



SWES SOUNDS

THE UNIVERSITY OF
ARIZONA
COLLEGE OF AGRICULTURE
AND LIFE SCIENCES

The Heartbeat of the Department of Soil, Water & Environmental Science

October/November 2011

<http://ag.arizona.edu/SWES/>

TONES FROM THE TOOTH

Jeffrey C. Silvertooth, Department Head

We are working in a time when we are facing an interesting set of converging challenges. On one hand we have an enormous set of environmental challenges ahead of us as a society and population. At the same time we are experiencing a significant change in economic conditions that are being dictated by some very harsh fiscal realities at the national and state levels. Associated with this broad range of challenges it is extremely important how we choose to address the modifications that will be needed to adapt in the Department of Soil, Water and Environmental Sciences (SWES) at the University of Arizona in the next few years. These decisions and directions will determine to a large extent the nature and complexion of our department in the decade ahead.



We clearly need to maintain a strong Environmental Science curriculum at both the undergraduate and graduate levels. A well-educated populace, particularly in the earth and environmental sciences, is a much needed resource. Associated with these curriculum needs we must maintain a robust portfolio of research programs that are directed towards the fundamental aspects of the physical, chemical, and biological components active in environmental systems. Similarly, the programs that address practical applications of fundamental science to environmental and agricultural problems are increasingly important for us to maintain and support in the SWES Department. Finally, our extension programs provide to us the vehicles that are essential in transferring the products from the research program and bringing them to bear on relevant environmental and agricultural challenges and problems, particularly at the state and regional levels.

In the face of increasing financial pressures and constraints the SWES Department will need to think and act creatively to address the breadth of programs that we see as central to our mission and purpose. Our commitment to address these challenges will be tested. I am confident that the SWES Department has the capacity, fortitude, and flexibility to rise to the challenges ahead of us. We will be best able to do so with a willingness to work cooperatively, both internally and externally, and apply ourselves in a committed manner. The time is upon us to think and act with a sense of practicality and vision for what it is we strive to achieve as a department. We need each element of the SWES Department to join in this collective effort.

Volume 30, Issue 4

Shantz Bldg. 38, Rm. 429

Tucson, AZ 85721

FEATURED RESEARCHER

Karletta Chief –

One of the newest faculty members in SWES, KarlettaChief started in August as an assistant professor and extension specialist in SWES. Dr. Chief comes from Desert Research Institute in Las Vegas where she completed a postdoctoral fellowship in the Division of Hydrologic Sciences.



She first went to DRI to work on large weighing lysimeters at the Scaling Environmental Processes in Heterogeneous Arid Soils Project in Boulder City (www.sephas.dri.edu). Three 7.4-foot-diameter lysimeters at the Nevada facility each use 150 sensors to measure soil moisture and temperature, among other factors, to 10 feet deep every 15 to 30 minutes. During her postdoc, she received an award from the American Indian Science and Engineering Society as “Most Promising Engineer/Scientist of the Year.”

Dr. Chief is originally from Black Mesa, Arizona, where she grew up on the Navajo Nation. She received a B.S. in 1998 and an M.S. in 2000 in Civil and Environmental Engineering from Stanford University. She received her Ph.D. at the UA from the Department of Hydrology and Water Resources as a National Science Foundation Doctoral Fellow, with a minor in Soil, Water and Environmental Science. While a UA student, Karletta was awarded the John Rainer American Indian Leadership Award, Stanford University Minority Alumni Task Force Featured Alumni, University of Arizona Centennial Doctoral Student Award, and Arizona Hydrological Society Scholar.

As an assistant professor, she aims to use physically based methods of research to improve our understanding, tools, and predictions of watershed hydrology, unsaturated flow in arid environments, and how natural and human disturbances affect soil hydrology. Dr. Chief’s research also focuses on how indigenous communities will be affected by climate change. She collaborates with an interdisciplinary group of scientists including hydrologists, system-dynamic modelers, and social scientists to determine how hydrological models can be improved to identify and mitigate risks to these vulnerable populations.

As an extension specialist, she works to bring relevant science to Native American communities in a culturally sensitive manner by providing hydrology expertise, transferring knowledge, assessing information needs, and developing applied science projects.

