommunications Board (CSTB) of the National Research Council. Before joining MIT, she was a Member of Technical Staff at The Mitre Corporation. A graduate of the University of California Berkeley with a BA in mathematics, Liskov earned a Ph.D. at Stanford University, where she was a graduate research assistant in Artificial Intelligence.

ACM will present the Turing Award at its ACM Awards Banquet on June 27, in San Diego, CA.

About the ACM A.M. Turing Award

The [A.M. Turing Award](#) <http://awards.acm.org/turing> 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 in 1966, 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.

About ACM

ACM, the Association for Computing Machinery www.acm.org, is the world's largest educational and scientific computing society, uniting computing educators, researchers and professionals to inspire dialogue, share resources and address the field's challenges. ACM strengthens the computing profession's collective voice through strong leadership, promotion of the highest standards, and recognition of technical excellence. ACM supports the professional growth of its members by providing opportunities for life-long learning, career development, and professional networking.

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