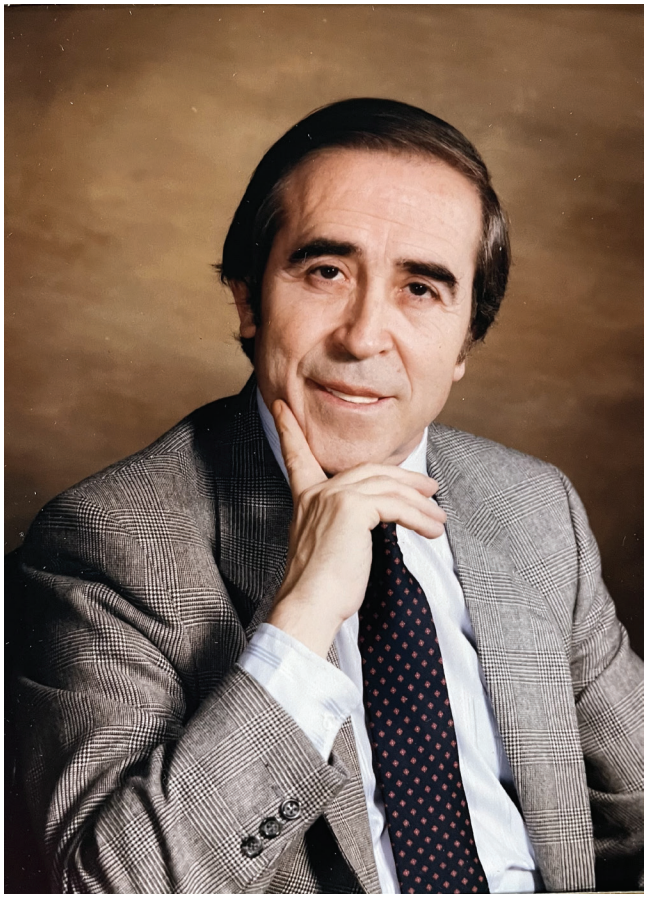

ANGEL G. JORDAN

1930–2017

Elected in 1986

"For contributions to solid-state device research, and for innovative leadership in engineering education."

BY PRADEEP KHOSLA

ANGEL GONI JORDAN was born September 19, 1930, in Pamplona, Provincia de Navarra, Spain, and raised in the country's northern mountain region of the Pyrenees. He earned a degree in physics at the University of Zaragoza in 1952, with a 1-year research fellowship (1951–52) in Pittsburgh at the Mellon Institute of Industrial Research, where he conducted basic and applied research in semiconductor photodevices and solar cells.

Back in Spain, he went to work as a research engineer, doing basic and applied research in servomechanisms and electronics, in the Laboratorio y Taller de Investigación, Estado Mayor de la Armada (LTIEMA) in Madrid (1952–56). He introduced the foundations of semiconductor devices and semiconductor electronics in the country's naval research laboratory and produced a number of technical reports.

In 1956 he and his wife Nieves came to the United States to pursue their PhDs in electrical engineering at the Carnegie Institute of Technology (now Carnegie Mellon University, CMU). Upon completing his PhD in 1959 Angel was hired at CMU as a researcher and assistant professor of electrical engineering.

During his 4-decade career he made numerous scientific and technical contributions in semiconductor electronics and materials science and engineering. He distinguished himself

in his work in tunnel diodes, junction devices, photodiodes, parametric amplifiers, high-frequency devices, behavior of semiconductor devices at low temperatures, noise in semiconductor devices, effects of imperfections in the electrical properties of semiconductors, radiation damage in semiconductors, thin films, gas detection devices, semiconductor metal oxides, and microprocessor-controlled systems. Later in his career he conducted research on high-definition television, intelligent sensors for robotics applications, technological innovation and management of technology, and studies of the computer industry.

During his tenure in the CMU Electrical and Computer Engineering Department (ECE) Angel attracted considerable government and industry funding and was instrumental in building one of the country's first and finest university laboratories in solid-state devices. His work enabled advances in the understanding and theory of semiconductor phenomena and devices, and contributed to technological developments with impacts on microelectronics, environmental monitoring and control, biomedical instrumentation, coal mining safety, and automated systems.

He taught several generations of undergraduate and graduate courses and supervised the doctoral work of 28 students, launching them and numerous master's students to become influential leaders in their fields. He is remembered fondly as a warm and engaging teacher.

