proceedings of the acm

Annual Conference
August 1972
Boston

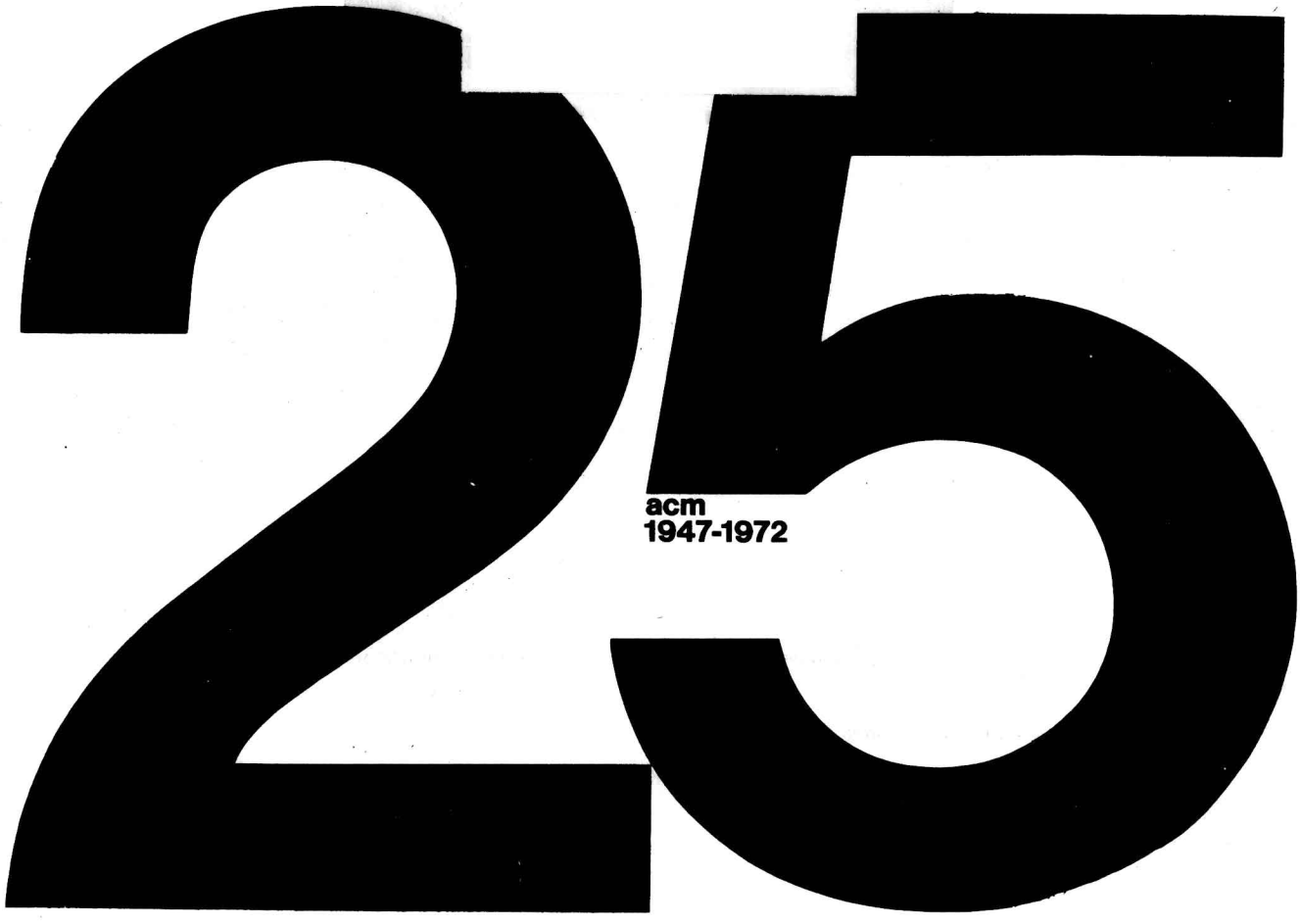
Vol. I

25

acm
1947-1972

proceedings of the acm

Annual Conference
August 1972
Boston



ASSOCIATION FOR COMPUTING MACHINERY
1133 Avenue of the Americas
New York, New York 10036

Additional copies of this volume may be purchased by prepaid order directed to the ACM at the above address. The prices are:

ACM Members – $15.00
Non-ACM Members – $20.00

Please include an additional $1.50 for mailing and handling charges. ACM members are asked to include their membership numbers.