SWES REPORT CARD

PUBLICATIONS

Brusseau, M.L., K.C. Carroll, T. Allen, J. Baker, W. DiGuseppi, J. Hatton, C. Morrison, **A. Russo** and J. Berkompas. 2011. Impact of in-situ chemical oxidation on contaminant mass discharge: linking source-zone and plume-scale characterizations of remediation performance. *Environmental Science and Technology* 45: 5352-5358.

Brusseau, M.L., J. Hatton, and W. DiGuseppi. 2011. Assessing the impact of source-zone remediation efforts at the contaminant-plume scale: application to a chlorinated-solvent site. *Journal of Contaminant Hydrology* 126: 130-139.

Dupont, C.L., G. Grass, and **C. Rensing**. 2011. Copper toxicity and the origin of bacterial resistance – new insights and applications. *Metallomics* 3: 1109-1118.

Gerba, C.P., A. Ross, K. Takizawa, and **I.L. Pepper**. 2011. Efficiency of ASTM Method D4994-89 for recovery of enteric viruses from biosolids. *Food Environ. Virol.* 3: 43-45.

Gerba, C.P. 2011. Microbial risk assessment as a tool in predicting outcomes of hygiene interventions. *HPC and Compendium on Detergency* 2: 4-6.

Gerba, C. P., **A. H. Tamimi**, C. Pettigrew, A. V. Weisbrod and V. Rajagopalan. 2011. Sources of microbial pathogens in municipal solid waste in the United States of America. *Waste Management and Research* 29: 781-790.

Grass, G., L. Rensing, and **C. Rensing**. 2011. Metal Toxicity. *Metallomics* 3: 1095-1097.

Hayes, S.M., P.A. O'Day, S.M. Webb, **R.M. Maier**, and **J. Chorover**. 2011. Changes in zinc speciation with mine tailings acidification in a semiarid weathering environment. *Environmental Science and Technology* 45: 7166-7162.

Jardine, K., A. Yañez Serrano, A. Arneth, **L. Abrell**, **A. Jardine**, **J. van Haren**, P. Artaxo, L. V. Rizzo, F. Y. Ishida, T. Karl, J. Kesselmeier, **S. Saleska**, **T. Huxman**. 2011. Within-canopy sesquiterpene ozonolysis in Amazonia. *Journal of Geophysical Research* 116, D19301.

Lin, Y., **X. Hao**, L. Johnstone, S.J. Miller, D.A. Baltrus, **C. Rensing**, G.H. Wei. 2011. Draft genome of *Streptomyces zinciresistens* K42, a novel metal-resistant species isolated from copper-zinc mine tailings. *J. Bacteriol.* 193: 6408-6409.

McCray, J.E., G.R. Tick., J.W. Jawitz, J. S.Gierke, **M.L. Brusseau**, R.W. Falta, R.C. Knox, D.A. Sabatini, M.D. Annable, J.H. Harwell, A.L. Wood. 2011. Remediation of NAPL source zones: lessons learned from field studies at Hill and Dover AFB. *Ground Water* 49: 727-744.

Miles, S.L., K. Takizawa, **I.L. Pepper**, and **C.P. Gerba**. 2011. Survival of infectious prions in water. *J. Env. Sci. & Hlth. Part A* 46: 938-943.

Miles, S.L., R.G. Sinclair, **M.R. Riley**, and **I.L. Pepper**. 2011. Evaluation of select sensors for real-time monitoring of *Escherichia coli* in water distribution systems. *Applied Environmental Microbiology* 77: 2813-2816.

Singh, S.K., S.A. Roberts, S. Franke McDevitt, A. Weichsel, G.F. Wildner, G.B. Grass, **C. Rensing**, and W.R. Montfort. 2011. Crystal structures of Multicopper Oxidase CueO bound to copper(I) and silver(I): functional role of a methionine-rich sequence. *J. Biol. Chem.* 286: 37849-57.

Vaughan, M.J., **R.M. Maier**, and B.M. Pryor. 2011. Fungal communities on speleothem surfaces in Kartchner Caverns, Arizona, USA. *Internat. J. Speleology*, 40:65-77.

