



SWES SOUNDS

THE UNIVERSITY OF
ARIZONA
COLLEGE OF AGRICULTURE
AND LIFE SCIENCES

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

March/April 2011

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

TONES FROM THE TOOTH

I was recently contacted by Mr. Bill Buckmaster, a local radio station host, and invited to participate in an interview and discussion regarding a proposal to defund the Environmental Protection Agency. The other guest in the discussion was Mr. Steve Milloy, who had recently advocated defunding the EPA in an article he had written for the Washington Times.



Mr. Milloy is the founder and publisher of JunkScience.com, a co-founder and portfolio manager of the Free Enterprise Action Fund (the first conservative/libertarian mutual fund), and a long-time columnist for FoxNews.com. His position is basically founded on the premise that the regulatory nature of the EPA is counter-productive to business and commerce and that the EPA takes on regulatory responsibilities beyond its designated authority.

My position, which supports maintaining the EPA, is based in part on the abundant evidence that overall the EPA has had a positive impact on the quality of the environment in the U.S. since it was formed during the Nixon administration in 1970 with regulatory responsibilities for water, air, and fuel quality standards. Furthermore, industry and commerce in the U.S. has prospered during this period despite the fact that they have been required to comply with regulatory standards for environmental protection. The EPA has provided a framework and mechanism to protect the environment where the American public lives and the very resources we depend on for survival. We, as a society, are also responsible for good stewardship in the utilization and wise management of our natural resources for the benefit of the future generations of Americans yet to live.

Bill Buckmaster always conducts a good interview and Mr. Milloy was very civil. I doubt if I was able change Mr. Milloy's opinion on this or any other matter during our discussion. But the opportunity did give me a chance to reflect on the EPA: its history, value, and also some things that could probably be improved upon in its management. However, the final view for me is that this is not a time, despite the economic problems in the U.S., to back off from our environmental standards. In my view, the EPA is a reflection of our societal ethics and the value that we place on our environment and our responsibility as good stewards of our natural resources.

Jeffrey C. Silvertooth, Department Head

The broadcast can be heard at:

<http://www.buckmastershow.com/2011/02/22/buckmaster-2222011/>

More on the history of the EPA can be found at:

<http://www.epa.gov/history/topics/epa/15c.htm>

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FEATURED POSTDOC

Antje Legatzki ---

I joined Dr. Raina Maier's Environmental Microbiology Research Group as a postdoctoral researcher in April 2007 to work on the Kartchner



Caverns project. Kartchner Caverns is located near Benson, Arizona. The cave features many different formations, such as stalactites, soda straws, stalagmites, columns and draperies. In 2006, Kartchner Caverns was added to the National Science Foundation list of Microbial Observatories.

We are interested specifically in the microbial diversity colonizing the formations of the cave and in what influences the diversity. We are using molecular methods such as DGGE, 16S rRNA gene clone libraries, 16S pyrotag and metagenomic analysis to evaluate the microbial diversity. In addition, we are looking at the physical and chemical environmental parameters that characterize our different sample sites and potentially influence the variety of microbial communities present on the different formations. Furthermore, we are interested in whether microbes as well as geochemical processes are involved in the formation of some of those structures.

My Ph.D. work in molecular microbiology at the Martin Luther University in Germany focused on the investigation of resistance mechanisms in the gram-negative bacterium *Cupriavidus metallidurans* CH34 to some heavy metals: zinc, cobalt and cadmium ions. After my dissertation, I worked for a patent agency in Dresden to help researchers from universities in Germany evaluate and promote their inventions. After a while I longed to return to research, so I applied to Dr. Maier's program. It was a good decision. I really enjoy working in this research group and on this exciting project. Parts of Kartchner Caverns are open to the public, and I highly recommend that all of you who have not been there yet take time to visit it. It is really worth it.

