John R. Pasta

Born 1918, New York City; died June 5, 1981, Washington, D. C.; mathematician, computer scientist, and science administrator who started programming at Los Alamos Scientific Laboratory and finished his career as the leading Proponent of computer science research as director of the Division of Mathematical and Computer Sciences of the National Science Foundation, with S.M. Nam and Enrico Fermi, the originator of the Fermi-Pasta-Ulam (FPU) problem.

Education: BS, City College of New York, 1946.

Professional Experience: real estate title examiner, Title Guarantee and Trust Co., 1938-1941; patrolman, New York City Police Department, 1941-1942; officer, Signal Corps, US Army, and cryptographical security officer, radar officer, 29th Tactical Air Command, Ninth Air Force, 1942-1946; Los Alamos Scientific Laboratory, 1951-1956; Mathematics and Computer Branch, Atomic Energy Commission Division of Research, Washington, D.C., 1956-1961; research professor of physics, Digital Computer Laboratory, University of Illinois, 1961-1970; National Science Foundation, Washington, D.C., 1970-1981.

Honors and Awards: Bronze Star; Belgian Fourragere.

John was born in New York City in 1918, the eldest of four children, and grew up in Queens. He attended the New York public schools and became interested in physics at an early age when an uncle gave him some of his old college books. After graduating from Townsend Harris High School, he entered City College of New York in 1935 and completed three years. The depression forced him to drop out of college at that stage to take a job as a real estate title examiner for Title Guaranty and Trust Company. In 1941 he took the examinations for the New York City police department, entered the police academy, and became a patrolman in August 1941. In 1942, he was drafted into the US Army, became an officer in the Signal Corps, and took courses on electronics and radar at Harvard and MIT. He married Betty Ann Bentzen at the Little Church Around the Corner in New York City in May 1943. After the war, John and Betty had two children: Diane, now a lawyer in Seattle, and David, completing his doctoral dissertation in statistics at Stanford and president of a statistical computing firm in Palo Alto.

John's tour of duty with the Army during World War II was spent in the European theater, mostly as cryptographical security officer and radar officer for the 29th Tactical Air Command, Ninth Air Force, for which he was awarded the Bronze Star and the Belgian Fourragere. After being discharged from the Army in 1946, he took advantage of the GI Bill to finish his undergraduate work at City College that same year and enter graduate school at New York University to study mathematics and physics.

As a graduate student he became a research fellow in the Department of Physics at Brookhaven National Laboratory, the beginning of a long and rewarding association with Brookhaven, and completed his thesis on “Limiting Procedures in Quantum Electrodynamics” in 1951 under the guidance of Hartland Snyder.

He became a staff member of the Los Alamos Laboratory in August 1951. The MANIAC was in its final stage of construction and testing, and like many others, John was mesmerized by this marvelous toy that offered so much potential for gaining an insight into nonlinear physics. Trained as a theoretical physicist, he came to grips with “hands-on” computing, dealing directly with all its aspects.

John's most cherished interaction was with Fermi. In the summer of 1953 Fermi raised the question of the nature of approach to describing the equilibrium of a vibrating nonlinear string initially in a single oscillatory mode. Together with Ulam, they formulated some preliminary test problems. As expected, the computations showed that the initial vibrational energy gradually transferred into neighboring modes, and the system seemed to achieve equilibrium—the time taken being the so-called relaxation time. The completely unexpected happened one day when a typical problem was being computed. Owing to a very energetic, distracting discussion, the computations continued beyond the usual cutoff. The results were so strange and mysterious that everyone around was quick to assume that the computer, the traditional whipping boy, had gone awry. The vibrational energy had returned to the initial mode, within a few percent. The rest is history—the stimulation that work provided to soliton theory, the enormous literature that emerged globally. Today it is well known as the FPU (Fermi-Pasta-Ulam) problem.

He joined the AEC in 1956, and he performed two important functions. The first was to serve as the sole computer expert and adviser at AEC headquarters for unclassified work involving computing.

John's second task was to institute a contract-research program in mathematics and computers. By 1956 the mechanism for the support of research in the basic sciences, as mandated by the Atomic Energy Act of 1946, was well established, but it was believed that there was no need for a separate and independent program of research in mathematics, since relevant mathematics research was implicit in the theoretical physics program.

Early in the 1960s a major concern of the AEC was the availability of computer systems capable of handling the anticipated future loads of the weapons laboratories and, to a lesser extent, the requirements of its reactor and high-energy physics programs. In retrospect, it is somewhat amusing to note that the absence on the horizon of a “machine ten times STRETCH” was taken as cause for great concern. In consequence, the major manufacturers were invited to discuss their future plans at a meeting hosted by Oak Ridge National Laboratory in May 1962.

Shortly after that meeting, with the concurrence of the AEC, a small informal group consisting of Pasta, Nicholas Metropolis, John Richardson, Jerome A.G. Russel, Yoshio Shimamoto, and, later, Daniel L. Slotnick was organized to discuss and explore some of the newer computer technologies that were beginning to make the news.

The members felt that the meetings were instructive and worthwhile, however, so they continued to meet at a rate of once every 9 to 10 months. At one of the meetings, Slotnick was asked to discuss his SOLOMON computer and was invited to become a member of the group shortly thereafter. This association was influential in the subsequent research and development leading to the ILLIAC IV.

Around 1965, John returned to his first love-nonlinear physics and his time at Brookhaven was devoted to numerical experimentation. The Brookhaven staff also benefited from his managerial talents, for he was constantly drawn into planning and management discussions. When the decision was made to connect minicomputers, located at the various experimental facilities, to the CDC 6600 of the Central Scientific Computing Facility, John was also involved in the initial planning stage of the project.

