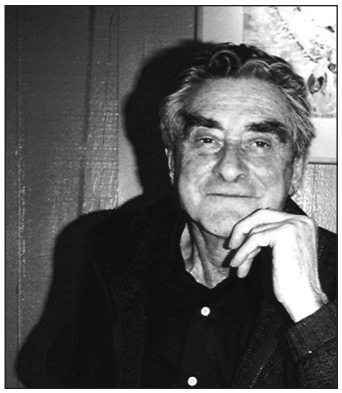
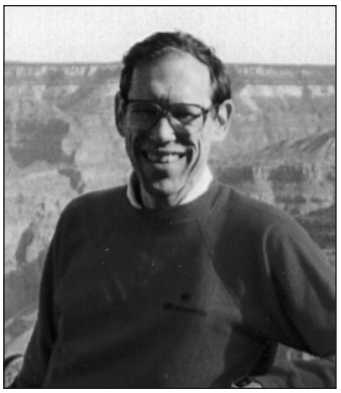
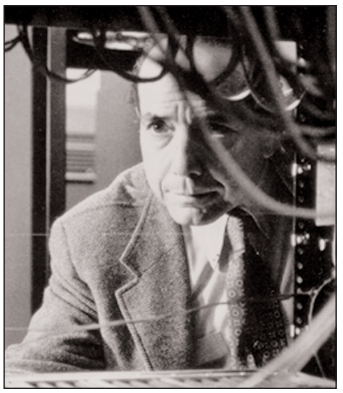




