

At a meeting of the FACULTY OF ARTS AND SCIENCES on February 12, 2008, the following tribute to the life and service of the late George Francis Carrier was spread upon the permanent records of the Faculty.

GEORGE FRANCIS CARRIER

BORN: May 4, 1918
DIED: March 8, 2002

George Francis Carrier, T. Jefferson Coolidge Professor of Applied Mathematics, *Emeritus*, at Harvard University, one of the world's leading applied mathematicians, died of esophageal cancer in his 84th year, on March 8, 2002.

He was born in Millinocket, Maine, on May 4, 1918. His father was a chemical engineer and manager of the Great Northern paper mill in Millinocket. As a teenager, George was a guide in his beloved Maine woods; he worked summer jobs at the mill without his father's knowledge. Following in his father's footsteps, he attended Cornell University, where he received a Masters of Engineering degree in 1939 and Ph.D. in 1944, working with Professor Norman Goodier. An accomplished clarinet and ocarina player, he organized a jazz band at Cornell and worked as a houseman at a local pool hall.

In graduate school at Cornell, George contracted tuberculosis and spent a year in a sanitarium breathing fresh air and studying books on advanced mathematics. He then returned to graduate school where he taught courses in mechanical drawing and mechanisms and the first advanced course in applied mathematics for engineers at Cornell. Two students in the latter course, Julian Cole and Ivar Stackgold, said they first heard about asymptotics and perturbations analysis in that course and believed that experience had shaped their careers (they both became distinguished professors of applied mathematics).

George began his technical career in 1944 as a research engineer working for Harvard's Professor Howard Emmons on the flow of compressible fluids. George helped design and build a high-speed cascade wind tunnel for the study of jet engine turbines and compressor blades. He was a good experimenter, but his extraordinary mathematical-modeling and analysis capabilities set him apart. Emmons proposed him for a faculty position but was overruled by the rather formal Professor Richard von Mises who thought George was "too much of a wise guy." So George went off to Brown University, where he quickly set the academic world on fire.

Stories of George's intellectual exploits at Brown abound. He worked with 14 Ph.D. students and is reported to have given a fall course on complex variables that ended by Thanksgiving. In response to complaints, he gave the entire course again by the end of the term. After only five years, he was promoted to full professor.

In 1952, he was invited back to Harvard (von Mises had retired) as Gordon McKay Professor of Mechanical Engineering. In 1972, he was appointed T. Jefferson Coolidge Professor of Applied Mathematics. He had 24 Ph.D. students at Harvard, many of whom went on to pursue distinguished careers in applied mathematics. He became an emeritus professor in 1988 but continued his research with two original research papers published after his death.

George was widely considered one of the best applied mathematicians the United States ever produced. He loved applied problems with complex mathematical models, for which he found ingenious approximations and asymptotic results. He had a quick mind and remarkable physical intuition, which made him much sought after as a consultant to business and government. He could listen to the description of a problem and come up with the solution or an effective approach to the solution in minutes. Almost every summer for 40 years, he was a consultant to either the Los Alamos National Laboratory or the Space and Defense Group at TRW in California; both organizations considered him the ideal consultant. Among his many accomplishments at TRW (according to his former Ph.D. student and co-author Frank Fendell) were: (1) showing how a spinning spacecraft could be controlled with a tuned liquid damper (jointly with John Miles of UCSD); (2) showing how to contend with vortexing during rapid drainage of a propellant tank; and (3) showing how ceiling sprinkler systems might kill people by keeping smoke near the floor. His good friend and distinguished aerodynamicist, Hans Liepmann of Caltech, described him as "the greatest problem solver ever!"

George's favorite subject was wave propagation, and in the 1960s he taught a graduate course with this description: "*Haphazardly selected superficial (but advanced!) investigations in the propagation of waves in various media.*" The dean of the faculty objected, but George persisted, arguing that the description was absolutely accurate. Harry Yeh, a distinguished oceanographer, told how George stimulated his and others' research on tsunamis by pointing out, among other things, that even the Pacific Ocean is too small for a tsunami to evolve into a soliton (solitary wave) through dispersive effects. George provided analytical solutions with simple geometry for the tsunami run-up problem that could be used to check computer simulations with more complicated geometries. George also showed that the eye-formation is a critical feature of the thermal ocean-air interaction in hurricanes.

