

B&ESD Newsletter October 2011

Pubs and Products

Borole, A. P., Reguera, G., Ringeisen, B., Wang, Z.-W., Feng, Y., and B. H. Kim. 2011. Electroactive biofilms: Current status and future research needs. *Energy Environ Sci*. Available online. DOI: 10.1039/c1ee02511b

Druckenbrod, D. L., and V. H. Dale. 2012. Experimental response of understory plants to mechanized disturbance in an oak-pine forest. *Ecol. Indic.* 15: 181-187.

On October 11th Dwayne Elias, along with co-inventors Melanie Mormile, Matthew Begemann, and Judy Wall, was awarded a U.S. Patent (8,034,592) for the new process, Fossil Fuel-Free Process of Lignocellulosic Pretreatment with Biological Hydrogen Production. This patent is a result of work done previous to Dwayne's work at ORNL.

Foston, M., Hubbell, C. A., Samuel, R., Jung, S., Fan, H., Ding, S.-Y., Zeng, Y., Jawdy, S., Davis, M., Sykes, R., Gjersing, E., Tuskan, G. A., Kalluri, U., and A. J. Ragauskas. 2011. Chemical, ultrastructural and supramolecular analysis of tension wood in *Populus tremula x alba* as a model substrate for reduced recalcitrance. *Energy Environ. Sci*. Available online. DOI:10.1039/C1EE02073K

Geerlofs, S., Voisin, N., Ham, K., Tagestad, J., Hanrahan, T., Coleman, A., Saulsbury, J., Wolfe, A., Hadjerioua, B., and K. Stewart. The Integrated Basin-Scale Opportunity Assessment Initiative, FY 2011 Year-End Report: Deschutes Basin Preliminary Hydropower Opportunity Assessment. PNNL-20802. Pacific Northwest National Laboratory. October 2011.

Graham, D. E., Wallenstein, M. D., Vishnivetskaya, T. A., Waldrop, M. P., Phelps, T. J., Pfiiffer, S. M., Onstott, T. C., Whyte, L. G., Gilichinsky, D., Elias, D. A., Mackelprang, R., VerBerkmoes, N. C., Hettich, R. L., Wagner, D., Wullschleger, S. D., and J. K. Jansson. 2011. Microbes in thawing perma-frost: The unknown variable in the climate change equation. *ISME J*. Available online. DOI:10.1038/ismej.2011.163

Hadjerioua, B., Wei, Y., Kao, S., and B. Smith. An Assessment of Energy Potential at Non-Powered Dams in the United States – September 2011 Final Report. Oak Ridge National Laboratory, to be released by the Energy Efficiency and Renewable Energy (EERE) office.

Li, Y., Wang, W., Qiu, X., Song, L., Meyer, H. M., Paranthaman, M. P., Eres, G., Zhang, Z., and B. Gu. 2011. Comparing Cr, and N only doping with (Cr,N)-codoping for enhancing visible light reactivity of TiO₂. *Appl. Catalysis B. Environ.* 110: 148-153.

Lochner, A., Giannone, R. J., Keller, M., Antranikian, G., Graham, D. E., and R. L. Hettich. 2011. Label-free quantitative proteomics for the extremely thermophilic bacterium *Caldicellulosiruptor obsidiansis* reveal distinct abundance patterns upon growth on cellobiose, crystalline cellulose, and switchgrass. *J. Proteome Res*. Available online. DOI: 10.1021/pr200536j

Suresh, A. K., Doktycz, M. J., Wang, W., Moon, J.-W., Gu, B., Meyer, H. M., III, Hensley, D.

K., Allison, D. P., Phelps, T. J., and D. A. Pelletier. 2011. Monodispersed biocompatible Ag₂S nanoparticles: Facile extracellular bio-fabrication using the gamma-proteobacterium, *S. oneidensis*. *Acta Biomater.* 7: 4253-4258.

Tetard, L., Passian, A., Farahi, R. H., Davison, B. H., Jung, S., Ragauskas, A. J., Lereu, A. L., and T. Thundat. 2011. Nanometrology of delignified *Populus* using mode synthesizing atomic force microscopy. *Nanotechnology* Available online. DOI:10.1088/0957-4484/22/46/465702

Wang, Z.-W., Lee, S.-H., Elkins, J. G., and J. L. Morrell-Falvey. 2011. Spatial and temporal dynamics of cellulose degradation and biofilm formation by *Caldicellulosiruptor obsidiansis* and *Clostridium thermocellum*. *AMB Express* Available online. DOI:10.1186/2191-0855-1-30

Yang, X. and W. M. Post. 2011. Phosphorous transformations as a function of pedogenesis: A synthesis of soil phosphorous data using Hedley fractionation method. *Biogeosciences* 8: 2907-2916.

Notable Achievements

T. J. Blasing presented “Global Warming: Hot Air and Cold Facts” at the meeting of the Technical Society of Knoxville on October 3rd.

