



Michael M. Conwell

MICHAEL M. CARROLL

1936–2016

Elected in 1987

“For unique contributions in the development of physically based models for geological materials and in related applications to the mechanics of porous materials.”

BY RONALD P. NORDGREN

MICHAEL MARY CARROLL, the Burton J. and Ann M. McMurtry Professor in Mechanical Engineering and Computational and Applied Mathematics at Rice University and former dean of its George R. Brown School of Engineering, died January 17, 2016, at the age of 79.

A charming, witty native of Ireland, Michael is remembered as much for his kindness as for his research accomplishments and administrative flair. Of particular significance is his research on finite elasticity and on the behavior of porous media with pore collapse. He was also an award-winning playwright, songwriter, and creator of cryptic crossword puzzles.

Michael was born December 8, 1936, in rural County Tipperary to Tim Carroll and Kit Gleeson. He showed an early interest in solving puzzles and mathematical problems. After beginning his education at his father’s school and attending an Irish-speaking school, he earned a scholarship to University College, Galway (UCG), where he majored in mathematical science and received his BA degree in 1958 and MA in 1959. He was then appointed an assistant lecturer at UCG. He also learned to play golf, a lifelong passion, at Galway.

He continued his graduate studies at Brown University under Ronald Rivlin, a preeminent researcher in the fields of nonlinear elasticity and non-Newtonian fluids. Michael’s

doctoral research led to his dissertation, "Electro-Magneto-Optical Effects." His degree was awarded in 1965 and he continued at Brown University as a research associate.

In the fall of 1965 he joined the Department of Mechanical Engineering at the University of California, Berkeley as an assistant professor. He achieved tenure in 1969, became a full professor in 1975, held the Shell Distinguished Chair (a five-year appointment) from 1983 to 1988, and in 1986–88 was also associate dean for interdisciplinary studies in the College of Engineering. In addition, he served as ombudsman on the Berkeley campus (1969–71), a position in which he advocated on behalf of students to resolve grievances. He became a US citizen in 1970.

Michael's research ranged from electromagnetism to non-linear elasticity, porous media, and acoustics. He taught courses in statics, dynamics, vibrations, acoustics, noise control, mathematical methods, continuum mechanics, linear and nonlinear elasticity, and plasticity. He was a gifted teacher, with the ability to make difficult material understandable and bring out the physics behind the equations.

He left UC Berkeley in 1988 to become dean of the George R. Brown School of Engineering at Rice University, with faculty appointments in the Departments of Mechanical Engineering & Materials Science and Computational & Applied Mathematics, and with an endowed professorship. As dean he recruited excellent faculty, built strong outside support for the school, brought recognition to his faculty—including elections to the National Academy of Engineering—and in many other ways promoted and strengthened engineering at Rice. He also spearheaded the establishment of a new department in the engineering school, bioengineering, in 1997.

During his 10 years as dean, Rice's engineering faculty grew from 74 to 92, and the proportion of female engineering undergraduates rose from 17 percent to 30 percent. His leadership style was to enable his faculty's visions rather than imposing his visions on them. That style served him and Rice very well.

Michael's recurring course offering at Rice, "Good Vibrations," on sound, acoustics, and music, which he cotaught

with Art Gottschalk, chair of Composition and Theory at Rice's Shepherd School of Music, was a popular interdisciplinary elective among students.

During the 1980s he served on the American Society of Mechanical Engineers (ASME) Applied Mechanics Division Executive Committee, rotating into the chair's position in 1986. He was a member at large of the US National Committee on Theoretical and Applied Mechanics in 1980–84, and president of the Society of Engineering Science in 1986–87.

He authored over 100 papers, mainly on finite elasticity and on porous media. He also contributed to nonlinear optics, electromagnetism, nonlinear wave propagation, acoustics, viscoelasticity, plasticity, and the mechanics of sports. According to James Casey, a colleague at Berkeley:

His work is characterized by strong physical insight, mathematical rigor, clarity, elegance, and an extraordinary ability to find the hidden clue that cracks open a difficult problem. His predominant strengths are (1) his talent for discovering exact solutions to the complicated equations of the nonlinear field theories; and (2) his ability to model complex physical situations by mathematical theories involving only a few unknown parameters. His exact solutions, even when simple in form, provide insight into the behavior of nonlinear materials and are also of use in guiding experiments and in providing benchmark checks for computational schemes. His mathematical models are constructed with experiments close at hand, and have produced excellent agreement with measured data.

Michael's research on porous media led to significant improvements in the theory of their behavior. His work, with collaborators from Lawrence Livermore Laboratory and his students at Berkeley, advanced the field of porous media by establishing a rational approach to the formulation of constitutive equations. A variety of effects were treated, including pressure maxima, rate effects, and shear-stress enhancement of void compaction. Use of simple yet powerful mathematical models yielded excellent agreement with experimental data for porous metals and rocks.

In addition, his research led to the improvement of golf clubs and aluminum baseball bats, and fairer oval running tracks. A detailed discussion of his research accomplishments and a list of his publications is given by Casey in the preface to a collection of papers¹ dedicated to Michael in celebration of his 75th birthday.

In recognition of his distinguished career, Michael Carroll received many honors. He became an ASME fellow in 1984 and was elected to the NAE in 1987. He was also a fellow of the American Academy of Mechanics (1990) and American Academy of Arts and Sciences (1995), and was named an ASME honorary member in 1999. In 1979 he received a DSc and in 1992 an honorary doctor of laws (LLD), both from the National University of Ireland.

In addition to his theoretical work, Michael wrote two plays, one of which, *I Hear the Rolling Thunder*, about President Lyndon Johnson, opened the Allied Theatre Stage West's 2000 season in Fort Worth. He also composed a number of cryptic crossword puzzles that appeared in the *New York Times* and elsewhere. And he wrote a love song that was arranged and played by musicians at the Shepherd School of Music as well as the Irish group the Chieftains. In 2004–05 he was president of the Houston Philosophical Society.

Michael's spirit is illuminated by this quotation from his family's memorial page:

Michael recognized the rhythm and beauty in everything—an equation of a sound wave, the drone from a Gaelic piper's lament, a rousing stanza from a Yeats poem, the just right chip shot to the green, and—perhaps most of all—the calm yet majestic pull of a wave coming into the beach at sunset.

He is survived by his wife, the former Carolyn Gahagan, whom he married in 1964; their children Patricia and Timothy; three grandchildren; and five younger sisters.

Michael Carroll will be remembered fondly by all who knew him.

¹*Mathematics and Mechanics of Solids* 16(5):453–466 (2011).