SWES Day during Earth Week events draws students on March 31

Presentations

Daniel P. Bunting: *Estimating large-scale evapotranspiration in arid and semi-arid lands*

Matt Levi: *Advancing spatial models for soil prediction in the Basin and Range*

Rebecca Lybrand: *The effects of climate and landscape position on soil chemical weathering in the Santa Catalina Mountains, Arizona*

Lindsey Hovland: *Soil nitrous oxide flux dynamics in an eastern Amazon tropical forest*

Esther Babcock: *Greenhouse gas emissions from agricultural and animal operations*

Andrew McMillan: *Ethanol addition for enhancing denitrification at the Uranium Mill tailing site in Monument Valley, Arizona*

Christina Canter/Paul Blowers: *Modeling of sustainability of biofuels from microalgae: predicted bottlenecks for success*

Matt Narter: *In-situ, pore-scale measurement of fluid distributions and fluid-fluid interfaces in multiphase porous media systems*

Nihat H. Akyol: *In-situ remediation of chlorinated solvents in karst aquifers using potassium permanganate*

Oluyomi Ajibode: *Incidence of pathogenic microorganisms in reclaimed water*

JuttaElguindi: *Antimicrobial copper alloys and their use against copper ion-resistant bacteria*

Oscar H. Torres Urquidy: *Overcoming reported copper resistance in bacterial strains: using a combination of copper and silver ions*

Corin M. Hammond: *Effects of a phytostabilization strategy on arsenic speciation and mobility in arsenic containing mine tailings*

Marian Ortiz: *Estimation of the bacterial taxonomic diversity and variability on speleothem surfaces in Kartchner Caverns, Arizona*

Posters

Juliana Araujo: *Comparison of methods for measuring air-water interfacial area in porous media*

Hazel Cox: *Transport of titanium dioxide nanoparticles in porous media*

Zack Guido: *Changing precipitation patterns or waning glaciers?*

Matt Levi: *Advancing spatial models for soil prediction in the basin and range*

Donald Matthieu: *Field-scale characterization of chlorinated solvent Superfund site in Tucson, Arizona*

Rose McAndrew: *Groundwater contaminant transport modeling in the Upper Santa Cruz Basin*

Zieng Miao: *Characterizing sulfate sources and enhanced reduction at a mining site*

Jon Mainhagu: *Characterizing organic-liquid sources in the vadose zone*

Krystine Nelson: *Continuous monitoring of dynamic pulse-driven phenological phases in semiarid shrubland*

Selene Hernandez Ruiz: *Determining the affinity of emerging contaminants for dissolved organic matter and hydroxylated minerals via equilibrium dialysis and LCMSMS analysis*

Angelica Vazquez: *Characterization of dissolved organic matter during reactive transport: a column experiment with spectroscopic detection*

Oluyomi Ajibode: *Incidence of pathogenic microorganisms in reclaimed water*

Lourdes Mexicano: *Classification procedure for Quickbird and WorldView2 images and analysis of vegetation dynamics in the Cienega de Santa Clara, 2008 - 2010*

**SWES graduate representatives
Juliana Botelho Araujo,
Valerie Herman, Elguindi Jutta,
and Brittany Choate d
id an outstanding job for a very
successful SWES Day during Earth Week events.**

Daniel Bunting: *Estimating large-scale evapotranspiration in arid and semi-arid lands*

Deserie Soliz: *Long-term viability of irrigation of *a. lentiformis* with RO concentrate in an agricultural setting*

Corin Hammond: *A phytostabilization strategy for arsenic contaminated mine tailings in the arid Southwestern United States*

Matthew Stroud: *Soil evaporation rates using high-resolution thermal imaging*

Lindsey Hovland: *Soil nitrous oxide flux dynamics in an eastern Amazon tropical rainforest*

Oscar Torres-Urquidy: *Overcoming reported copper-resistance in bacterial strains using a combination of copper and silver ions*

Johana Marcela Soto Beltran: *Recovery of enteroviruses from water using an inexpensive electropositive filter*

Joost van Haren: *Using forest growth rate to predict soil N₂O gas fluxes*

Nihat Akyol: *In-situ remediation of chlorinated-solvent contaminated source zones*

Zulia Sanchez Mejia: *Influence of temporal variation in the vertical distribution of soil moisture on the surface radiation budget: Implications for semiarid land-atmosphere interactions*

GRANTS:

Gerba, C.P., K.A. Reynolds, P. Beamer and **A. Tamimi.** Development of a model for office hygiene. Kimberly Clark, \$90,000.