During October 3rd-4th Matt Langholtz and Virginia Dale participated in the Council on Sustainable Biomass Production (CSBP) meeting in Knoxville, TN. The meeting focused on continued development of biomass certification standards and processes for producers and consumers, targeting rollout in July of 2012.

Alex Johs presented an invited talk entitled "SAXS reveals the intramolecular metal ion transfer between flexibly-linked domains of mercuric ion reductase" at the Advanced Light Source User Meeting 2011, October 3rd-5th, at Lawrence Berkeley National Lab. Alex also participated in a workshop on Small-angle X-ray Scattering (SAXS) from Biological Materials.

Bob Cook, Suresh K. SanthanaVannan, Shishi Lui, and Chris Lenhardt attended the 2011 Carbon Cycle and Ecosystems Joint Science Workshop, October 3rd-7th, in Alexandria, VA.

The National Research Council (NRC) report on Potential Economic and Environmental Effects of U.S. Biofuel Policy was released on October 4th. As one of the authors of this report, Virginia Dale talked with several people about her concerns that the report can be misleading if the assumptions of the analysis are not considered. She points out that with any scientific process, it is difficult to reach conclusions when (a) the data are inadequate, (b) some models are applied at scales inappropriate to the situation, or (c) key processes are not included in the theories. All of these limitations, she says, are applicable to current analyses of the effects of biofuels. The answer to the question of what are the economic and environmental effects of biofuels is that “it always depends” on a broad set of preexisting conditions, trends and available options, with no one solution being the best for all situations. Her perspective was reported in several places:

- <http://news.sciencemag.org/scienceinsider/2011/10/panel-doubts-us-biofuels-goals.html>
- <http://blog.25x25.org/?p=2330>
- <http://news.medill.northwestern.edu/chicago/news.aspx?id=189869>

In addition, Virginia communicated with

- Elliott Levine, who handles press for Department of Energy (DOE) EERE. He was

looking for someone who lives in Washington, D.C., to speak at a November 8th-9th high-level meeting at DOE. Virginia suggested that he contact Ari Patrinos who also served on the NRC committee.

- Jetta Wong, who covers issues related to renewable energy and energy efficiency policy for the House Committee on Science and Technology in Washington, DC. At her request, Virginia emailed Jetta some of the recent commentaries on the report and the recent paper by Kline, *et al.* (In press in *Biomass and Bioenergy*).
- Tara Billingsley, Senior Professional Staff Member with the Committee on Energy and Natural Resources U.S. Senate, who asked Virginia to provide some comments on the process used by the National Academy.

The Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) prototyped an Environmental Research Division's Data Access Program (ERDDAP) server, <http://daacds.ornl.gov/erddap/info/index.html>, using Open-source Project for a Network Data Access Protocol (OPeNDAP) standards. ERDDAP is a web service provided by the U.S. Department of Commerce (DOC) at the National Oceanic and Atmospheric Administration (NOAA) that helps humans and computer programs download scientific data in common file formats and make graphs and maps. ERDDAP focuses on making it easier to get scientific data by unifying the different types of servers to provide a consistent way to get data in desired formats. When a request for data is made of ERDDAP, ERDDAP reformats the request into the format required by the remote server, sends the request to the remote server, gets the data, reformats the data, and sends the data to the requestor.

On October 4th, 11th, 20th, 24th and 28th Keith Kline participated in conference calls and meetings to develop next steps for the Global Sustainable Bioenergy (GSB) Project involving representatives from Europe, the U.S. and South American universities and research centers.

During October 4th-7th Debo Oladosu and Keith Kline collaborated with research colleagues in Brazil to review and comment on the revised Global Trade Analysis Project (GTAP) model simulations for indirect land-use change that were presented to the California Air Resource Board (CARB) and released to the public on September 15th.

Vince Neary, Mark Bevelhimer, and Budi Gunawan attended the Saint Anthony Falls National Science Foundation (NSF) Marine and Hydrokinetic (MHK) workshop on October 5th-7th in Minneapolis, MN. Discussions included MHK technology and environmental research challenges. Colleagues from all four major DOE labs working on MHK research and development have been invited. Vince and Budi completed measurements on the St. Anthony Falls Laboratory (SAFL) flume and providing a demonstration during the SAFL lab tour of the acoustic measurements ORNL is collecting around the 1:10 scale Verdant Gen5 turbine. Vince and Budi also presented a poster on the experiments conducted in collaboration with SAFL. Mark gave an overview presentation on ORNL research regarding environmental effects of MHK devices.

A meeting of the Biological and Environmental Research Advisory Committee (BERAC) was held during October 6th-7th, in Rockville, MD. Paul Gilna, a member of the Committee, attended, as well as Tony Palumbo and others from BESD.

Debo Oladosu gave a presentation at the 30th U.S. Association for Energy Economics/International Association for Energy Economic (USAEE/IAEE) North American Conference, held October 9th-12th at the Capital Hilton Hotel, Washington, DC. The presentation examines the global indirect energy use and associated emission implications of biofuels policy in

the United States.