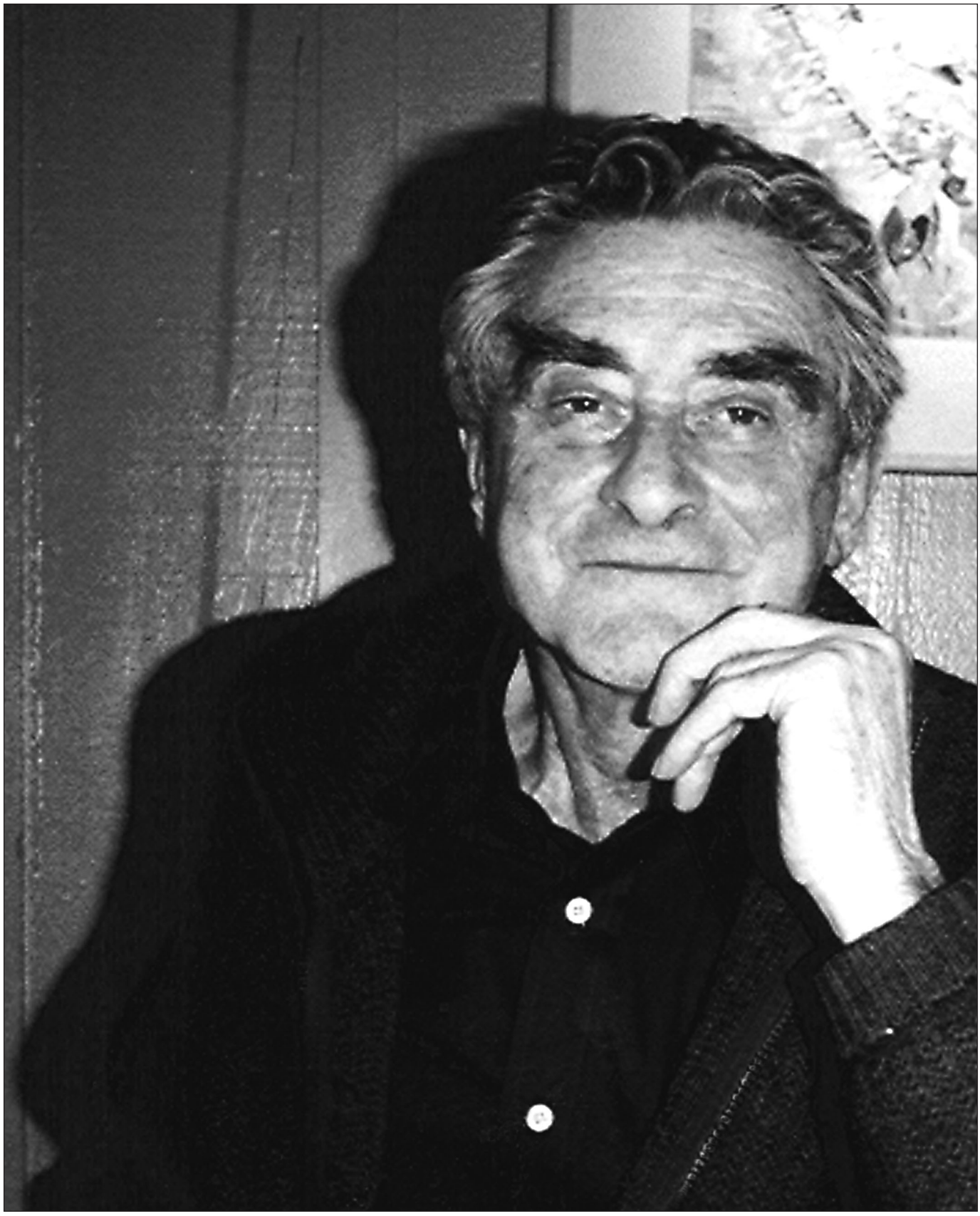
In Memoriam

Charles Rosen, Norman Nielsen, and Saul Amarel

Peter E. Hart and Nils J. Nilsson, Ray Perrault, and Tom Mitchell and Casimir A. Kulikowski

In the span of a few months, the AI community lost four important figures. The fall of 2002 marked the passing of Ray Reiter, for whom a memorial article by Jack Minker appears in this issue. As the issue was going to press, AI lost Saul Amarel, Norm Nielsen, and Charles Rosen. This section of *AI Magazine* commemorates these friends, leaders, and AI pioneers. We thank Tom Mitchell and Casimir Kulikowski for their memorial to Saul Amarel, Ray Perrault for his remembrance of Norm Nielsen, and Peter Hart and Nils Nilsson for their tribute to Charles Rosen. The AI community mourns our lost colleagues and gratefully remembers their contributions, which meant so much to so many and to the advancement of artificial intelligence as a whole.

– David Leake



Charles Abraham Rosen, December 7, 1917 – December 8, 2002

Charles Abraham Rosen—Scientist and Visionary: 1917–2002

Charlie Rosen combined enormous creativity and a spirit of adventure with an equally enormous sense of responsibility at all levels.

The foundation of Charlie's creativity was his broad knowledge. His intellectual curiosity resulted in a head crammed with facts and figures from many disciplines. He knew a lot about applied physics, about what used to be called radio engineering, about manufacturing engineering, plant physiology, neurobiology, adaptive learning algorithms and devices, machine vision, industrial robotics, national politics, international affairs, and art. His special creative genius was his ability to associate knowledge from these different disciplines and to recognize the possibilities of combining apparently unrelated ideas in new and interesting ways.

Born in Canada, Charlie received a B.S. degree in electrical engineering at Cooper Union followed by a master's at McGill University in Montreal and a Ph.D. at Syracuse University. He came to SRI International (then called the Stanford Research Institute) in the late 1950s after working with solid-state devices at the General Electric Company in Syracuse, New York. While at G.E., he coauthored an influential textbook on transistors.

Charlie's first involvement with artificial intelligence was his work on a series of neural network machines at SRI during the early 1960s. The last of these, MINOS III, achieved impressive results—including classification of symbols on army maps and accurate recognition of hand-printed characters on FORTRAN coding sheets.