Williams, D. L., **C. P. Gerba**, **S. Maxwell** and **R. G. Sinclair**. 2011. Assessment of the potential for cross-contamination of food products by reusable shopping bags. *Food Protection Trends* 31: 508-513.

Chris Rensing was featured in the journal *Metallomics*. For the text see: <http://blogs.rsc.org/mt/2011/10/21/meet-chris-rensing/>.



Photo by Kurt Paterson/Michigan Technological University
Aminata Kilungo, a doctoral student in the UA Soil, Water and Environmental Science department, spent a month in Tanzania testing water wells and ceramic water filters. For more, see: <http://lqp.arizona.edu/node/4234>

PRESENTATIONS

Chorover, J., R.A. Root, C. Hammond, S. Hayes, R.Rushforth, J. Neilson, A. Valentin-Vargas, K. Nelson, and **R.M. Maier**. Nanoscale mechanisms of metal(loid) rhizostabilization in desert mine tailings. Superfund Research Program Annual Meeting, Lexington, Kentucky, Oct. 23-26.

Gerba, C.P. Assessment of water treatment devices. Household Water Treatment Workshop. Khartoum, North Sudan. Sept. 27.

Gerba, C.P. Microbial contamination of public buses. American Public Transportation Association Annual Meeting. New Orleans, La., Oct. 2.

Gerba, C.P., **J. Naranjo**. Laboratory assessment of a water purifier designed for household use in low income settings. Water and Health Conference. Chapel Hill, North Carolina, Oct. 5.

Gerba, C.P. Where the germs are and how to get rid of them. Workshop on Healthy Learning Environment in Schools. Holmdel, New Jersey, Oct. 12.

Gerba, C.P. Infection prevention and control in healthcare settings: a global perspective. Malaysian Society of Infectious Diseases and Chemotherapy. Petaling Jaya, Malaysia. Oct. 25.

Gerba, C.P. The importance of hygiene in the 21st Century. Inauguration of Infection Control Month Malaysia. Kuala Lumpur, Malaysia. Oct. 26.

Gil-Loaiza, J., F.A. Solis-Dominguez, S.A. White, R.A. Root, C. Hammond, A. Valentin-Vargas, K.N. Nelson, J. Chorover, and R.M. Maier. 2011. Field-scale phytostabilization of mine tailings at the Iron King Mine-Humboldt Smelter Superfund Site. Superfund Research Program Annual Meeting, Lexington, Kentucky, Oct. 23-26.

Hammond, C., R.A. Root, S.A. White, R.M. Maier, and J. Chorover. Monitoring soil forming processes and contaminant transport during field-scale phytostabilization of arsenic-containing Iron King Mine tailings, Dewey-Humboldt, Arizona. Superfund Research Program Annual Meeting, Lexington, Kentucky, Oct. 23-26.

Levi, M.R., C. Rasmussen, and N. Starman. Spatial prediction models of physical soil properties in southern Arizona. In Abstracts, Annual Meeting Soil Sci. Soc. Am., San Antonio, Texas. Oct. 16–19. ASA, Madison, Wisc.

Maier, R.M., J. Csavina, J. Gil, S. White, J. Chorover, A.E. Saez, A. Landazuri, K. Rine, J. Field, and E.A. Betterton. Quantifying the reduction in airborne particulate emissions resulting from phytostabilization of mine tailings at the Iron King Mine Humboldt Smelter Superfund site. 8th International Phytotechnology Society Conference, Portland, Oregon, Sept. 13-16.

Moreno Ramirez, D., J.A. Field, A.J. Gandolfi, and **R.M. Maier.** Packaging environmental trainings: transferable modules targeting community health workers. Superfund Research Program Annual Meeting, Lexington, Kentucky, Oct. 23-26.

Pepper, I.L. The Future of Residuals and Biosolids Management. 84th Annual Arizona Water Conference. Glendale, Arizona, May 4-6.

Pepper, I.L. Pathogens and indicators in U.S. Class B Biosolids, national and historic distributions. 84th Annual Arizona Water Conference, Glendale, Arizona, May 4-6.

