

Leon Knopoff

1925–2011

Fellow and Gold Medallist of the RAS, distinguished theoretical seismologist and musicologist.



Leon Knopoff, an internationally renowned scientist who served on UCLA's faculty for 60 years and made significant research contributions in physics, seismology and music, died on 20 January 2011, surrounded by his wife and children. He was 85.

Author of more than 360 scholarly publications and editor or co-editor of five books, Knopoff's many honours include election as a member of the National Academy of Sciences (1963), a fellow of the American Academy of Arts and Sciences (1965), a fellow of the American Association for the Advancement of Science (1964), a Guggenheim Foundation fellow (1976), and a member of the American Philosophical Society (1992). He received four outstanding teaching awards from UCLA's physics department. He earned the Medal of the Seismological Society of America (1990), and the Gold Medal of the Royal Astronomical Society (1979), was awarded an honorary doctorate from the University of Strasbourg (2004) and was named the first Honorary Professor of the Institute of Geophysics of the China Earthquake Administration (2004). He supervised 38 PhD students, as well as 39 postdoctoral scholars from 17 countries. He served on the editorial board of the journal *Science* (1985–1990) and on the California Governor's Earthquake Council (1972–74).

"Leon Knopoff's career was exemplary, replete with numerous examples of outstanding contributions to fundamental geophysics," said his colleague Paul M Davis, UCLA professor of geophysics. "His trademark approach has been to apply developments in mathematical physics and condensed matter physics to seismology, contributing both to physics and geophysics. Leon was extremely creative, unusually prolific and elegant in his choice of research topics. His service to his university and profession has also

been extraordinary. His selfless cooperation has been truly global. As a teacher, he reduced complexity to its simplest terms with an infectious enthusiasm, and a caring empathy for his students. His graduate students, recognized for their rigorous training in fundamentals, have been sought after, and have gone on to successful careers in academia and industry."

Knopoff earned his PhD from the California Institute of Technology in 1949 in physics and mathematics, and came to UCLA the following year as a research associate in geophysics. He was promoted to associate professor in the Institute of Geophysics in 1957, and just three years later was appointed to full professor in the physics department and the Institute of Geophysics. He served as director of the UCLA Institute of Geophysics and Planetary Physics (IGPP) from 1972 to 1986, and became a research musicologist in 1960 in the newly formed UCLA Institute of Ethnomusicology.

From earthquakes to pottery

His research focused on the physics and statistics of earthquakes, earthquake prediction, the interior structure of the Earth, plate tectonics, pattern recognition, nonlinear earthquake dynamics, and several other areas of solid-Earth geophysics, as well as musical perception, and dating of ancient pottery by thermoluminescence. Although best known for his theoretical breakthroughs, he also made pioneering measurements of seismic wave velocities and tidal gravity variations at the South Pole.

One of the milestones in the evolution of seismology is the representation theorem by Robert Burridge and Knopoff in 1964, which is called the first principle of modern seismology. In addition, a widely cited model by Burridge and Knopoff in 1964 has attracted widespread

attention in statistical physics and seismology, and is regarded as one of the most important models in condensed matter physics.

Among the discoveries from his systematic research on the statistics of earthquakes was that most small earthquakes are not genuine predictors of subsequent instability on a major fault; however, they do play the role of a stress gauge. He and his colleagues also found that large earthquakes cluster in space and time. Knopoff worked on the development of a comprehensive theory of earthquakes, including sudden increases in precursory seismicity, aftershocks and foreshocks.

Exceptional clarity

"Extreme rigour and thorough consideration of alternate interpretations were hallmarks of Leon's research, and he was known for his exceptional clarity in teaching," said his UCLA colleague David D Jackson, professor of geophysics. "He was also a wonderful mentor."

In September 2000, UCLA's IGPP honoured Knopoff's 75th birthday and his 50th anniversary at UCLA with a symposium titled "The Earth: earthquakes and seismic waves". The majority of his former PhD students attended, along with many of his colleagues and former postdoctoral scholars, some of whom came from as far as Australia, China, Germany and Russia.

Knopoff and his wife of almost 50 years, Joanne V C Knopoff, created an important endowment in UCLA's College of Letters and Science in 2001. The Leon & Joanne V C Knopoff Career Development Chair in Physics and Geophysics was the first endowed chair in the basic sciences to be endowed by a faculty member during the Campaign UCLA fundraising effort. The chair supports the research of a promising young scientist in solid-Earth geophysics. With their endowment, the Knopoffs encouraged research that will help us better understand patterns in complex systems in physics and solid-Earth geophysics. Knopoff said at the time: "Joanne and I have benefited so much from being at UCLA that we would like to return the favour. Our lives revolve around UCLA."

He recorded a UCLA Oral History in 2003, and continued to work until very recently. Knopoff is survived by Joanne, a graduate of UCLA who has volunteered for UCLA alumni and community programmes for more than 50 years; their three children, Michael Knopoff, Rachel Knopoff and Katie Knopoff Wadley; son-in-law Adrian Wadley; and a young grandson. Leon was born in Los Angeles, the only child of Max and Ray Singer Knopoff.

Contributions in Leon Knopoff's memory may be made to the Leon & Joanne V C Knopoff Fund for a career development chair for a young scientist at UCLA.

Stuart Wolpert