

# obituaries

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## Owen Martin Phillips

Owen Martin Phillips, a pioneer in geophysical fluid dynamics who devised a leading theory for the generation of ocean waves by the wind, died at home of gastric cancer on 13 October 2010 in Chestertown, Maryland.

Phillips was born on 30 December 1930 in Parramatta, New South Wales, Australia. He graduated from the University of Sydney with a BSc degree in applied mathematics in 1952. That same year he moved to the UK to begin graduate research at Cambridge University, initially under the supervision of G. I. Taylor and later under George Batchelor.

Phillips's 1955 PhD thesis, "On Shear Flow Turbulence," exemplified the Cambridge approach to turbulence and earned him a postdoctoral fellowship at St. John's College, where he began seminal research on ocean-wave generation by the wind. At that time, existing theories for ocean-wave generation assumed laminar flow at the air-sea interface and grossly underpredicted the actual rate at which ocean waves grow. Adapting statistical theories of homogeneous turbulence recently developed by Andrei Kolmogorov, Batchelor, and others to the air-sea interface, Phillips demonstrated how turbulent pressure fluctuations in the wind resonate with propagating ocean waves. Back-to-back 1957 volumes of the *Journal of Fluid Mechanics* contain Phillips's turbulence paper and another by John Miles proposing a critical layer-growth mechanism; together they provided a theoretical basis for decades of ocean-wave measurements.

Phillips first came to the US in 1957 as an assistant professor in mechanical engineering at the Johns Hopkins University. Apart from a brief return to Cambridge to join the newly formed department of applied mathematics and theoretical physics, Phillips would spend the rest of his career at Johns Hopkins, as an associate professor beginning in 1960 and as a full professor from 1963 on.

In the 1960s the nonlinear interaction among gravity waves had become the major stumbling block for theories



Owen Martin Phillips

of the statistical properties of the ocean surface. In a series of papers between 1958 and 1962, Phillips developed what became the standard model for the equilibrium range in the spectrum of wind-generated waves. Phillips's influential 1966 monograph, *The Dynamics of the Upper Ocean* (Cambridge University Press), provided the theoretical framework connecting ocean variability to waves and turbulence.

His research on ocean-wave mechanics found many practical applications. For example, he demonstrated that the height of so-called rogue waves—giant ocean swells that occasionally arise from random interactions of smaller waves and are known to capsize large ships and ocean platforms—can be predicted using routine measurements from monitoring buoys. Somewhat inadvertently, he also developed a method of submarine detection based on the modulation of surface waves by the internal waves generated as the submarine moves through the ocean thermocline.

Phillips then turned his attention to problems in geophysical turbulence. Between 1968 and 1978, he carried out a series of landmark experiments with H. Kato, Lakshmi Kantha, and others, in which they measured the rate of turbulent entrainment in a stratified fluid as a

function of the stress applied at the fluid's surface. Those experiments yielded the first scaling laws directly applicable to wind-induced turbulent mixing in the upper ocean and in the atmosphere boundary layer, both critical processes for the regulation of Earth's climate.

Phillips had a gift for communicating science to audiences at all levels. His 1968 book *The Heart of the Earth* (Freeman, Cooper and Co), a highly original introduction to geophysics, is singular in its emphasis on the use of scientific inference and dimensional analysis in the exploration of Earth's and other planets' interiors. As global energy crises struck in the 1970s, Phillips became alarmed by how lightly Americans were treating an important issue that directly affected their security. His whimsically titled *The Last Chance Energy Book* (Johns Hopkins University Press), published in 1979, gives a lively, prescient account of the true costs and risks of our energy negligence. His leadership in the Maryland Academy of Sciences in the 1970s marked a period of extraordinary expansion of its public outreach.

The next chapter in Phillips's research career began in the late 1980s when he collaborated with several geology colleagues on problems of how aqueous fluids infiltrate and react with permeable sedimentary and metamorphic rocks. In his 1991 monograph *Flow and Reactions in Permeable Rocks* and in *Geological Fluid Dynamics: Sub-surface Flow*

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Harry Lustig  
23 September 1925 – 17 March 2011  
Simon van der Meer  
24 November 1925 – 4 March 2011  
James Elliot  
17 June 1943 – 3 March 2011  
Charles Bachman Moore  
28 October 1920 – 2 March 2011  
Marshall Stoneham  
18 May 1940 – 18 February 2011  
Webster Capps  
1 February 1920 – 16 February 2011  
Nobutoshi Kihara  
14 October 1926 – 13 February 2011  
Joseph Himes  
15 October 1934 – 10 February 2011  
Tony Lane  
27 July 1928 – 9 February 2011  
Maurice F. Murphy  
1927 – 6 February 2011  
Brian Safer  
1948 – 6 February 2011  
W. James Carr Jr  
6 May 1918 – 16 November 2010  
Russell Lewis Collins  
21 September 1928 – 11 October 2010

and *Reactions* (both from Cambridge University Press) published in 2009, Phillips developed fluid mechanical theories for isothermal reaction fronts and for gradient reactions controlled by temperature variations in rock; both are important processes in hydrothermal systems.