PUBLICATIONS:

Gerba, C.P. 2010. Schools and health-focused cleaning: tips for flu season. *Pediatrics for Parents* 26(9-10): 5.

Kim, E-H., Nies, D., McEvoy, M., and **C. Rensing,** 2011. Switch or Funnel: how RND-type transport systems control periplasmic homeostasis. *Journal of Bacteriology.*

Miles, S.L., K. Takizawa, C.P. Gerba, and **I.L. Pepper,** 2011. Survival of infectious prions in Class B biosolids. *Journal of Environmental Science and Health* 46:364-370.

Pepper, I. L., J.P. Brooks, R.G. Sinclair, P. L. Gurian and **C. P. Gerba,** 2010. Pathogens and indicators in United States class B biosolids: national and historic distributions. *Journal of Environmental Quality* 29:1-6.

Ramirez-Diaz, M., A. Diaz-Magana, V. Meza-Carmen, L. Johnstone, C. Cervantes, and **C. Rensing,** 2011. Nucleotide sequence of *Pseudomonas aeruginosa* conjugative plasmid pUM505 containing virulence and heavy metal resistance genes. *Plasmid*

Rijal, G., J.K. Tolson, C. Petropoulou, T.C. Granato, A. Glymph, **C. Gerba,** M.F. Deflaun, C.O'Conner, L. Kollias and R. Lanyon, 2011. Microbial risk assessment for recreational use in the Chicago area waterway system. *Journal of Water Health.* 9:169-186.

Sinclair, R.G. and C.P. Gerba, 2011. Microbial contamination in kitchens and bathrooms of rural Cambodian village homes. *Letters in Applied Microbiology* 52:144-149.



Channah Rock talks about reclaiming water at the April 5 CALS Faculty/Staff meeting.

Soliz, D., Glenn, E.P., Seaman, R., Yoklic, M., Nelson, S.G., Brown, P. 2011. Water consumption, irrigation efficiency and nutritional value of *Atriplex lentiformis* grown on reverse osmosis brine in a desert irrigation district. *Agriculture, Ecosystems & Environment* 140: 473-483.

Vidals-Conteras, J., C. P. Gerba, M.M. Karpiscak, H.R. Fuenmtes, J. Escareno and C. Chaidez-Quiroz, 2010. Performance of a surface flow constructed wetland system used to treat secondary effluent and filter backwash water. *Intl J of Ag and Biol* 12: 821-827.

Kim, E.H., D.H. Nies, M.M. McEvoy, and **C. Rensing,** 2011. Switch or Funnel: how RND-type transport systems control periplasmic metal homeostasis. *J. of Bacteriology.*

Ramirez-Diaz, M., A. Diaz-Magana, V. Meza-Carmen, L. Johnstone, C. Cervantes, and **C. Rensing,** 2011. Nucleotide sequence of *Pseudomonas aeruginosa* conjugative plasmid pUM505 containing virulence and heavy metal resistance genes. *Plasmid*

Vaz, C.M.P., I.C. de Maria, P.O. Lasso, and **M. Tuller,** 2011. Evaluation of an advanced benchtop micro-computed

tomography system for quantifying porosities and pore-size distributions of two Brazilian oxisols. *Soil Sci. Soc. Am. J.* 75(3)

PRESENTATIONS:

Gerba, C.P. Norovirus, the number one cause of foodborne outbreaks. Southwest Environmental Health Conference. Laughlin, NV. January 26-27.

Gerba, C.P. How to keep salmonella out of your salad. 18th Annual High Desert Gardening and Landscaping Conference. Serria Vista, AZ. February 18.

Gerba, C.P. A low-cost family water treatment device. *Calidad de Agua para todas las Comunidades.* Mexico City, Mexico. March 3.

Gerba, C.P. Hygiene in the 21st Century. Conference of Indiana Practitioners of Infection Control. Indianapolis, IN. April 15.

Maier, R.M. Bacterial numbers and diversity in semi-arid mine tailings as a guide for plant establishment. Annual Meeting of the Society for Mining, Metallurgy & Exploration, Denver, CO, Feb. 27-March 2.