Preface

The ACM'72 Technical Program Committee has developed the technical program around the Special Interest Groups and Committees of the ACM. Each SIG and SIC was invited to participate in the Conference by designing sessions that it felt best represented the significant areas in its field. They were responsible for the refereeing process for contributed papers, as well as all other details relevant to their respective sessions.

In general, the Technical Program of ACM'72 is designed to address three major needs:

(1) To help the professional and the student who wishes to broaden his knowledge of computing through general subject tutorials exploring areas outside his scope of expertise.

(2) To provide high-quality, advanced technical sessions for professionals knowledgeable in that area.

(3) To reduce the time lag between the generation of results and their public presentation by having immediate state-of-the-art workshops and informal research reports.

John J. Donovan
Rosemary Shields
ACM'72 Technical Program

TABLE OF CONTENTS

VOLUME 1

VOLUME 2

TURING AWARD

ACM's most prestigious award, the A.M. Turing award, is given annually to the person deemed most deserving of recognition for his contributions to the field of computer science and engineering. The recipient is selected by a committee named by past presidents of the ACM and includes an honorarium of $1,000.

The 1972 presentation goes to Edsger W. Dijkstra, Department of Mathematics, Technological University, Eindnozen, Netherlands. Edsger Dijkstra was a principal contributor in the late 1950's to the development of ALGOL, a high level programming language which has become a model of clarity and mathematical rigor. He is one of the principal exponents of the science and art of programming languages in general, and has greatly contributed to our understanding of their structure, representation, and implementation. His fifteen years of publications extend from theoretical articles on graph theory to basic manuals, expository texts, and philosophical contemplations in the field of programming languages.

RESEARCH SESSION

CURRENT RESEARCH IN COMPUTER SCIENCE

SESSION CHAIRMAN AND ORGANIZER - John J. Donovan
MIT

This is a feature session at ACM 72. At this session prominent and active people working in the area of computer science, its applications, or its supporting disciplines will state what they are doing, its importance to mankind, and its applications and prospects. The speakers will report on work in the following broad areas: artificial intelligence, industrial research, computer architecture, software, automatic programming, graphics, modeling, population control, speech recognition and generation, and other timely topics. The following speakers will talk about the research being conducted by the groups for which they are responsible.

PARTICIPANTS

Dr. Herbert Shorr	Head of Computing Science, IBM, Yorktown Heights, New York
Dr. John Weil	Vice President, Advanced Systems Technology Organization, Honeywell Information Systems, Inc.
Prof. Edward Fredkin	Director, Project MAC, MIT
Prof. Thomas Cheatham	Head, Center for Research and Computing Technology, Harvard University
Prof. Peter Denning	Professor, Purdue University
Dr. Lawrence Roberts	Director of Information Processing Services, ARPA

HERBERT SCHORR

Director, Computer Sciences Department
Yorktown Heights, New York
IBM Research Division

Dr. Herbert Schorr received his B.EE degree from the City College of New York in 1957 in Electrical Engineering . He did graduate work in Electrical Engineering at Princeton University, receiving the M.A., M.S. and Ph.D. degrees, the latter in 1962. His thesis, "Towards the Automatic Analysis and Synthesis of Digital Computers," was supervised by Professor E. J. McCluskey. He was an Instructor of Electrical Engineering during the 1961 academic year. During 1962-1963 he was a National Science Foundation Postdoctoral Fellow at Cambridge University, Cambridge, England, where he worked with Professor M. V. Wilkes on the design of systems and software. Upon returning from England, Dr. Schorr taught Computer Science as an Assistant Professor at Columbia University for the year prior to joining IBM.

He joined IBM in May, 1964, as a member of the Research Division, Yorktown Heights, New York, working under Dr. John Cocke and Dr. J. E. Bertram on Project Y. Project Y was incorporated into the Advanced Computer System Project of SDD in August, 1965, and Dr. Schorr became its Architecture Manager. In June of 1966, he assumed responsibility for the software and became Manager of Architecture and Programming. He assumed his present duties in June, 1968.

JOHN W. WEIL

Vice President, Advanced Systems and Technology
U.S. Group
Honeywell Information Systems

John W. Weil is Vice President of Advance Systems and Technology, Honeywell Information Systems, with headquarters in Waltham, Massachusetts. He is responsible for directing worldwide advanced technical work for HIS and for preparing new ideas for inclusion in product plans and product design.