George was elected to American Academy of Arts and Sciences in 1953, the National Academy of Sciences in 1967, the National Academy of Engineering in 1974, and the

American Philosophical Society in 1976. He received the President's Medal of Science in 1990 with the following citation: "For his achievement and leadership in the mathematical modeling of significant problems of engineering science and geophysics and their solution by the application of innovative and powerful analytical techniques." He also received many other awards and honors, including the Dryden Medal of the American Institute of Aeronautics and Astronautics, the Fluid Dynamics Prize of the American Physical Society, the Timoshenko Medal and Silver Centennial Medal of the American Society of Mechanical Engineers, the National Academy of Sciences Award in Applied Mathematics and Numerical Analysis, the von Karman Medal of the American Society of Civil Engineers, and both the John von Neumann Lectureship and von Karman Prize of the Society of Industrial and Applied Mathematics.

George served with distinction on at least 27 committees and panels of the National Research Council of the National Academies, including the Executive Committee of the Assembly of Mathematical and Physical Sciences, Naval Studies Board, Executive Committee of the Assembly of Engineering, and Advisory Board of the Office of Mathematical Sciences. He was also an associate editor of the *Journal of Fluid Mechanics* and the *Quarterly of Applied Mathematics*.

George authored or co-authored more than 110 technical papers on fluid mechanics, solid mechanics, heat transfer, radiation, stochastic systems, oceanography, and mathematical techniques. In these papers and in his consulting work, he made outstanding contributions to the understanding of tsunamis, hurricanes, water waves, and singular-perturbation theory. He also co-authored *Functions of a Complex Variable: Theory and Technique* with Carl E. Pearson and Max Krook, and co-authored with Pearson both *Ordinary Differential Equations* and *Partial Differential Equations: Theory and Technique*.

George had boundless energy, a cheerful nature, and was master of his emotions. He knew how to put a fractious committee at ease with a lighthearted remark. He had no appetite for prestige, position, or wealth. He was unfailingly honest, always did what he thought was right, and was quick to admit when he was wrong or made a mistake. He chose to work on technical problems for their usefulness and for the fun he could have. Despite his extraordinary accomplishments, he managed to remain modest and "human." He served Harvard as a member of the Administrative Board of the College, as acting dean of the Division of Engineering and Applied Sciences, and as chair of the Committee on Applied Mathematics for many years. In 2005 a fellowship was established in his honor, to be awarded "to a scholar of engineering and applied sciences with a special emphasis in widely applied mathematics."

George was also known for his high jinks. On one occasion, he arranged to have the dean of engineering arrested for a parking violation during the annual Christmas party. On another occasion, during a seminar on guided missiles, he and a prestigious MIT professor

“arrested” the speaker and carried him out of the room for revealing “classified information.” He was fan of the Marx brothers and shared with colleagues his joy for outrageous puns.

He loved gardening and building things at his home in Wayland, playing catch with his sons, and dancing with his wife in the living room to a Benny Goodman record. Evenings he enjoyed watching Perry Mason on TV, but after a few minutes his mind would drift, and he would take out a yellow pad of paper and begin writing equations at a furious pace. That way he was able to enjoy Perry Mason for 40 years, according to his son Mark, because he could never remember “who done it.”

His wife Mary (nee Casey) died on July 5, 2006. She and George were a devoted couple for nearly 60 years of married life. Three sons, Kenneth of Ithaca, New York; Robert of Wayland, Massachusetts; and Mark of Eugene, Oregon; and two grandchildren, McKenzie and Katrina of Eugene, Oregon, survive them.

Respectfully submitted,

Arthur E. Bryson
Harvey Greenspan
Howard A. Stone
Tai T. Wu
Frederick H. Abernathy, Chair