Pepper, I.L. Fate of chemical and biological emerging contaminants in biosolids and after land application. Residuals and Biosolids 2011, Sacramento, California, May 22-25.

Pepper, I.L., H. Zerzghi, S. Bengson, B. Iker, and J. Brooks. Copper mine tailings amended with Class A Biosolid: long term effects on soil bacterial populations. 4th Congress of European Microbiologists, FEMS 2011, Geneva Switzerland, June 26-30.

Pepper, I.L., D. Quanrud, H. Zerzghi, C. Leung, and C. Gerba. Fate of endocrine disruptors following long-term land application of Class B Biosolids and risks to public health. 3rd International Conference, EmCon 2011, Copenhagen, Denmark, August 23-26.

Pepper, I.L., and C.P. Gerba. New tool for site-specific biosolids risk assessment. Northwest Biosolids Management Annual Conference. Stevenson, Washington. Sept. 13.

Ramirez, M. Presentation at SRP Annual Meeting. Lexington, Kentucky. October 23-26.

Rensing, Chris. Controlling cellular copper concentrations for a healthy future. Institute of Urban Environment, Chinese Academy of Sciences, Xiamen, China.

Wilkinson, S.T., **M.D. Ramirez-Andreotta, R.M. Maier, A.J. Gandolfi, and M.L. Brusseau.** Applying laboratory and field research to real-world problems through research translation: an Arizona mining example. Superfund Research Program Meeting, Lexington, Kentucky, Oct. 23-26.

CONGRATULATIONS

Monica Ramirez-Andreotta received the 2011 Karen Wetterhahn Memorial Award from the Superfund Research Program, National Institute of Environmental Health Sciences. Advisors: Mark Brusseau, Raina Maier, Janick Artiola.

Corin Hammond won first place in the environmental science category for her poster, “Monitoring nutrient influx and contaminant lability during field-scale phytostabilization of arsenic containing Iron King Mine tailings, Dewey-Humboldt, Arizona,” at the Superfund Basic Research Program Annual Meeting held in Lexington, Kentucky, Oct. 23-26. Co-authors were Robert Root, Scott White, **Raina Maier** and **Jon Chorover.**

Rebecca Lybrand won first place for graduate student oral presentation for “Chemical weathering of granitic soils in the Santa Catalina Mountains, Arizona: effects of climate and landscape position,” in the Pedology Division at the Soil Science Society of America Meeting in San Antonio, Oct. 16-19. Advisor: Craig Rasmussen

Pamela Nagler was invited by National Academy of Sciences President Ralph Cicerone to participate in a joint meeting with the NAS and the Chinese Academy of Sciences in Shenzhen, China, Nov. 3-7. This allowed Dr. Nagler to participate in the academy’s premiere activity for distinguished young scientists. The NAS stated that “attendees are selected by a committee of Academy members from among young researchers who have already made recognized contributions to science, including recipients of major national fellowships and awards and who have been identified as future leaders in science.”

Karis Nelson, won third place for her poster “Influence of phytostabilization on carbon and nitrogen cycling activities in metalliferous mine tailings” at the 8th International Phytotechnology Society Conference in Portland, Oregon, Sept. 13-16. Co-authors were **Jon Chorover** and **Raina Maier.**

Raina Maier was appointed to the editorial board of the *International Journal of Phytotechnology.*

C.P. Gerba was appointed to the advisory board of the Healthy Facilities Institute.

Damian Gilling, who worked with C.P. Gerba, defended his Ph.D. dissertation, “The efficacy of natural plant antimicrobials against *Escherichia coli.*”

Oscar Torres, who worked with C.P. Gerba, defended his Ph.D. dissertation, “Copper resistant bacteria better tolerate commercially available antimicrobial treatments based in silver and silver-copper ions.”

Chris Rensing was appointed visiting professor at both King Saud University Riyadh, Saudi Arabia, and at the Institute of Urban Environment(IUE) at the Chinese Academy of Sciences in Xiamen, China.

