Princeton University

Honors Faculty Members Receiving Emeritus Status

May 2017

The biographical sketches were written by staff and colleagues in the departments of those honored.

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Samuel George H. Philander

Samuel G. H. Philander will transfer to emeritus status at the end of the 2017 academic year after twenty-seven years on the faculty. George was born and raised in South Africa, receiving his B.S. in applied mathematics and physics at the University of Cape Town in 1962. Shortly thereafter his family emigrated to the United States to escape apartheid. But George never lost his attachment to his homeland. From 2007 to 2010 he returned to the University of Cape Town for six months of each year as a research professor and as director of research at the African Centre for Climate and Earth System Science. He received an honorary doctorate from his alma mater in 2007. In 2011, George taught a freshman seminar course that involved a trip to South Africa. The Princeton students and South African students (from the IkamvaYouth group) worked together on field trips around Cape Town to study earth sciences amid the natural beauty of the region. George also arranged summer intenships for Princeton students to visit and work in South Africa. A number of South African graduate students in turn spent months or longer working with advisers in Princeton, and have returned to positions in South Africa. In his teaching, George has recently focused on the intersection between science and society, educating students about earth history and the science of global warming, while helping them understand the importance of cultural perspectives in how we define and address scientific challenges.

George received his Ph.D. at Harvard University in 1970 studying fluid dynamics and physical oceanography. After a postdoctorate at Massachusetts Institute of Technology, he joined the National Oceanic and Atmospheric Administration's Geophysical Fluid Dynamics Laboratory (GFDL) in Princeton and began lecturing in the interdepartmental Geophysical Fluid Dynamics Program (now the Atmospheric and Oceanic Sciences [AOS] Program within the geosciences department). In 1978, he was appointed senior research oceanographer at GFDL. In 1990, he moved to Princeton University as a professor of geosciences. He served as director of the AOS program from 1990–2006 and as chair of the Department

of Geosciences from 1994–2001. He was named the Knox Taylor Professor of Geosciences in 2005. In his role as department chair, George calmed tumultuous waters, got the books in order, oversaw the expansion of the biogeochemistry group in the department, and created the Hess Postdoctoral Fellowship, which is now recognized as a highly honorific international position.

In his Ph.D. thesis research and in the early '70s, George studied the currents of the equatorial oceans, especially the remarkable equatorial undercurrent in the Pacific Ocean, one of the strongest currents in the world and one that is aligned precisely along the equator. With modest observational guidance, in a series of papers culminating in a major review paper in 1973, George outlined the essential dynamics of this current and established himself as a leading expert on the fluid dynamics of the tropical oceans. Throughout the 1970s, he focused primarily on the mean climate of the tropical Pacific Ocean and then the variability in its currents caused either by instabilities or by variability in the wind stresses exerted by the atmosphere on the ocean surface. The intricate response of the tropical oceans to changing wind fields, involving a variety of long equatorially trapped waves—Kelvin waves propagating eastward and Rossby waves propagating westward—was clarified by George and colleagues in the late '70s and early '80s, emphasizing the distinctive feature of the tropical oceans as a region in which there can be large basin-scale responses to changes in wind fields on the time scale of months, rather than the multi-year to multi-decade response times more typical of higher latitude oceans.

This interest in the tropical oceans' response to variability in winds then coalesced into George's abiding interest in the El Niño phenomenon. By combining these insights on the oceanic response to wind variability with earlier efforts to understand how changing sea surface temperatures affected the atmosphere, a coherent picture emerged of a coupled atmosphere-ocean phenomenon: an unstable nonlinear oscillator, with atmospheric winds responding to ocean temperatures and ocean temperatures responding to atmospheric winds. George orchestrated the research of a closely knit group of colleagues that laid the foundation of the modern understanding of this phenomenon. It was the work of George and his close colleagues that made it clear that El Niño should not be thought of as a metastable state that the climate would occasionally fall into, but that it contained

the seeds of its own destruction (in particular, through the equatorial Rossby waves generated during the emergence of the El Niño state) and was best thought of as a phase of a nonlinear oscillation. George (or his Spanish-speaking wife, Hilda) coined the term La Niña for the opposite phase, a term that has entered the popular lexicon. He also wrote the first modern monograph on the subject in 1990: *El Niño, La Niña, and the Southern Oscillation*.

George helped organize a decade-long (1985–1994) international observational program (TOGA: Tropical Ocean Global Atmosphere) that was designed to test the emerging theory of the coupled ocean-atmosphere system in the tropics. TOGA paved the way for operational predictions and for improved simulations in global climate models, topics on which George has written extensively and which continue to be active areas of research.

George has also focused on longer time scales in the climate system. In a two-page paper that is one of his most cited, he discussed how the subtropical atmospheric response to tropical ocean temperatures could engage slower responses of the ocean system, producing variability on multi-decadal time scales—a topic of intense interest today as researchers try to disentangle internal variability on these longer time scales from anthropogenic climate change. In recent years, George turned to paleoclimatology as a unique testing ground for our understanding of the climate system. He was particularly intrigued by the controversial suggestion that two to three million years ago, in a substantially warmer climate, the temperature gradients across the equatorial Pacific were much weaker than at present, a state that current climate models are unable to simulate in response to warming.

The list of awards George has received includes the Sverdrup Gold Medal of the American Meteorological Society (1985), election as fellow in the American Geophysical Union (1991), and membership in the National Academy of Sciences (2004). He was also selected as a fellow of the Third World Academy of Sciences (2008) and a fellow of the Academy of Sciences of South Africa (2010), recognizing not only his research career as a renowned physical oceanographer but also his drive to improve science education and opportunities in science for all South Africans.