



DONALD BREN SCHOOL OF ENVIRONMENTAL SCIENCE AND MANAGEMENT

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Mr. Emmitt C. Witt, III
General Secretary
American Institute of Hydrology
Chief, USGS Department of Defense Earth Sciences
Prog. Mid-Continent Mapping Center
1400 Independence Road, MS-319
Rolla, MO 65401

Dear Emmitt:

Re: C.V. Theis Award Nomination

The AIH C.V. Theis Award Committee recommends that the 2006 Award be given to Dr. Fred J. Molz, Professor in the Department of Environmental Engineering and Science at Clemson University for his contributions to ground water hydrology through research, teaching, consulting, and professional service.

Dr. Molz has made fundamental contributions to several areas of ground water hydrology related to water management in soils and aquifers and to the migration and processing of contaminants and other materials. His work is characterized by a rigorous application of fluid mechanics and thermodynamics to soil-plant interactions and to the saturated and variably saturated zones of heterogeneous aquifers. He uses theory and experiment as well as field surveys, and his work has influenced the fields of hydrology and aquifer development, soil physics, agronomy, ecology, and the evaluation of contaminated regolith. These influences are documented by the citations to his publications as well as the syllabuses of his short courses and consulting activities. He has also co-authored the earliest (1971) textbook on the application of numerical methods in subsurface hydrology and a manual of practice for measuring hydraulic conductivity in heterogeneous materials (1990).

His earliest research in plant-soil interactions developed rigorous models of water migration in soils, roots, and plant tissues and of the extraction of water from soils by plants. The results were published in an extraordinarily diverse range of journals from hydrology, agronomy, soil science, and several biological fields. Some of these papers have become classics in both soil hydrology and plant physiology. There followed a period in which his team studied dispersion in aquifers and invested considerable effort in the interpretation of tracer tests. In the 1980s, a series of papers in *Water Resources Research* and *Ground Water* documented these studies. Characteristically, the work

involved interpretation of field measurements, conceptual model development, mathematical analysis, and finally numerical simulation.

Molz went on to study a wide range of techniques for field investigation of the hydraulic and transport properties of aquifers, including tracers, slug tests, and flow meters as he gradually broadened his ideas and methods for characterizing the properties of the subsurface. His team mounted rigorously designed, detailed field experiments to separate horizontal and vertical transport, to measure the shapes of flow fields around sensors, and to refine the measurement techniques. These publications have been disseminated through a wide range of hydrological publications, including *Ground Water*, *Ground Water Monitoring and Remediation*, *Hydrological Processes*, and the *Journal of Hydrology*

His concern for characterization of subsurface properties broadened into a wide range of conceptual and mathematical approaches, including geostatistical and facies-based geological methods. The papers produced by his team reflect not only his mathematical acumen but also his experience with modern instrumentation and with field measurements, and have been widely cited. An important component of his leadership in this new field was his convening of the 1998 AGU Chapman Conference on *Fractal Scaling, Non-linear Dynamics and Chaos in Hydrologic Systems*.

Molz has made a number of other contributions to the modeling of saturated, variably saturated, and surface flow, incorporating modern concepts of flow and the dual-domain and stochastic properties of both the surface and subsurface, and the transport and chemical and microbial processing of contaminants ranging from hydrocarbons to radionuclides. His research output continues to be both conceptually rich and relevant to a range of problems in ground water hydrology. He has invested considerable effort in thinking about how to make practical computations of flow in highly diverse environments, in spite of the fact that many conceptual and logistical problems continue to challenge researchers.

Dr. Molz's research has been recognized through election as a Fellow of the American Geophysical Union in 2000, and by the Horton Award (1992) of the AGU Hydrology Section. He takes a leadership role in the Hydrology Section, recently chairing the Horton Award Committee, and serving on the Groundwater Committee and the Unsaturated Zone Committee, the Committee on AGU Strengths, Weaknesses and Opportunities, and the AGU Executive Committee.

In summary, we consider Dr. Molz to be an exemplary, active leader of modern ground water hydrology applied to environmental management, and we recommend that the Executive Committee of AIH honor him with the C.V. Theis Award.

Sincerely



Thomas Dunne

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