In 1965, Charlie proposed creating the world's first intelligent mobile robot, and SHAKEY was born. The genius behind SHAKEY was Charlie's vision of a project that would combine in one experimental test-bed advances from every subfield of artificial intelligence. That indeed was exactly what happened. SHAKEY combined machine vision, automatic planning and execution monitoring, navigation, speech and natural language understanding, and robot software architecture in ways that were initially unforeseen and had never been done before.

The SHAKEY project, funded by DARPA for several years, generated several very important AI technologies. Among them were the introduction of region finding and the invention of the so-called "modified" Hough transform in computer vision, the development of three-level robot software architectures, the A* heuristic search algorithm (which among many other applications is universally used for computing driving directions), the STRIPS automatic planning system, and what has come to be called "explanation-based learning" (EBL). These techniques are still foundational today, almost 40 years later.

An example of Charlie's sense of humor is displayed in the 1972 SRI film "SHAKEY, the Robot." Dressed in black cape as a gremlin, Charlie attempts to frustrate SHAKEY by blocking its path to a goal. (SHAKEY's planning and execution-monitoring software was able, of course, to overcome such unanticipated interference.)

Charlie wanted to do more with robots than just use them as a platform for developing AI techniques. He wanted to develop robot systems that could actually be applied to important problems in industry. In the mid-1970s, he formed a Robotics Group within SRI's AI Center and began work on several projects aimed at moving robots out of the laboratory.

One of the important inventions of the Robotics Group at that time was a very robust machine vision system capable of recognizing industrial parts as they came down conveyor belts. Ultimately, interest in this system led Charlie and others to found Machine Intelligence Corporation, which commercialized this product.

Charlie's sense of responsibility had no boundaries. He felt personally responsible for everyone he worked with, taking special care to mentor younger colleagues. He felt a great sense of business responsibility to the funders and investors who made his work possible and was always straightforward in his depiction of risks and rewards. And he had an unlimited sense of social responsibility, donating, for example, his own time to goals like "appropriate technology" for the developing world, which he did under the auspices of the National Academy of Engineering.

Charlie sometimes observed that there were two kinds of people in the world, "givers" and "takers." No one ever doubted what kind of person Charles A. Rosen was. His passing is a great loss. We shall not soon see his kind again, but his influence and example will be with us for a long time to come. We are proud and privileged to have been able to work under him.

—Peter E. Hart and Nils J. Nilsson

Norman Russell Nielsen: 1941–2002

Norman Nielsen, the secretary-treasurer of the American Association for Artificial Intelligence (AAAI) since 1992, died at his home on 25 December 25 2002.

Since 1975, Norm was an information technology consultant for SRI International and its subsidiaries, where he led projects in applied AI, speech recognition, network architecture, and information security. Because of his deep understanding of their real needs, his technical insight,

Norman Russell Nielsen, September 8, 1941 – December 25, 2002

and his integrity, he developed long-lasting relationships with clients around the world. He led the effort to create an expert system to assist in the selection of fasteners used in automobiles at General Motors (GM). Not only was the expert system application successful, but by capturing the knowledge of how fasteners should be selected, GM was able to improve its design practices and reduce the number of fasteners used in cars from 5000 to 500, resulting in substantial savings. In a project for the Electric Power Research Center, Norm pioneered the use of expert systems for the control of utility power generators, improving the monitoring, control, and safety of power-generating plants beyond what was practical with just human operators.

The valedictorian of his class at Pomona College, Norm received an M.B.A. and Ph.D. in operations and systems analysis from Stanford University, served as assistant director of the Stanford Computation Center, and taught at the Stanford Graduate School of Business before joining SRI. He was the author of two books on applied AI and more than 75 articles.

As secretary-treasurer of AAAI, he chaired the Finance Committee, which oversees annual budgets and the association's investments, and was a member of the AAAI Executive Committee. He was a valuable source of advice on policy, as well as finances, and his quiet words of common sense were always respected and appreciated.

He leaves his wife of 39 years, Jeannette, and a daughter, Joanne.

