



A handwritten signature in black ink, appearing to be 'R. H. ...', written in a cursive style.

RICHARD C. CHU

1933–2012

Elected in 1987

“For pathfinding contributions and creative technical leadership in the development of cooling technology and thermal systems for electronic equipment.”

BY ROGER R. SCHMIDT

RICHARD C. CHU passed away at age 79 on September 8, 2012, at his house on Twin Lakes in Elizaville, New York. He was an internationally recognized authority in cooling technology for computer electronics. For four decades he played a key role in developing the world’s most advanced computer cooling solutions for IBM.

Born in Beijing on May 28, 1933, Dick was the son of Liang-Hsi Chu and Yun Hwa Wang. He studied mechanical engineering and received his bachelor of science degree from National Cheng-Kung University in 1958 and his master’s degree from Purdue University in 1960. He was later recognized by both as a distinguished alumnus, and received two honorary doctoral degrees: in 1992 from American University of the Caribbean and in 1996 from his alma mater, Purdue.

He began his professional career at IBM in 1960 as a thermal engineer. During his early years he worked on the development of the IBM System/360. His 1965 invention of a multilevel air-liquid hybrid cooling design was pivotal to IBM’s successful introduction of its System/360 Model 91, the world’s highest-performance computer system at the time. The introduction of this hybrid cooling system marked the beginning of the water cooling era, which lasted throughout the years of bipolar technology. In 1966 he was made a manager with the assignment

of establishing and leading a heat transfer technology group to develop new and improved cooling technologies.

Throughout his career Dick was a prolific technical innovator, as demonstrated by his impressive record of inventions. He received 66 IBM invention awards for over 200 patents and 150 invention publications. As one of the inventors of the cooling scheme for the IBM thermal conduction module (TCM) he received an IBM Outstanding Innovation Award and a Corporate Award. This thermal conduction technology coupled with his modular cold plate cooling system concept formed the basis for the cooling design of IBM's large computer systems for over 15 years following the first shipment in 1980. Variations of this water cooling concept were adapted by each of the major worldwide computer mainframe manufacturers. He received three additional IBM Outstanding Innovation Awards for other innovative thermal solutions that were applied to various IBM products.

Dick's many contributions to IBM through his creativity, thermal expertise, and technical leadership led to his appointment as an IBM Fellow in 1983, the company's highest technical honor. He continued contributing in this capacity, with a small team dedicated to exploring cooling technology for future computers, until his retirement in 2011, after which he became an IBM Fellow Emeritus and maintained a strong presence at the company.

In 1996 he initiated an effort to study the feasibility of using lower-temperature cooling to enhance complementary metal-oxide semiconductor (CMOS) performance. He coined a dual-channel evaporator cold plate that enabled modular refrigeration cooling (MRC) with redundancy and concurrent maintenance; the MRC concept was used on all IBM CMOS-based high-performance computers from 1997 to 2010.

In addition to providing leadership in electronics cooling and thermal management, Dick was always looking ahead to the need for a new generation of thermal engineers. He spent time sharing the benefits of his experience and insight by serving as a mentor to many young engineers at IBM.

The influence of Dick's contributions to computer cooling technology extends well beyond the company where he worked. He was a strong promoter of a close working relationship between industry and academia. For 25 years he was the principal individual responsible for IBM sponsorship of electronic cooling research in air and liquid immersion cooling at MIT, Rensselaer Polytechnic Institute, Clarkson, Georgia Tech, Iowa State University, University of Minnesota, Purdue, City College of New York, Stanford, UC Berkeley, University of Rhode Island, Duke, and University of Arizona, yielding over 80 thesis-related publications, 20 percent of them at the PhD level. The results of this sustained industry-university collaborative research greatly strengthened the nation's competitiveness in the electronic cooling field. A further benefit of these research projects was the number of students who joined IBM and other companies to work in electronic cooling after completing their degree.

Dick was also widely known through his appearances at ASME- and IEEE-sponsored conferences, presenting papers and often serving as a keynote speaker sharing the benefits of his experience and knowledge. He published three books, nine book chapters, and over 50 technical publications. He was a coauthor of one of the earliest books on electronic cooling, *Heat Transfer in Microelectronic Equipment* (with John Seely; M. Dekker, 1972), and in 2002 he coauthored *Thermal Management of Microelectronic Equipment* (with Lian-Tuu Yeh; ASME Press).

The importance of Dick's contributions is widely recognized and attested to by the number of awards and honors he received. He was a member and past president of the IBM Academy of Technology. He received the ASME Heat Transfer Memorial Award, was the first recipient of the I-THERM Memorial Award, and was also a recipient of the Semi-Therm Significant Contributor Award and the InterPACK Conference Achievement Award, making him the only person to receive all of these awards from the major thermal conferences.

In addition to his NAE membership, he was an ASME fellow and a fellow of the American Association for the

Advancement of Science. As a member of the Academia Sinica (the Chinese Academy of Science in Taiwan), he participated in many activities sponsored by the Asian-American communities. In 1999 he received both the Professional Achievement Award from the Chinese American Academic and Professional Society (CAAPS) and the Asian Pacific American Corporate Achievement Award from the Organization of Chinese Americans (OCA) at its National Convention in Detroit, and in 2006 he was selected for the prestigious Asian American Engineer of the Year award.

Dick loved his work, but above all he loved his wife and family. On August 24, 1963, he had married Theresa Lee, whom he lovingly referred to as “Mother Theresa,” and they led an active life together. He was a dedicated and loyal husband, father, grandfather, brother, uncle, colleague, mentor, and friend.

He also loved the Hudson Valley area where he lived most of his years, raised his family, and formed many lifelong friendships. His hobbies and passions included jogging, windsurfing, sailing, paddle boating, golfing, skiing, and travelling to visit his four surviving children and their families. His passion was riding his hydro bike at his favorite spot, his lake house on Twin Lakes.

Dick is survived by his wife; their children and spouses: Benjamin and Kara Chu, Benson and Mary Chu, Benedict and Adora Chu, and Bonnie and David Sclafani; grandchildren Kelsey, Aaron, Stephen, Lucas, Dylan, Ryan, Owen, Dean, Ty, and Ming Lee; and his sisters and their husbands, Cora and Shu Beam Eng, Linda and James Yuan, and Nancy Sher.

