

Kenneth Torrance

August 23, 1940 – February 15, 2010

Professor Kenneth E. Torrance was born on August 23, 1940 in Minneapolis, Minnesota; he died at age 69 on February 15, 2010 in Ithaca, New York.

Ken received degrees of B.S., M.S. and Ph.D. (1966) in Mechanical Engineering from the University of Minnesota. He then became a Research Associate (1966-68) at the Fire Research Section of the National Bureau of Standards in Gaithersberg, MD, where he studied how fires develop in buildings.

In 1968, Ken came to Cornell as Assistant Professor of Thermal (Mechanical) Engineering. For a sabbatic year, he was a Postdoctoral fellow at NCAR (National Center for Atmospheric Research). In due course, he became Professor of Mechanical Engineering in the School of Mechanical and Aerospace Engineering, and, after 2001, occupied the chair of Joseph C. Ford Professor of Engineering.

At the time of his death, Ken Torrance had been a member of the Cornell Faculty for 42 years. Along the way, he served the University, College of Engineering, and his Department in a wide range of capacities, notably three years as Associate Dean of Engineering for Research and Graduate Affairs.

In his professional career, Dr. Ken Torrance was a master of the science of heat and energy transformation, and its application to a wide range of practical applications. He was a leader in theory, computation, and experiment. His research was always done with students, and credit for results was generously shared with them. Having supervised 46 MS/Ph.D. theses and 28 undergrad engineering projects at Cornell, Dr. Torrance trained generations of engineering scientists to deal effectively with the great energy issues

of the future, not just in Mechanical Engineering, but in the fields of Aeronautics, Geology, Architecture, Computer Science, Agricultural and Biological Engineering, for whom he co-supervised student theses. Dr. Torrance and his students published important fundamental contributions to the knowledge of heat convection in planetary mantles, for example in geothermal processes. They also studied heat exchange processes in the Earth's atmosphere, especially in and around cities. In his laboratory, Dr. Torrance was the first to determine the thermodynamic structure of boiling convection in porous materials. His research provided understanding of how fire spreads on the surface of liquid fuels. He also performed important studies of methods for component cooling of miniaturized electronics, and pioneered numerical methods for various heat transfer computations.

Perhaps his most notable accomplishment was to show that to be successful, "computer graphics", or computer generation of realistic synthetic visual images of objects and scenes, must fully account for the radiometric properties of the objects and media involved. Collaborating with faculty and students in the Cornell Program of Computer Graphics, he went on to develop a measurement laboratory in which such properties are determined, and he pioneered the development of physical models and computational methods by which the goals of computer graphics are then achieved, even for enclosures with multiple reflections. He introduced radiosity algorithms now recognized as breakthroughs for computer graphics. Much of the software now used for realistic simulations in flight simulation, computer games, architectural rendering, the entertainment industry, automobile design, and cosmetic products, is based on Ken's theoretical and experimental work. He also extended his radiation energy-transfer ideas to problems of food inspection and microwave heating.

The great impact of Ken's experimental talent and computational leadership in the computer-graphics field were recognized when he was given the prestigious SIGGRAPH Computer Graphics Achievement Award of the Association of Computer Machinery (ACM).

Dr. Torrance's 7 conference keynote speeches, on Boiling in Porous Media, Mantle Convection, and Image Synthesis, are all evidence of his wide scientific influence. He was elected Fellow of the American Society of Mechanical Engineers, and served on important committees for the ASME Heat Transfer Division. He received three "best paper" awards from the ASME. He was also a Fellow of the American Association for the Advancement of Science.

Owing to Ken Torrance's personal and scientific reputation at Cornell, and his generous spirit of helpfulness, he was in great demand for committee service, far beyond what is usually expected of a university professor. For the University at large, he was a member of the General Committee of the Graduate School, the Executive Committee of the Materials Science Center, and the Faculty Council of Representatives (as Chair of its Research Policies Committee). He also served for a time as an Advisor for CURW (Cornell United Religious Work).

For the College of Engineering, in addition to his service as Associate Dean, Ken served on the College Policy Committee, the College Computing Policy Committee, the Facilities and Master Plan Committee, Lecture Halls Renovation Committee, and the Duffield Hall Safety Evaluation Committee (especially concerned with the design of laboratory exhaust stacks). For the Mechanical and Aerospace School, Ken most notably served as Graduate Faculty Representative for the Field of Mechanical Engineering, as Chair of the Graduate Area of Fluid and Thermal Sciences, and as Faculty Advisor to the Student Section of ASME.

Students and colleagues of Ken Torrance testify to the benefits they derived from their associations with him. In all his studies, Ken pursued and gained understanding by very hard work, and then happily conveyed that understanding to colleagues and students; his three teaching awards demonstrate the regard in which students held him. Ken was one of the first in the country to introduce a course on Computational Fluid Mechanics and Heat Transfer; generations of Cornell students have taken this course. Students testify that as an advisor, Ken obviously prepared and deliberated carefully in his

own mind before meeting with students. Students found him a warm and receptive mentor and guide, in both technical and professional matters.

He was unfailingly willing – eager – to share his knowledge and understanding; he would feel obliged to provide a scholarly, correct answer even to off-hand questions. Ken was always generous, never demanding credit. Of course, he must have appreciated the awards he received from the computer graphics community, but his bibliography shows many co-authorships in cases for which one imagines he was the intellectual leader.

The range of people and disciplines touched by Ken's generosity is quite amazing, including computational fluid dynamicists, astronomers, analytical chemists, and even a horticulturist (Professor Thomas Whitlow). Tom testifies that his first meeting with Ken not only confirmed his sense that all his grad students should take Ken's course, but also that he now had a friend and colleague with whom he could share his ideas. Ken always provided sage, succinct advice on Tom's experiments with plants, wind and dust. Ken was not just generous with time and ideas; he offered a no longer used wind tunnel, which now has been in Tom's lab for 6 years, helping him with his experiments and reminding him of Ken Torrance, a model colleague, teacher and friend.

Ken's greatest joy in life was spending time with his large family, including his wife of 48 years, Marcia, his brothers Don and John, his children, Charles, Deborah and Catherine, and all their own families including his six grandchildren. He was very proud of all his family's accomplishments, and derived great pleasure in following their activities. He had devoted much time and effort to teaching his children, and leading them on camping trips. In recent years, Ken rekindled his passion for classic cars, spending many hours fine-tuning his '57 Chevy and giving rides.

Ken Torrance was not only a fine scholar and teacher, but he was a supremely good man, responsible, industrious, neighborly and kind, loyal to friends, and loving to his family. He was very proud of his Midwestern heritage, and one supposes he would say that the virtues

just named are simply the expected Midwestern values. Of course, these values found profound expression in his professional life, as his Cornell colleagues well know. Cornell colleagues share a deep respect and affection for this good friend, and deeply mourn his passing.

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