As ECE department head (1969–79) he expanded areas in which the department was prominent; recognized and fostered new areas, such as computer-aided design, computer hardware, robotics, and optical electronics; initiated new interdisciplinary programs, such as magnetic technology and electronic materials; and propelled the department to a leading position in the country. Funded research support more than quadrupled and the level of enrollment and quality in both undergraduate and graduate programs increased substantially. He participated in the founding of CMU's Department of Computer Science, now recognized as nationally outstanding.

As dean of CMU's engineering college, Carnegie Institute of Technology (CIT, now the College of Engineering; 1979–83), he extended the scope of the Design Research Center; led all departments to higher levels of excellence; introduced manufacturing and automation in the research and educational programs of several engineering departments; was a leader, with Raj Reddy (NAE 1984) and Thomas J. Murrin (NAE 1984), in the formation of the Robotics Institute, encouraging participation from computer science, all engineering departments, and the Graduate School of Industrial Administration (this institute—which offered the first PhD program in robotics—is now the largest academic robotics research center anywhere); encouraged and supported the formation of the interdisciplinary Magnetics Technology Center (one of the few and the largest center of its kind in the nation, funded by industry and government agencies); fostered close cooperation among departments and centers; and led the college to a dramatic increase in funded research.

As CIT dean and then as provost of CMU (1983–91), he led the faculties of the CIT and Graduate School of Industrial Administration in putting together innovative curriculums in integrated manufacturing systems engineering and management to educate a new breed of manufacturing engineers and managers. All of the university's research programs expanded. By the last year of his term, research funding exceeded $125 million a year, of which 20 percent was from industry, one of the highest percentages in the country.

Under Dr. Jordan's leadership, in 1986 CMU attracted to its engineering college an NSF Engineering Research Center (ERC): the Engineering Design Research Center is based in the Design Research Center and the Robotics Institute, two programs also launched and nurtured during his tenure as dean. A second NSF-funded ERC, the Data Storage Systems Center based in the Magnetics Technology Center, was also established.

As provost he fostered close cooperation between the School of Computer Science and the rest of the university, particularly the College of Humanities and Social Sciences. For example, the Computational Linguistics Program, housed in the

Philosophy Department, comprises linguistics, philosophy, and computer science. The Center for Machine Translation, a large research institute based in computational linguistics and funded by government agencies and industry, reports directly to the provost because of its universitywide scope. The engineering college and the Graduate School of Industrial Administration collaborate in interdisciplinary programs in manufacturing and information technologies.

He was a leading force in the revitalization of the Mellon Institute, one of the first industrially sponsored research institutes in the country before it merged in 1967 with Carnegie Institute of Technology to form Carnegie Mellon University. In 1983 when Angel became provost, this institute was in a state of flux and in need of leadership. For two years he directed the institute from the provost's office and put it back on track before appointing a permanent director. The building that housed the Mellon Institute is now the home of Mellon College of Science, and over the years the programs of the original Mellon Insitute have dissipated or been absorbed in other parts of Carnegie Mellon.

In addition, Dr. Jordan participated in educational and search committees, inside and outside his department or college, and in universitywide committees with the administration. He was active in the development and fund raising for a campaign to raise $200 million for the university, and was instrumental in attracting a number of endowed professorships and gifts and grants from individuals, foundations, and corporations. In concert with the Development Office and the university president, he participated in a development campaign for the college to raise funding for renovations, construction, equipment, and facilities.

As a technology leader, Angel was a dynamic force in creating community and collaboration beyond the CMU campus. As department head, dean, and provost, he initiated and encouraged local, national, and international industry-university research partnerships. He was a pioneer in technology transition with the university acting as a catalyst for economic development in Pittsburgh and Western Pennsylvania.

In 1983 he founded, was the first chair, and later served on the board of directors of the Pittsburgh High Technology Council, an organization to help change the city from one of smokestacks to high technology. He also played an important role in the formation and implementation of the Enterprise Corporation (and served on its board of directors), the mission of which is to help start new companies in Greater Pittsburgh; participated in the conversion of the J & L Steel site to an industrial park, the Pittsburgh Technology Center, to help attract advanced technology companies to the city and to work with CMU; served on the Allegheny County Airport Advisory Commission for the construction and expansion of the Midfield Terminal; and worked with community groups in the area and around the state to foster economic development through education and technology.

