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Data Processing Division, Systems Science Institute, Los Angeles, California.

Mathematics (Ph.D., University of California, Los Angeles, 1962). He joined the IBM Federal Systems Division in 1956 as a programmer. Since receiving his Ph. D. degree through an IBM Fellowship, he has held positions in sales and systems engineering, and has worked in the field of applied mathematics at the IBM Scientific Center, Los Angeles. He is currently a Senior Staff Member at the Systems Science Institute, specializing in the areas of programmer productivity techniques, and the application of statistics and queuing theory to communication system design.

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Electrical engineering (E.E., Sheffield University, England, 1963). After four years experience in computer engineering and logic design, he transferred to systems programming by joining the Large Scale Systems Design Center at the IBM United Kingdom laboratories. There he worked on the design and implementation of message switching and airline reservation systems and real-time terminal systems. For one year he was assigned to the early installation group for TSS/360 at Yorktown Heights as an anchor man for European accounts and subsequently joined the Research Center in 1969. Presently, he is a staff member of the Computing Systems Department where he has specialized in measurement and analysis of the performance of the CP-67 and VM/370 systems installed at the Research Center.

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Computer science (Ph.D., Yale University, 1966). Presently an Associate Professor of Management and Principal Investigator of an IBM-M.I.T. joint study on the applicability of relational data base ideas to an energy information system for New England. Other positions he has held are Clinical Associate Professor of Pediatrics at Tufts University School of Medicine, Associate Professor of Electrical Engineering at M.I.T., Chairman of the Board of MITROL, Board Member of Financial Publishers, Lecturer at Oxford University, Faculty Member of M.I.T.'s Project MAC, and Principal Investigator of several sponsored research projects at M.I.T. He is author or coauthor of several texts including *Systems Programming*, *Operating Systems*, and *Software Engineering*.

Wilbur D. Hagamen

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Authors

David J. Linden

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Since joining Cornell in 1970, he has worked in the areas of artificial intelligence and natural language analysis, including the programming of A Tutorial System (ATS). In 1973, he wrote an APL program for the production of statistical reports and discharge summaries for the Obstetrical Department. This was one of several application programs that led to his major current interest, the development and continuing enhancement of A Program Generator (APG).

Stuart E. Madnick

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Computer science (Ph.D., Massachusetts Institute of Technology, 1972). Worked with IBM as a consultant from 1966 to 1972 on the design of various components of the CP-40/CMS, CP-67/CMS, and VM/370 virtual machine systems. During that time, he was a research assistant at M.I.T.'s Project MAC and an instructor on systems programming and operating systems in the M.I.T. Department of Electrical Engineering. In 1972 he joined the Sloan School of Management as an Assistant Professor of Management Science. In 1973 and 1974, he was project supervisor of a study of user requirements for security sponsored by the IBM Data Security Study. In 1974 he assisted in the establishment of the Center for Information Systems Research. The author of several technical papers in the field of computer science including a recent textbook on operating systems, he is currently involved in teaching and research in advanced information systems.

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Mathematics (B.A., Barnard College, 1973). Has worked at Cornell since 1973 as a programmer analyst. She has written several major applications for both the College and the Hospital in APL, and is currently involved in improving the efficiency with which APG manages large data bases and interfaces with COBOL files.

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