Prior to his appointment, Weil served since 1966 as manager of advanced systems and technology for General Electric's Information Systems Group, where he formed and directed a worldwide organization for advanced development. Prior to that he served for two years as manager of systems and processor operations and for a year before that was manager of special projects, responsible for the design of large-scale computer systems, including the 600 series.

Weil was graduated in 1948 from Massachusetts Institute of Technology with a bachelor's degree in business and engineering administration and received a doctor's degree in experimental physics in 1953 from Cornell University.

He is a member of the Association for Computing Machinery, the American Nuclear Society and served on the latter group's national program committee for three years. Weil is also a member of Panel No. 7 of the Committee on Scientific and Technical Information (COSATI) of the Office of Science and Technology of the U.S. Government. This panel is concerned with the legal implications of information systems. He also is active on a sub-panel on the right of access.

EDWARD FREDKIN

Director, Project MAC, MIT

Edward Fredkin is young enough to be a native of the computer field, which he entered while serving in the Air Force during the Korean War, yet old enough to be a full Professor at MIT, Director of Project MAC, MIT's interdepartmental computer laboratory, Chairman of the Board of Information International, Inc. and founder of at least 32 other companies. Professor Fredkin's personal research field is cellular automata. He teaches a course in Problem Solving -- how to solve problems outside the limits of one's expertise. His main objective for Project MAC is an automatic programming system, a system of programs which, after interacting with its customer to determine his needs and conditions, will prepare, test, document, and deliver the programs.

THOMAS E. CHEATHAM
Head, Center for Research and Computing Technology, Harvard University

Prof. Cheatham, a graduate of MIT, is a full professor at Harvard University and is head of the Center for Research and Computing Technology. While president of Massachusetts Computer Associates, Inc. (COMPASS) he published numerous articles on various aspects of programming languages, becoming especially well known for his work in extensible languages. Currently, he is directing the efforts of the Center in automatic programming.

Some of his publications include:
Cheatham, T.E. and Warshall, Stephen. Translation of Retrieval Requests Couches in a Semi-Formal English-Like Language. CACM, 5 (January, 1962), pp.34-39.

Cheatham, T.E. Syntax Directed Compiling. Proceedings of AFIPS Spring Joint Computer Conference. Washington, D.S., April 1964. Vol. 25, Baltimore Spartan, 1964.

Cheatham, T.E. The Introduction of Definitional Facilities into Higher Level Programming Languages. Proceedings of AFIPS Fall Joint Computer Conference. San Francisco, November 1966. Vol. 29, Washington, D.C. Spartan, 1966.

PETER DENNING
Professor, Purdue University

B.S. in Electrical Engineering, Manhattan College, NYC, 1964
M.S. in Electrical Engineering, MIT, 1965
Ph.D. in Electrical Engineering, MIT, 1968

Assistant Professor of Electrical Engineering, Princeton University, 1968-1972
Associate Professor of Computer Science, Purdue University, beginning September, 1972

PUBLICATIONS:
Has had numerous publications dealing with resource allocation problems and memory allocation and program behavior modeling.

Is co-author with Edward G. Coffman, Jr., of OPERATING SYSTEMS THEORY, scheduled to appear in July, 1972, Prentice-Hall

AWARDS:
ACM Best Paper Award in Systems and Languages, "The Working Set Model for Program Behavior," CACM, 1968

Princeton Engineering Association Award for Outstanding Faculty Member, 1971

AFIPS Best Paper Award from SJCC 1972, "Operating Systems Problems and Undergraduate Science Curriculum"

PROFESSIONAL POSITIONS:
Chairman, ACM Board SIG/SIC's, 1970-1972
Chairman, ACM SIGOPS, 1969-1970

LAWRENCE C. ROBERTS
Director of Information Processing Services, ARPA

Dr. Roberts obtained the Ph.D. Degree in Electrical Engineering from MIT in 1963. His present position is that of Director for Information Processing Techniques, Advanced Research Projects Agency.

In the ARPA position, Dr. Roberts is principally concerned with the research, development and evaluation of new information processing techniques in the areas of computer system design and architecture; graphics; artificial intelligence; signal processing; weather modeling; and man-machine interaction. In addition, he is responsible for the development of the ARPA Computer Network, a new concept for inter-connecting autonomous computer systems in order to share hardware, software, and data resources amoung the entire ARPA research community.