As chair of the Association of Engineering Colleges in Pennsylvania and governor-appointed member of the Pennsylvania Science and Engineering Foundation, he was a leader in creating and launching the Ben Franklin Partnership Program and the state's Advanced Technology Centers, and served as director of the Western Pennsylvania ATC.

He was the orchestrator and driving force behind the effort to attract the Software Engineering Institute to CMU and Pittsburgh. This federally funded research and development center is meant to enhance the productivity of software production and set the standards of software engineering for DOD and industrial corporations. Together with CMU's School of Computer Science and College of Engineering, the SEI is a catalyst for spin-offs and magnets to attract software companies to Pittsburgh and Western Pennsylvania. In addition to spearheading the SEI's establishment in 1984, Angel served as acting director (2003–04).

For years he served on the board of directors of the Mellon Pittsburgh Corporation (MPC), including as vice chair (1985–87) and chair (1987–91). The corporation was established for collaborations between CMU and Pitt. Under the MPC umbrella the two institutions in 1986 formed the Pittsburgh Supercomputing Center, one of the original five

supercomputing centers in the nation funded by the National Science Foundation. Because of its universitywide scope the center reports directly to the provost.

He fostered research collaborations between CMU and the University of Pittsburgh in areas where the two institutions complement each other—for example, in magnetic resonance and in cancer research between CMU's Biological Sciences and Computer Science Departments and Pitt's School of Medicine; and in biomedical informatics between CMU's Laboratory for Computational Linguistics and Center for Machine Translation and Pitt's Linguistics Department and School of Medicine.

As ECE department head he reorganized the interdisciplinary Biomedical Engineering Program in the College of Engineering and served as acting chair, fostering collaborations between the program and Pitt's medical school and between the program and Allegheny Singer Research Institute (the basic and clinical research branch of Allegheny General Hospital), for which he served on the research committee and board of directors. He continued fostering these collaborations as dean of engineering, and as provost he expanded them to include CMU's science and engineering colleges, Robotics Institute, and School of Computer Science. He also served on the board of directors of the Allegheny Heart Institute (a division of Allegheny General Hospital) and chaired its research committee.

He lectured at US universities and abroad on interdisciplinary education, industry-university relations, technology transfer, and strategic planning; fostered and participated in collaborative efforts between CMU and universities and research establishments nationally and abroad; and initiated a number of international research and educational programs in science and technology and in the humanities and social sciences. In parallel, throughout his faculty career he consulted (two days a month on average) with industry, universities, and government agencies nationally and abroad.

He published extensively in refereed journals, wrote a number of reports and monographs, and made numerous presentations at national and international meetings. He was a

coauthor of a 1984 report by the Business–Higher Education Forum, *The New Manufacturing: America's Race to Automate*, that has been widely circulated and attracted national and international attention.

For the National Research Council, he was appointed to the Committee for the Study of Defense Industrial Mobilization (1988–90); and as an NAE member he volunteered on the Electronics, Communication and Information Systems Engineering Peer Committee (1987–89; chair, 1989–90) and Committee on Membership (1989–90).

Angel's contributions were well recognized. In addition to his NAE election, he was a fellow of the IEEE and American Association for the Advancement of Science and a member of the American Physics Society and American Society of Engineering Education. He was a Distinguished Fulbright Scholar, the 1987 Vectors Pittsburgh Man of the Year in Education, and selected to receive the Enterprise Award, presented by the *Pittsburgh Business Times*, "in recognition of his foresight and leadership in bringing the Software Engineering Institute to Pittsburgh." He was particularly pleased to have received honorary doctorate degrees from several higher education institutions in the country of his birth, including the Polytechnic University and Universidad Carlos III, both in Madrid.

In July 1991 Dr. Jordan stepped down as provost and returned full time to research and teaching as a University Professor of Electrical and Computer Engineering and Robotics, affiliated with the ECE Department, School of Computer Science, Robotics Institute, and Graduate School of Industrial Administration. He became professor emeritus in 2003.

He became an American citizen in the 1960s, and embraced his new "hometown" of Pittsburgh with pride—and enthusiasm for the Steelers, cheering the team in Spanish as he watched games with his family.

He died August 4, 2017, at the age of 86 surrounded by his loved ones. He is greatly missed by the CMU community and by his wife, Nieves; their three sons, Edward (Rina) of Utah, Xavier (Perlita Peret) of Washington, DC, and Arthur (Dana) of Upper St. Clair, PA; and six grandchildren.