Norm was a seasoned traveler (he visited Japan over 60 times), a devoted outdoorsman, a passionate supporter of Stanford athletics, and a lifelong lover of trains. He will be remembered for his warmth, generosity, and integrity.

—Ray Perrault

Saul Amarel: 1928–2002

Saul Amarel, D.Sc., Alan M. Turing professor of computer science at Rutgers University, passed away in Princeton, New Jersey, on Wednesday, 18 December, from a heart attack following a six-year battle with cancer. This occurred just as the celebration of his retirement from Rutgers University, after more than 40 years of leadership in computer science nationally and internationally, was under preparation for 20 December. At his request, the celebration went forward as a memorial, bringing together many of his friends, family, students, and colleagues, especially from AI. Those of us who knew Saul well were not surprised that he kept fighting and worked till the end. His strength and determination were legendary in the community—as an enthusiastic leader, visionary researcher, and pioneering contributor to advanced computing and AI methodologies, applied to both scientific inquiry and engineering practice.

Saul Amarel developed seminal concepts and wrote foundational papers on knowledge representation for human and automated problem solving. An early example is "On the Automatic Foundation of a Computer Program Which Represents a Theory" (*Self- Organizing Systems,* eds. Yovits et al., Spartan, 1962), written while he headed the RCA Sarnoff Labs Computer Theory Group. He attended the Allerton House Conference organized by Von Foerster of the University of Illinois in that year, which brought together a number of early AI researchers inspired by the work of Warren McCullogh in his *Embodiments of Mind,* and later in the decade, Amarel became a member of the board of directors of the American Cybernetics Society (ACS), which emphasized the cybernetic origins and strand within AI. In 1966, Amarel spent a sabbatical at Carnegie Mellon University, where he joined Allen Newell's seminar on shifts in knowledge representation. As the result of this seminar, Amarel published "An Approach to Heuristic Problem Solving and Theorem Proving in the Propositional Calculus" (*Systems and Computer Sciences,* eds. Hart and Takasu, University of Toronto, 1967), which showed how an appropriate representational choice can vastly simplify the search for problem solutions. Amarel's research evolved at this time from networks, communication, and simulation toward more general AI problem- solving approaches. His sojourn at Carnegie Mellon proved fortuitous, leading to lifelong friendships and professional associations with Herb Simon, Allen Newell, Ed Feigenbaum, and Bruce Buchanan, among many others. The two best-know papers summarizing Amarel's contributions to representational shift were published in the Machine Intelligence series of Metzger and Michie: "On Representations of Problem of Reasoning about Actions" in the third volume (1968) and "Representations and Modeling in Problems of Program Formation" in the sixth volume (1971). He used the classical missionaries and cannibals problem to illustrate how representational choice is instrumental in producing simple and efficient, rather than elaborate and computationally complex, solutions.

In 1969, Amarel moved on to establish the Department of Computer Science at Livingston College, Rutgers — The State University of New Jersey — in New Brunswick and was its chairman until 1984. At Rutgers, Amarel designed one of the first undergraduate programs in computer science worldwide as well as founded its doctoral program and developed a modern research-centered department. He was deeply committed to developing and dissemi-

Saul Amarel, February 16, 1928 – December 18, 2002

nating computational methods that would benefit society and wrote one of the early papers on the foundations of computer science, which appeared in the *Communications of the ACM* in 1974. He also wrote on the effect of computing in developing nations and successfully championed the independence of academic computing resources from centralized state control in New Jersey.

