A Porous Medium
Jon Chorover, Department Head

The work that we do as a Department of Soil, Water and Environmental Science represents a bridge across the Grand Canyon that separates the “deep” timescale of processes studied by geologists and the short timescale processes studied by ecologists and many environmental scientists. For example, soils – nothing less than the foundation for all terrestrial life – may require hundreds to millions of years to evolve a composition and structure that provisions to society and the planet such supporting services such as plant growth, water purification, carbon stabilization and microbial biodiversity.

The long time-scale for soil formation, in fact, has led many to regard it as a “non-renewable resource,” because it is essentially non-renewable on human-use time scales. This contrasts with the living biomass (plants and microbes) that colonize soils and constitute the “renewable resource” component of ecosystems. Indeed, biota undergo many ecosystem successions (i.e., primary colonizing species, later successional species, climax community composition, disturbance, repeat …) over the course of soil development. The process of “pedogenesis” and its multiple superimposed ecosystem successions is much longer than the time required for degradation of soil because of human mismanagement, contamination, or erosion; the latter all occur in the “blink of an eye” in the life of a soil.

Faculty, staff and students in SWES are working to understand this “most complex biomaterial on the planet” so that we can manage it more effectively for future generations. Like us, those folks too will need it to (i) feed the world, (ii) maintain climate balance, and (iii) purify water, (among other required qualifications for the soil job). We believe that a non-renewable resource with these particular qualifications should have access to good health care, which is why our department is researching technologies on how best to remediate it when it is adversely disturbed by human activity.

We pursue the science needed for sustainable management of Earth’s skin by studying how the soil resource evolves over hundreds to millions of years (pedology); how the resulting structures it comprises affect the flux of energy and matter (soil physics); the mechanisms whereby (bio)chemical reactions occur at soil particle-fluid interfaces (soil chemistry); the types and functions of microorganisms that colonize its surfaces (environmental microbiology); and how physical, chemical and biological characteristics of porous media interact to affect the subsurface migration of pollutants (contaminant transport). By bringing these fields of inquiry together in our undergraduate and graduate programs, we train students to combine chemistry, biology and physics to bridge the Grand Canyon that lies between the long time scales of soil formation, and the short time scales of disturbance or remediation of its services to society.

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Martin Yoklic in 1982

Martin was present at ERL during its heyday when more than 150 personnel were involved in projects such as the Biosphere 2, the Epcot Center in Disney World, shrimp farms in Hawaii and Singapore, and halophyte projects in Mexico and the Middle East.

Martin interacted with everyone at ERL, and was well liked and respected for both his work and his outlook on life. He was indeed a brave and courageous man who will long be remembered. He is survived by wife Debbie and sons Max and Simon.

His positive attitude was epitomized in his fight against the cancer that finally ended his life. Even in his passing, he emphasized conservation by requesting that people who wished to honor him do so not by sending flowers, but by contributing to The Nature Conservancy.

GRANTS


Chief, K. Aquaponics and community engagement. Haury Foundation, $10,000.

Chief, K. Water resources technician training program. Bureau of Indian Affairs, $94,814.


Chorover, J. Establishing chemical and microbial indicators of safe, harvested rainwater to promote water conservation and public health. Environmental Protection Agency, $747,483.

Chorover, J. Collaborative Research: Coupled hydrological and geochemical process evolution at the landscape evolution observatory. National Science Foundation, $190,740.

Crimmins, M. Using a co-development process to improve, integrate and encourage use of drought information and adaptive management of livestock grazing. National Oceanic and Atmospheric Administration, $92,566.

Crimmins, M. Drought assessment and ecological forecasting for the Southwest through improved integration and analysis of ground and airborne observations. UA Water, Environment, and Energy Program, $45,000.

Gerba, C. Evaluation of risk-based water quality sampling strategies for the fresh produce industry, University of California, Davis, $71,264.

Kahn-Rivideneira, P. Developing scientifically-based consensus food safety metrics for leafy greens and tomatoes. USDA National Institute of Food and Agriculture, $299,916.


McLain, J. Developing a sustainable seafood industry infrastructure in Myanmar. U.S. Agency for International Development, $1,499,266.

McLain, J. Creation of self-sterilizing harvesting tools. Arizona Department of Agriculture, $80,000.

McLain, J. Collaborative Research: Relative abundance and diversity of antibiotic resistance genes and pathogens in reclaimed versus potable water distributions. National Science Foundation, $35,000.


Pepper, I. I/UCRC Water and Environmental Technology Center membership fees. National Science Foundation, $174,000.

Pepper, I. Water and Environmental Technology Center (I/UCRC). National Science Foundation, $40,000.


Rock, C. Creation of self-sterilizing harvesting tools. Arizona Department of Agriculture, $80,000.

Rock, C. Evaluation of risk-based water quality sampling strategies for the fresh produce industry. Center for Produce Safety, $150,742.

Rock, C. UA Extension support for volunteer water quality monitoring. Arizona Department of Environmental Quality, $15,000.

Sanchez, C. Mitigation of heavy metals in produce. Arizona Department of Agriculture, $80,000.


