New Faculty

Introducing Huifang Xu

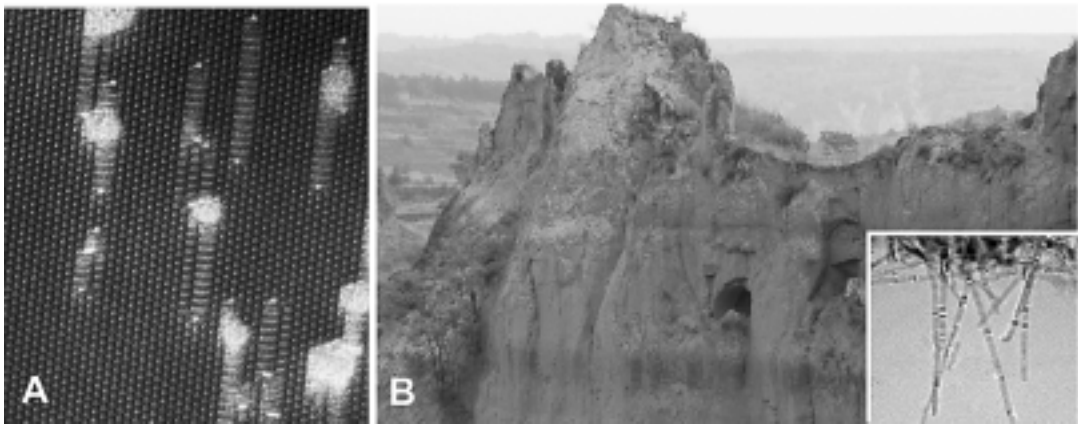
Huifang Xu

After we had lived in the Land of Enchantment (New Mexico) for seven full years, my family and I moved to the American Dairy Land last summer. It was the perfect time for us to enjoy the most beautiful season of Madison. My family and I immediately fell in love with this place. This is a remarkable department with strengths in both Geochemistry and Geophysics. I learned about the University of Wisconsin and this department over 20 years ago when Professor S.W. Bailey gave a workshop about clays and clay minerals in Nanjing University, my Alma Mater, China.

As a mineralogist and electron microscopist, I have been studying microstructures and interface structures of minerals at the atomic scale by transmission electron microscope (TEM) and scanning transmission electron microscope (STEM). My recent work has addressed the mineral reactions in nanoprous environments. Geochemical reactions in nanopore and nanotube environments will differ greatly from those in bulk solution systems because of electric double layer overlap and water property changes (such as activity and dielectric constant), which will affect many aspects of geochemical processes, such as chemical weathering, ore deposit formation, replacement reactions, and fate of toxic metals in ground water aquifers. Nano-geochemistry is a new and rapidly evolving field in the geosciences. The study will provide a linkage, currently missing, between laboratory measurements and the real geological world, especially in the "critical zone" where fluids meet solid Earth. Nanoporous materials with enhanced chemical and functional properties can also be used for immobilizing toxic metals and pollutants in the environment.

I also investigate the role of bio-organics on the mineral formation by studying both natural samples (e.g., dry soils of loess) and laboratory synthesized samples. The "soft" and "cool" bio-induced molecules can "whip" stiff minerals and change their shapes, textures, and even crystal structures.

The goal of my first year is to build the Mineral Science Laboratory located in Weeks' new addition (that was a gift from UW alumni!) and to involve UW faculty and students in my research. For example, Nita Sahai and I have submitted an NSF proposal to support nano-geochemistry research in Geology; Paul Voyles (Materials Science & Engineering), Ralph Albrecht (Animal Sciences) and I have submitted an NSF MRI proposal to bring a modern field emission-gun STEM/TEM to the UW community; and Craig Benson (Civil & Environmental Engineering) and I have submitted an EPA proposal to support study of nano-structured clays for environmental applications.



(A): TEM image shows wide chains (precursors of smectite) formed during weathering of an amphibole.
(B): A photo shows an outcrop of loess in central China that recorded paleo-climate changes during the Quaternary. Inserted TEM image shows single-crystal calcite nano-fibers in the loess. Such fibrous calcite is directly related to microbial activities in a semi-arid soil environment.