Although he was humbly aware of his own limitations, Phillips saw little value in propping up the walls between scientific disciplines; indeed, he spent his career forging links between seemingly disparate fields. And he knew well the role played by good fortune when he told the *Johns Hopkins Gazette* in 1998,

In doing science, everybody has a number of strokes of luck, and some people miss them. When you see that an opportunity is given, you must grab it. Now, the luck brings it along, but you have to have the awareness to take advantage of it.

Many scientists he inspired around the world might add that their own best stroke of luck was to have known Owen Phillips.

**Peter Olson**  
*Johns Hopkins University  
Baltimore, Maryland*

## Michael Tinkham

Michael Tinkham, renowned Harvard University physics professor and researcher, died in Portland, Oregon, on 4 November 2010 of complications following a stroke. He was Rumford Professor of Physics and Gordon McKay Professor of Applied Physics Emeritus in the physics department and the School of Engineering and Applied Sciences at Harvard University.

Born on 23 February 1928 in Green Lake County, Wisconsin, Mike graduated from Ripon College in Wisconsin in 1951 with a bachelor's degree in physics. He received his master's degree in 1951 and his PhD in 1954, both from MIT. His PhD thesis, "Theory of the Fine Structure of the Molecular Oxygen Ground State with an Experimental Study of its Microwave Paramagnetic Spectrum," was supervised by Malcom Strandberg. Mike spent a postdoctoral year, 1954–55, at the Clarendon Laboratory at Oxford University, where he worked on understanding the magnetic properties of transition-metal ions in a diamagnetic lattice. He was a postdoctoral scholar in the physics department at the University of California, Berkeley, beginning in 1955, and he joined the faculty there



**Michael Tinkham**

in 1957. In 1966 he moved to the physics department at Harvard, where he spent the remainder of his career.

At Berkeley, Mike's research was predominantly in superconductivity and magnetism. He was instrumental in elucidating the energy gap, a central component of the theory of superconductivity. In 1956, before John Bardeen, Leon Cooper, and Robert Schrieffer had presented their theory of superconductivity, Mike and Rolfe Glover III, also a postdoctoral scholar at Berkeley, measured the absorption of far-IR light passing through thin films of superconductors. They found that the light was transmitted much more readily than through a normal metal film. In the understanding at the time, it was a contradiction: Since superconductors conduct infinitely better than normal conductors, one would naively expect them to reflect light much more strongly. They contacted Bardeen, who said that the results were "not entirely unexpected." As they increased the frequency, however, Mike and Glover found a sudden onset of absorption—at a frequency corresponding to twice the energy gap. Those experimental results, particularly the measurements of the temperature dependence of the energy gap, were a key confirmation of the theory.

Superconductivity remained Mike's main research focus for the rest of his career. In the early 1970s, with Malcolm Beasley, Jerry Gollub, and Ron Newbower, he made important contributions to understanding the effect of thermal fluctuations on broadening the transition between the superconducting and normal states. In 1972, while on sabbatical at the University of Cambridge in the UK, he and one of us (Clarke) worked together to develop the theory of charge

imbalance—the imbalance between so-called hole-like and electron-like quasiparticles above and below the Fermi surface—that results in a voltage developed at the contact between a normal metal and a superconductor. That work is an excellent example of the remarkable theoretical depth that characterized Mike's research. With members of his group he applied those ideas to phase-slip centers, current flow across the superconductor-normal interface, and the subharmonic energy-gap structure in superconducting metallic weak links. Subsequently, Mike and his group studied submicron tunnel junctions capacitively coupled to minute islands, the Kosterlitz–Thouless transition in arrays of Josephson junctions, and tiny metallic whiskers grown on carbon nanotubes.

Mike was a gifted writer. His first book, *Group Theory and Quantum Mechanics* (McGraw-Hill, 1964), inspired many young students. His deep understanding of superconductivity led him to write his second book, *Introduction to Superconductivity* (McGraw-Hill, 1975), which clearly elucidated the subtle mysteries of the subject and has become a classic in the field.

Graduate students were attracted to Mike for his ability to make complex ideas seem simple and to offer thesis problems on the leading edge of the field. Although he stimulated his students in new directions, he gave them full freedom to follow their own ideas and develop as creative scientists. He hungered for data from his labs and had an uncanny talent for transforming scraps of experimental data into an ever-deeper understanding of superconductivity.

Mike loved good food, good wine, and, above all, desserts. His many students and postdocs were devoted to him and held an annual "Tinkham Dinner" at the March meetings of the American Physical Society. He was a modest man with a keen wit and sense of humor, and he could give and take in jesting and repartee. He once walked into his lab where some of his students were having lunch and was upset to find that none of the homemade electronics were labeled. He demanded that everything in the lab be labeled for the next generation. The next day he found all the equipment duly labeled, and his students, including the other of us (Silvera), sitting with bowed heads. When we were asked to look up, Mike saw five foreheads labeled "Graduate Student."

**John Clarke**  
*University of California, Berkeley*  
**Isaac Silvera**  
*Harvard University  
Cambridge, Massachusetts*