DEPARTMENT NEWS

SWES grads, postdoc participate in BioBlitz

SWES graduate students **Alexis Valentin-Vargas** and **David E. Hogan** and postdoctoral researcher **Dragos G. Zaharescu** were among those invited to lead two science teams for the 2011 National Park Service/National Geographic BioBlitz held Oct. 21 and 22 in Saguaro National Park. The BioBlitz gives families, students, teachers, and other community members the opportunity to join scientists in the field and participate in identifying and learning about as many species of plants, animals, microbes, fungi, and other organisms as possible. National Geographic organizes a BioBlitz in a different national park each year during the decade leading up to the U.S. National Park Service Centennial in 2016.

While more than 5,000 people combed the east and west sides of the park searching for different forms of life, Alexis, David and Dragos had the task of improving the public's negative perception of microbes with an activity called "**The critical role of microbes in shaping desert landscapes.**" It included two one-hour guided walks, during which

volunteers learned of the different functional roles of microbes in the environment, their distribution in nutrient islands, their role in biological rock weathering and their formation of biofilms. Volunteers also learned how to sample and cultivate microbes from a variety of surfaces including rock varnish, cryptobiotic crusts, lichen and moss formations and plants.

SWES Club cleans rivers, evaluates mine

In September, the SWES Club helped clean the Salt River, hiked Marshal Gulch and volunteered with San Xavier Mining Laboratories to do a mine evaluation. In the coming months members will be participating in a collaborative effort to restore damaged land in the Ironwood National Monument.



For more information and to read the article about the SWES Club in the *Daily Wildcat*, follow this link:

http://www.wildcat.arizona.edu/index.php/article/2011/11/soil_water_club_digs_into_environmental_science

GRANTS

WRRC awarded reclamation grant

The Water Resources Research Center has secured grant funding from the U.S. Bureau of Reclamation WaterSMART Program to undertake a two-year project to produce a *Utility Guide to Rainwater/Stormwater Harvesting as an Adaptive Response to Climate Change*. WRRC Director Sharon Megdal has a joint appointment in SWES and the Department of Agricultural and Resource Economics.

Throughout the western U.S., water utilities are looking to obtain additional water supplies, construct additional infrastructure, and consistently deliver sufficient water to meet growing demands. Beneficial uses of harvested rainwater and stormwater include water savings, cost savings, reduced flood peaks, stormwater water quality management, habitat enhancement and reduction of urban heat island effects.

Photo removed for web publication

Daniel Basubas, a junior in Environmental Science, won first place in the People category for his photo, "Dancing Himba". His entry, taken during a summer conservation biology course in Namibia, competed with more than 100 other in the Honors College Study Abroad Photography Competition.

However, relatively little guidance exists on how public utilities and agencies can evaluate the suitability and cost-effectiveness of water harvesting strategies to provide tangible and significant benefits to the community. This project will develop guidance tools for use by water utilities, stormwater management agencies, flood control agencies, and other public departments that obtain, deliver, or otherwise manage potable water, rainwater and/or stormwater in western urban environments.

The U.S. Department of Agriculture awarded a \$542,969 grant to **Bright, K.**, B. Law, K. Nolte, **C. Rock**, **C.P. Gerba**, L. Joens for their project "The role of biofilms as a reservoir for foodborne pathogens in irrigation systems."

Vestegarrd awarded a \$71,000 grant to **Naranjo, J.**, **A. Tamimi** and **C. P. Gerba** for an assessment of accelerated aging of a water treatment device designed for developing countries.

The Center for Produce Safety awarded an \$84,580 grant to **Rock, C.**, **K. Bright**, **C.P. Gerba** for the following project: "Assessment of *Escherichia coli* as an indicator of microbial quality of irrigation water used for produce."

PLANE TALK FROM ERL

Ian Pepper, Director

As Bob Dylan used to sing, "The Times They Are a-Changin'." Plans are now underway for the Environmental Research Lab to move to a brand new building being constructed by Pima County as part of the development of a new Water and Energy Sustainable Technology (WEST) Center.



The move is targeted to occur in the summer of 2013, but a lot of work needs to be done in advance of the move. As we prepare for this world-class opportunity, there is great excitement but also some sadness due to budget cuts. Jennifer Wood is leaving us and has been restationed within SWES offices on campus. Thanks for all your hard work and efforts Jennifer — we will miss you.