Sanchez, C. Field evaluation and demonstration of controlled release N fertilizers in the western United States. California Department of Agriculture, $224,967.

Sanchez, C. Preliminary evaluation of a genetic solution to a heavy metal risks in lettuce. Arizona Iceberg Lettuce Research Council, $14,747.

Schaap, M. Colloid mobility in soils: Fundamental pore-scale mechanisms, simplifications and practical relevance for risk analysis. U.S. Department of Agriculture, $441,000.

Tuller, M. Optimization of aeration and water holding properties of advanced greenhouse substrates based on physical characterization and numerical simulations. Binational Agricultural Research and Development Fund (Israel), $153,000.
PUBLICATIONS


SWES graduate student Darcy VanDervort shows Manzo School pupils how to monitor and maintain an aquaparconics system. Her work at this Tucson school is part of The Green Academy for Garden-Based Curriculum Transformation. For more, see http://bit.ly/1Gs2ifo.


DEPARTMENT NEWS

New administrators join SWES team

SWES Administration Office has seen some change in staff in recent months. Kristie Gallardo left SWES to become the executive administrative associate in the College of Agriculture and Life Sciences Cooperative Extension Office in October 2014. She is still close by and visits often.

Almeda Kennedy, secretary in the SWES Business Office, retired in November 2014. She is looking forward to riding her Harley and enjoying time with her grandchildren.

Wendy Haley, administrative associate, joined SWES in November to assist Jon Chorover and the department. Wendy has been at the UA for 25 years, working in the College of Engineering (both in Chemical & Environmental Engineering and the Dean’s Office), the Provost’s Office and the College of Architecture, Planning and Landscape Architecture before coming to SWES.

Linda Heffernan joined SWES in December 2014 and is the Human Resources person for the department. Previously, Linda worked in management consulting in central UA HR, then retired and came back part time as an organizational consultant working with UA information technology. Now she is pleased to be here at SWES providing HR administrative support to the department.

Linda Heffernan

CONGRATULATIONS

Cassie Fausel won the CALS Outstanding Master’s Teaching Assistant award for the fall 2014 semester, while Katherine Heydorn was named the SWES Outstanding Senior.

Valerisa M. Joe, a master’s student working in the laboratory of Water Resources Research Center Associate Director Jean McLain, has been awarded the Native Agriculture and Food Systems Scholarship by the First Nations Development Institute.

Brunno Cerozi, a Ph.D. student in SWES, represents the Science without Borders program of Brazil and is a 2014 Institute of the Environment Carson Scholar. Brunno received his B.S. degree in agronomy and his master’s degree in animal science from the University of São Paulo. His research area is in aquaculture. He came to the University of Arizona to study aquaponics, a more sustainable way of producing fish and plants together in a soil-free hydroponic integrated system, in which nutrients and water are constantly recycled. Working with Kevin Fitzsimmons, he is raising tilapia and growing lettuce and tracing inputs, partitioning, and outputs of phosphorus throughout the system.

Bradley Schmitz, Ph.D. student in SWES, won both Best Research Presentation and Best Link between Science and Society for his talk “Agua Nueva: A new 21st century wastewater treatment plant: Efficacy of nutrient and Virus removal.” The Grad Blitz is was presented by the UA Institute of the Environment and involved an afternoon of fast talks by graduate students from all over campus working on environmental-related research and arts to showcase their research findings and creative works.

Technology tips and support

The CALS Communications and Cyber Technology group has put up a new web page that includes some excellent security tips, reminds SWES Senior Systems Administrator Sheri Musil. There’s one that everyone should read if they post pictures online, say, on Facebook. Smart phones embed location information in the photo itself. So you could be posting the exact GPS coordinates of your house with each kid’s picture you are posting online. This can occasionally help the bad guys target you or your kids.

Go to https://cct.cals.arizona.edu/support/security-tips for more information about that (Tip 9) and also other tips. Also, https://cct.cals.arizona.edu/support has links to help you find out how to set an automatic reply (vacation message) for your email, help with connecting Android devices to UA email, and other helpful items.

BEST OF WEST

Ian Pepper, Director

The current BEST of WEST is “a tale of two cities.” WEST is coming along famously with respect to construction. The LEED-certified structure is spectacularly large, bright and cheerful. Furniture is being purchased and plans for the move from the Environmental Research Lab are underway. The official “date of occupancy” is April 4, but this may come even earlier. We are planning on an opening ceremony in late April/early May.

In contrast, ERL is sad, dark and dingy! Currently, talks between the UA upper administration and the airport staff are underway to determine what buildings (if any!) will be allowed to be left standing after we move, or whether the site has to be totally leveled. Estimates for total demolition are currently being solicited, and as you can imagine this will be a long complex process.

Once we have moved in to WEST, we will have an “open house” so that faculty interested in conducting a project at WEST can see what facilities are available. In fact we may conduct the department retreat at WEST! Also, don’t forget that this is a joint venture between the College of Agriculture and Life Sciences and The College of Engineering, so we will be closely interacting with engineers.