Maier, R.M. Approaches to studying the microbiome: three case studies. ABCD Graduate Colloquium, Arizona Center for the Biology of Complex Diseases, Tucson, AZ, April 22.

Tuller, M., G.S. Nearing, S.B. Jones, and R. Heinse, 2011. Geophysical characterization of inactive mine tailings - A first step for revegetation. European Geosciences Union General Assembly, Vienna, April 3-8.

Tuller, M., C. Vaz, P. Lasso, and R. Kulkarni, 2011. A new generation of high-resolution benchtop Micro-CT scanners for application in Earth Sciences. European Geosciences Union General Assembly, Vienna, Austria, April 3-8.

DEPARTMENT NEWS

After 17 years, **Raina Maier** is stepping down from her role as the editor of *SWES Sounds*. Kristie Gallardo will continue to play a key part in pulling the departmental newsletter together, with Melanie Lenart providing additional editing. Thank you, Raina, for your many years of hard work in producing this valuable contribution to the department!



Jon Chorover, Katerina Donstova, and Raina Maier were all invited to attend a workshop March 16-18 in Warrenton, VA, on "The Rhizosphere: A Frontier Cross-Cutting Research Area with Implications to Ecosystem Function, Climate Change, Sustainability, and Food, Energy, and Water Security." The workshop brought together life and earth scientists to examine the state-of-the-science in rhizosphere research and to develop an agenda for advancing knowledge through inter- and trans-disciplinary research and education efforts. The Soil Science Society of America will publish a report.



Markus Tuller (left) and Per Moldrup in Denmark.

Markus Tuller and Paul "Ty" Ferre of the UA's Hydrology and Water Resources taught their popular international Ph.D. course, Merging Measurement and Modeling in Soil Physics, with colleagues Per Moldrup and Lis Wollesen de Jonge from Aalborg and Aarhus Universities. The course ran from March 28 to April 4 at the Research Center Foulum in Denmark. Thirty-two Ph.D. students from all over the world attended the course, which is focused on the need for a unified treatment of measurement and modeling in quantitative soil physics. For more information, see

http://ag.arizona.edu/swes/soilphysics/stair_2011.html

Melanie Lenart discussed her recent book, *Life in the Hothouse: How A Living Planet Survives Climate Change*, on March 12 in a Tucson Festival of Books panel. The panel also featured Mitch Tobin, author of *Endangered*, and Laura Lopez-Hoffman, lead editor of *Conservation of Shared Environments*. For a C-SPAN video of the event, see <http://www.c-spanvideo.org/program/PanelonCl>.

Alicia Velasquez receives the CALS Outstanding Staff Award on April 5.



Mark Brusseau has been elected a Fellow of the American Geophysical Union.

Rose McAndrew won the Hargis Award, First Place Poster Presentation at the 2011 *El Dia Del Agua*.

Monica Ramirez-Andreotta has been awarded a Water Sustainability Program Graduate Fellowship Award, funded through the University of Arizona Technology and Research Initiative Fund. For more, see http://www.superfund.pharmacy.arizona.edu/news/EPA_Grant_Ramirez_Andreotta.php.

PLANE TALK

Ian Pepper, Director

Environmental Research Laboratory

In the Department of Soil, Water and Environmental Science and here at the Environmental Research Lab, we frequently conduct research and do science. However, rarely do we discuss the "art of science."

We all like to think that our scientific studies are perfect, but are they? Not so much!

We rarely "prove" anything, but rather give estimates of natural phenomena that are later shown to be inaccurate or even wrong. A classic example of this involves studies on the fate of prions during wastewater treatment.

A year ago, it was reported that prions survived mesophilic wastewater treatment. However, the methodology used to determine the fate of the prions involved "Western Blot Technology" which looks at the amino acid sequence of the prion, but does not distinguish between infective and non-infective prions.

Syreeta Miles here at ERL has developed a new assay for prions that detects only infectious prions. Using this assay, Syreeta has shown that prions do not in fact survive wastewater treatment, and that they are in fact inactivated. Thus the earlier reported study is shown to be erroneous.

Is our study perfect? Probably not, but only time will tell!