Amarel's research leadership was reflected by his bringing the first National Institutes of Health (NIH)–funded Special Rutgers Research Resource on Computers in Biomedicine to the university in 1971, laying the foundation for the knowledge-based research of the 1970s and 1980s applied to such diverse fields as medicine, bioengineering, chemistry, psychology, engineering design, and ecology. He was instrumental in the collaboration of the Rutgers Resource with its sister NIH Resource at Stanford SUMEX-AIM, led by Joshua Lederberg and Ed Feigenbaum, that pioneered the networking of biomedical informatics and AI methods for biomedical inquiry. Results of this work at Rutgers included the first causal reasoning system for medical consultation (CASNET) and the first medical expert system on a microcomputer (with Weiss, Kulikowski, and Safir) as well as systems for knowledge representation (AIMDS with Srinivasan), logic and simulation for bioengineering (with Chokhani, Welkowitz, and Kulikowski), planning of action sequences and learning in psychology (with Schmidt and Sridharan), and modeling and simulation in ecology (with Vichnevetsky and Trama). In the 1980s, Amarel also pioneered a long-term research effort on problem solving and engineering design, funded by the Defense Advanced Research Projects Agency, collaborating with Mitchell and Steinberg on knowledge-based approaches to design.

In 1977, Amarel founded the Laboratory for Computer Science Research at Rutgers, which introduced time-shared computing for scientific communication at Rutgers and was an early node in the ARPA net—the predecessor of the internet. Saul recruited Herb Simon's student Chuck Hedrick as leader in this effort, which contributed to the practical success of the early time sharing.

In 1983, Saul Amarel was general chair of the International Joint Conference on Artificial Intelligence (IJCAI) held in Karlsruhe, Germany. He was subsequently director of the DARPA Information Sciences and Technology Office from 1985 to 1988. On returning to Rutgers, he was named Alan M. Turing professor of computer science and, in 1989, led a major project on High Performance Computing and Design under a federal Department of Defense grant. The project investigated how to apply advanced AI techniques to the design of VLSI circuits (with Al Despain, Lou Steinberg), voice-recognition systems (with Jim Flanagan), propulsion systems for aerospace vehicles (with Doyle Knight and Andrew Gelsey), and the design of marine vessel hulls (with Tom Ellman and Nils Salvesen). This project reflected Amarel's unique abilities as a leader in organizing networks of collaborating scientists and engineers to develop advanced computer science methods for complex, real-world applications. Throughout his career, Amarel's scientific contributions and leadership in AI reflected his deep conviction that scientific insights into cognition and problem solving need to be continuously tested through computational models, designed and engineered to have practical significance. His accomplishments were recognized by the Association for Computing Machinery (ACM) through the Allen Newell Award in 1993. He was also elected a fellow of the Institute of Electrical and Electronics Engineers (IEEE) and received the Rutgers Research Excellence Award in 1994. From 1995, he chaired the Information Sciences and Technology Council at Rutgers University.

A 1948 graduate of the Israel Institute of Technology (Technion), Amarel received his master of science degree in 1953 and his doctorate in engineering science in 1955, both from Columbia University. From 1948 to 1952, Amarel was associated with the Scientific Department of the Israeli Ministry of Defense as project leader in control systems and simulation. He helped build and test one of the first successful remotely controlled guided missile systems for naval warfare. Before that, he had participated in the Israeli War of Independence in 1948 while he was still working for his undergraduate degree at the Technion in Haifa. He had earlier been a resistance fighter during the Nazi occupation of Greece and had been instrumental in leading his family out of danger to the then British Mandate of Palestine. Saul Amarel was born in Salonika, Greece, in 1928.

He was predeceased by his first wife, Marianne Kroh Amarel. He is survived by their sons Daniel and David, both of New York City, and by his wife Irene Kaplan Amarel of Princeton Township, New Jersey.

Saul Amarel's life, talents, contributions, and friendships spanned and enriched many worlds—physical, intellectual, and personal. He will be remembered as an indefatigable champion of artificial intelligence research, who inspired many others with his ideas on how to combine modeling of complex systems with AI problem solving. His insight into the human cognitive roots of problem solving involved a unique blend of scientific and engineering approaches that helped lay the foundations for the field of knowledge-based systems. But most importantly, Saul was a good friend, mentor, and close collaborator who will be sorely missed by all of us.

—Tom Mitchell and Casimir A. Kulikowski