After spending approximately four years in the Division of Research of the Atomic Energy Commission as head of the mathematics and computer branch, John had developed that branch into a vital part of the Division of Research's programs and had completed the task for which von Neumann had prevailed upon him to come to Washington. He felt ready for a change in career. After some discussion, John accepted a position as research professor of physics in the Digital Computer Laboratory, the Graduate College, and the Department of Physics in the College of Engineering at the University of Illinois, effective September 1, 1961.

His early research career at Illinois involved the programming of the ILLIAC II, which became operational in August 1962. As was often the case in those early days, most attention was paid to developing the hardware aspects of a computer system. Only when the machine was near completion was work begun on the operating system and compilers that would be needed before even talented users could exploit the machine. In two years they produced an operating system and Fortran compiler for the ILLIAC II that first ran in August 1964.

Cordial relations with the Department of Mathematics permitted a bachelor's degree called mathematics and computer science to be formulated; it contained a heavy component of mathematics as well as computer science. The tedious approval process was carried out in record time; the bachelor's program became official in 1965 and immediately enrolled 41 students. The graduate degrees became available in 1966 and immediately attracted 10 students. By 1970, when Pasta left Illinois, these programs had grown to 302 undergraduates and 141 graduates. Pasta felt that this facet of his stay at Illinois was personally the most rewarding.

Another significant development during Pasta's leadership was the consolidation and growth of the ILLIAC II project. The pilot study yielded promising results, and by 1964-1965 the AEC had agreed to fund the full development of a computer whose cost would be on the order of several million dollars. Naturally, the computer was called the ILLIAC III. Unfortunately, disaster in the form of a fire struck ILLIAC III before it was completed, and its ideas could not be tested. Nevertheless, it was pioneering work in parallel computer architectures.

Other research on parallel architectures during Pasta's tenure at Illinois involved the ILLIAC IV project and its originator, Daniel L. Slotnick. Slotnick's initial ideas about parallel computers go back to the mid-1950s. Pasta prevailed on Slotnick to join the Department of Computer Science at Illinois in May 1965.

Ivan Sutherland, who was in charge of computing activities in the Advanced Research Projects Administration (ARPA) of the Department of Defense, visited Illinois shortly after Slotnick's arrival to discuss building such a machine. A positive decision was made, and the ILLIAC IV project was born. Within a few months, a $10 million contract with ARPA was executed.

Another activity that should be mentioned, especially in connection with his Illinois period, is John Pasta's participation in international science. He participated in the IFIP conferences beginning in the 1950s and was the American delegate to IFIP in 1965-1966.

If John's personal feelings about his position at Illinois in 1969 were similar to those he had had about his AEC position in Washington in 1961, the situation he met when he returned to Washington was much like the one he had found at the AEC when he first went there in 1956. There was widespread bewilderment, doubt, insecurity, and downright skepticism in government circles about the role of computers in education and research, and computer science as a discipline had almost no recognition at all. NSF's university computer-facilities program was under attack and being reduced; its computer-research program had never grown. His credentials as a physicist often served him well in battles with physicists and other scientists to protect the fledgling computer-research activities, and he always loved the fight.

It is not surprising that John's first few years at NSF were ones of retrenchment and rebuilding. First, the university computer-facilities program was phased out; its mission was declared accomplished. The educational activities of the Office of Computing Activities were the next to go, moved into the foundation's Directorate for Science Education as a more natural organizational home for all of NSF's educational functions. John fought that move bitterly and lost. The Office of Computing Activities was then renamed the Division of Computer Research.

A final change took place in 1975 when the Division of Computer Research was merged with the mathematics section of NSF to form the Division of Mathematical and Computer Sciences, with John as division director and with one section for computer sciences and one for mathematics.

An area John worked on steadily from the time he came to NSF was computer networking. He advocated formation of a national computer network among research groups in computer science, but was stymied by skepticism at higher levels of NSF, and reluctance by the government to take on responsibility for an operation of unknown but possibly frightening magnitude. Unfortunately, although he lived long enough to see the National Science Network (CSNET) project, he was unable to participate in it.

Throughout his professional life, John was fascinated by the deep impact computer technology was having, first on science and then on the whole fabric of social organization and intercourse. It was natural for him to include in the spectrum of activities supported by his Division of Computer Research at NSF a group of projects performing research on the social impact of computing technology. He undertook to alert the branches of government that have primary responsibility for law enforcement, to the dangers of criminal activity using computer technology. NSF still carries on fundamental research in data and computer-system privacy and security.

Although his research funds at NSF were for scientific studies, and another (weakly funded) program in the foundation had responsibility for the history of science, John took the opportunity to work with that program and supplement the resources available for the history of science on several occasions when strong proposals were submitted to NSF. Two examples were the first History of Programming Languages Conference in 1978 and the Convocation of Computer Pioneers, organized in Los Alamos in 1976.

John was fascinated by the world around him and never missed the opportunity to better himself. Thus, while he was at Illinois, he availed himself of the facilities provided by the university to resume his childhood piano lessons, which had long been abandoned, and to take flying lessons and qualify for a pilot's license.

Above all, he was a man of considerable courage. He suffered a long, painful illness and had considerable time to contemplate death, yet he maintained the grace to joke on the subject. He served the NSF even after he was no longer able to walk. Until the very end, he was the tough New York City cop whose primary concern was the well-being of science and his country.[1]

[1] From Curtis et al. 1983.

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UPDATES

Portrait added (MRW, 2013)