Princeton University

Honors Faculty Members Receiving Emeritus Status

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

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Faculty Members Honored in 2019
for Receiving Emeritus Status

Eric wOOD

Eric Franklin Wood, the Susan Dod Brown Professor of Civil and Environmental Engineering, is transferring to emeritus status at the end of this academic year. Eric leads the Terrestrial Hydrology Research Group, which investigates land-atmosphere interactions for climate models and for water resource management. He is also known for the enormous impact he has had on the field of hydrology through his professional service to the global scientific community and through his mentoring of graduate students, who have gone on to have successful careers in academia, research, and engineering practice.

Born in Vancouver, Canada, in 1947, Eric studied civil engineering at the University of British Columbia, earning his bachelor's degree in 1970. Expanding his interests to systems analysis and decision analysis, he came to the United States for graduate studies in civil engineering at MIT, earning his doctorate in 1974. Continuing to follow his interests in systems analysis and water resources, he then spent two years in Laxenburg, Austria, as a research scholar at the International Institute for Applied Systems Analysis (IIASA).

Eric's Princeton career started in 1976 as a professor in the Department of Civil Engineering. The department at that time was heavily investing in systems analysis, stochastic processes, and operations research. Eric was recruited to Princeton by George Pinder, who was the director of the Water Resources Program. When George became department chair in 1980, Eric became the director of the Water Resources Program (currently called the Program in Environmental Engineering and Water Resources).

At the onset of his research career, Eric and a team of researchers conducted transformative work that pioneered data assimilation for hydrologic modeling. Data assimilation is a mathematical discipline that couples observations with theoretical dynamic models for the purpose of characterizing uncertainty and informing initial conditions for prediction. Eric was also a pioneer in developing spatially distributed hydrologic models of watersheds to account for the effects of topography. He introduced the concept of a "representative elementary area" and quantified the minimum area needed to resolve watershed hydrologic response.

Those early investigations of uncertainty and distributed hydrologic models meant that Eric was well-positioned to tackle very practical environmental engineering problems. Around the year 1990, Eric was asked to conduct an analysis regarding one of the nation's most notorious hazardous waste sites, Love Canal in Niagara Falls, New York. Love Canal was a residential area that had to be evacuated in the 1970s because decades of uncontrolled dumping of hazardous wastes led to extensive environmental contamination and threats to human health. Eric did field work at the site and designed a soil sampling protocol that would enable the Environmental Protection Agency to make a decision of whether the land could be resold and people could move back in.

Also around 1990, Eric established a strong collaboration with Dennis Lettenmaier, now a professor of geography at UCLA. Built on complementary interests in land surface hydrology, it was a collaboration that would last their entire careers. They first met in the early 1980s when Eric took his first sabbatical at the Institute of Hydrology in Wallingford, UK, and Lettenmaier was also visiting. Broadly, they shared an interest in development of land-surface hydrologic models that could be integrated with climate models. At that time, climate models didn't adequately account for hydrologic processes, and hydrologic models didn't adequately account for atmospheric processes. In Eric's words: "Hydrologic models were just water models." Members of Lettenmaier's team then built the "VIC model," which stands for Variable Infiltration Capacity model. Subsequently, the distributed modeling concepts Eric had pioneered in the previous decade were incorporated into the VIC model. The resulting VIC model emerged as the primary land surface parameterization scheme in many global climate circulation models.

Across his entire career, a characteristic of Eric's approach to research was extensive collaboration, and by joining forces with a global network of leading researchers he was able to make significant advancements and remain at the forefront of the field. Through connections at NASA's Goddard Space Flight Center, Eric took a lead role in planning for the NASA Earth observing system satellites, and he was part of the first team that proposed a soil moisture observation mission. This opened up satellite remote sensing as a source of valuable data in the field of hydrology, marking the 1990s as a decade for advancement of the entire field of hydrology, and the emergence of the fields of hydrometeorology and hydroclimatology.

In the last two decades, Eric made significant advances that moves the field closer to realizing the promise of global hydrology.

Around 2010, Eric proposed the development of hyperresolution land surface models with spatial resolution smaller than 100 meters, which could be applied at continental scales. This work pushes the envelope, while continuing the four-decade thread of data assimilation to enhance hydrologic models with remotely sensed observations. The hyperresolution approach enabled discovery of patterns of river flows, floods, and drought at scales ranging from regional to global. In recognition of these advancements, in 2017 Eric was awarded the American Geophysical Union's highest honor in hydrology, the Robert E. Horton Medal for "major advances toward process-based representation of global hydrology."

This enhanced forecast methodology has led to significantly improved drought forecasts, and it was the core of an important collaboration with Justin Sheffield, now a professor of hydrology and remote sensing at the University of Southampton. Together, they published an important book, *Drought: Past Problems and Future Scenarios* (Earthscan, 2011), which explained the connection between climate change and large-scale drought frequency and severity and formalized the developing field of drought monitoring and forecasting. In recognition of their groundbreaking work in drought prediction, they were awarded the Prince Sultan Bin Abdulaziz International Prize for Water in 2014.

By the fourth decade of Eric's career, he was widely recognized as a visionary in examining Earth's water cycle, having shed new light on the role of water in the climate system and developing groundbreaking analytical tools. In 2015, he was elected to the National Academy of Engineering "for development of land surface models and use of remote sensing for hydrologic modeling and prediction." He has won 17 major awards for research scholarship, including the Robert E. Horton Medal of the American Geophysical Union, the Alfred Wegener Medal of the European Geosciences Union, the Jule G. Charney Award of the American Meteorological Society, and the John Dalton Medal of the European Geosciences Union. He has been named a fellow of the American Association for the Advancement of Science (AAAS), the Royal Society of Canada, the American Meteorological Society, and the American Geophysical Union, and a foreign fellow of the Australian Academy of Technological Sciences and Engineering.

In addition to a career of outstanding research scholarship, Eric has a strong record of service and leadership. From 2013–14, he was the president of the hydrology section of the American Geophysical Union. Additional positions he has held include chairman of the Hydrology

Committee of the American Meteorological Society, chair of the Hydrological Applications Project of the NOAA's Global Energy and Water Experiment, in addition to his involvement in numerous mission science teams for NASA's various earth observing systems.

Eric's greatest strength as an educator has been in his role as a dedicated mentor to his more than 30 Ph.D. students, plus more than 30 postdocs and research staff. In an interview with Murugesu Sivapalan, as part of the History of Hydrology project at the European Geosciences Union General Assembly in 2018, Eric was asked about his students. He responded: "To be honest, I have been blessed. At a school like Princeton, you get fantastic students." Asked about his role as a mentor to graduate students, Eric said: "There are two parts. One is that the students are very bright to start with. Second is that they need mentoring and to be taught how to do research. If you go look at the early paintings of Picasso, Picasso started out doing classical portraits. He didn't wake up and say I am going to do Cubism! You have to teach someone how to do research, it is a learned skill."

Eric made inspiring remarks in December 2017 at the AGU awards ceremony in his acceptance speech of the Robert E Horton Medal. He said: "A young colleague asked me 'What does it take to have an impactful career?' and after some thought I said 'courage.' Courage to be creative. Courage to think in ways that others aren't thinking. Courage to persist but also courage to sit down and listen. You need courage to let your students and postdocs take your ideas and to develop them and take ownership of them. Since mentoring is central to our craft, I try to have this courage."

Eric will remain at Princeton as a senior scholar, continuing to develop hyperresolution land surface models. He will pursue new research avenues modeling infectious disease transmission and its relation to highly resolved hydrologic processes.