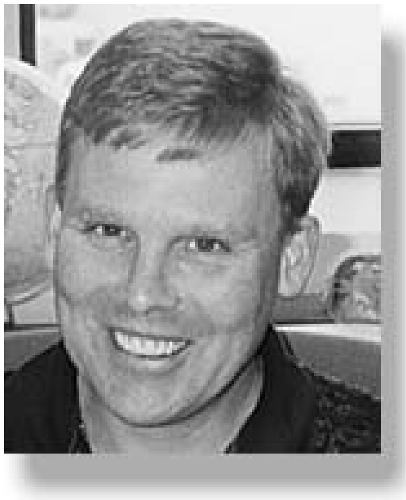
MORE Science at UTSA
Environmental Science and Engineering
Spring 2007 Seminar Series

Where: **Loeffler room (3.03.02) in the BioScience Building**
When: **4:00 PM – 5:00 PM on April 27, 2007**

Refreshments will be provided

Speaker: Dr. Bruce Herbert



Bruce Herbert, PhD, is professor of Biogeochemistry in the Geology & Geophysics Department, Texas A&M University, College Station. His ***Environmental Geochemistry Research Group*** conducts innovative research on the biogeochemistry of near-surface environments, including soils, wetlands, aquatic sediments, aquifers, and the coastal margin. He is also interested in improving learning about complex, dynamic environmental systems. As such, his research group studies geoscience at the interface between **biogeochemistry**, **cognitive science, geomorphology** and **landscape ecology**.

Dr. Herbert is also a National Association of Geoscience Teachers **(NAGT) distinguished lecturer** and is addressing a number of educational issues and research topics, including the design and implementation of authentic inquiry in the classroom, restructuring curriculum to focus on model-based learning, the use of multiple representations (i.e. physical models, visualizations, and simulations) to support student understanding of complex earth and environmental systems, and programmatic design that builds synergy between scientific research and education.

He got his PhD in University of California-Riverside in 1992

Topic: Cation-π bonding: A new perspective on the sorption of polycyclic aromatic hydrocarbons to hydrated mineral surfaces

Sorption of organic molecules to soils and sediments is generally assumed to be controlled by sorption to natural organic matter, with important contributions of sorption to mineral surfaces if the organic molecules contain polar or ionic functional groups that form partial covalent or charge-transfer bonds with surface functional groups. The contributions of weaker, noncovalent interactions to the sorption of nonionic organic compounds, such as polycyclic aromatic hydrocarbons, to hydrated mineral surfaces are generally discounted because of limited direct spectroscopic characterization. We have characterized the interactions of detuterium-labeled aromatic molecules with hydrated mineral surfaces using deuterium nuclear magnetic resonance (^{2}H NMR) spectroscopy. Relaxation of the quadrupolar deuterium nuclei is related to the molecular correlation time (˜ $_{c}$), thereby providing direct characterization of the molecular environments of adsorbed molecules. Both ^{2}H NMR and batch sorption experiments showed that softer exchangeable cations generally resulted in more sorption to the same mineral surfaces (e.g., $Ag^{+} > Cs^{+} > Na^{+} > Mg^{2+}$, Ba^{2+}), consistent with the sequence of cation-˜ i electron binding energies in aqueous solution. In addition, aromatic organic sorption was dependent on the surface charge density of the minerals (e.g., vermiculite > silica gels > kaolinite). These results strongly suggest that cation-˜ i bonding forms between PAHs and exchangeable cations at mineral surfaces and significantly affects PAH sorption to hydrated mineral surfaces. Implications of PAH fate and transport along the Gulf Coast will be explored.