Rocio Uria-Martinez also gave a presentation on October 10th at the 30th USAEE/IAEE North American Conference. Her presentation, "Modeling Energy Security and Economic Sustainability Issues of the U.S. Biofuel Industry," was co-authored by Paul Leiby and 'Debo Oladosu.

Boualem Hadjerioua is the Waterpower lead in the Eastern Interconnection States' Planning Council (EISPC) project, a joint effort between Argonne National Laboratory, the National Renewable Energy Laboratory (NREL), and Oak Ridge National Laboratory. The kick-off meeting was held on October 25th.

On October 11th Esther Parish met with University of Tennessee Civil Engineering Professor John Schwartz, his doctoral student Zachariah Seiden, and Sam Jackson of Genera Energy LLC to discuss plans for installing hydrology/water quality sampling equipment in eight catchments near the Vonore Biorefinery. Using United States Department of Agriculture (USDA) monies recently awarded to the Southeastern Partnership for Integrated Biomass Supply Systems (IBSS), several years' worth of field data will be collected from catchments that have already been planted with different proportions of switchgrass. Prof. Schwartz and his student are currently conducting walkdowns of the most promising site locations identified through the ORNL digital analysis of current switchgrass plantings. Sampling is scheduled to begin in Spring 2012, and data collected by UT staff will be used to verify ORNL's Biomass Location for Optimal Sustainability Model (BLOSM) results for the Lower Little Tennessee Watershed.

Also on October 11th Paul Leiby gave a presentation at the 30th USAEE/IAEE North American Conference. The presentation concerned National Low Carbon Fuel Standard: Tradable Credits System Design and Cost Savings. The co-author is Professor Jonathan Rubin, University of Maine. This presentation considered the role of low-carbon biofuels under a hypothetical national standard for average motor fuel carbon intensity, such as that being implemented in California, with a focus on flexible credit markets.

Scott Brooks, David Kocman and Ami Riscassi attended the Expert Panel Meeting of the South River Science team during October 11th-13th in Harrisonburg, VA, to interact with mercury researchers from DuPont.

Bob Cottingham was invited to attend the DOE Joint Genome Institute (JGI) workshop on Metagenomics Informatics Challenges entitled "Ten Thousand Genomes at a Time: Metagenome Assembly and Beyond" led by Nikos Kyrpides at JGI during October 12th-13th. The workshop reviewed potential solutions to the growing informatics challenges being encountered in metagenomic studies that are now producing massive amounts of data. Videos of the presentations are available at <http://www.youtube.com/playlist?list=PL29441D81BD645568>

Rich Norby was a remote participant in an "Amazon CO2 enrichment workshop," held in Manaus, Brazil, on October 12th. He presented a talk on "Designing an Elevated CO2 in Amazonia: Perspectives of a temperate forest researcher."

On October 13th ORNL DAAC Manager, Chris Lenhardt, participated in two Earth Science Information Partners (ESIP) Federation-related telecons. The first was a telecon of the Foundation for Earth Science Board of Directors and the second was the monthly telecon of the ESIP Federation Executive Committee.

Baohua Gu, Scott Brooks, Carrie Miller, David Kocman, and Ami Riscassi hosted Jason Demers and Patrick Donovan from the University of Michigan and helped them collect field samples for their research project.

A paper from the Plant-Microbe Interfaces (PMI) Science Focus Area (SFA) team, Distinct Microbial Communities within the Endosphere and Rhizosphere of *Populus deltoides* Roots across Contrasting Soil Types (17: 5934-5944), was released by *Applied & Environmental Microbiology* in September. Co-authors include Neil Gottel, Hector Castro, Marilyn Kerley, Zamin Yang, Dale Pelletier, Mircea Podar, Tatiana Karpinets, Ed Uberbacher, Gerald Tuskan, Rytas Vilgalys, Mitch Doktycz, and Chris Schadt. *AEM* has been named as one of the top 100 most influential journals of the last 100 years by the Special Libraries Association (SLA). Read the original paper online at <http://aem.asm.org/cgi/content/abstract/77/17/5934>. The paper was also featured in a “Current Topics” article (p.43, Distinctive Endophytes in Tree Roots, Plus “Intimate Symbiosis”) in the October issue of *Microbe*, a magazine and newsletter of the American Society for Microbiology. Read the *Microbe* article at www.microbemagazine.org/index.php/10-2011-current-topics/3915-distinctive-endophytes-in-tree-roots-plus-intimate-symbiosis. Additionally the original article was featured on the popular website “Decoded Science” in the article “Genomic Era Tools Pry Secrets from Plants and their Intimate Microbial Companions.” Read the “Decoded Science” article at <http://www.decodedscience.com/genomic-era-tools-pry-secrets-from-plants-and-their-intimate-microbial-companions/3456>. The highlight articles feature quotes from Chris Schadt and former Oak Ridge Institute for Science and Education (ORISE) post-graduate researcher Neil Gottel. Neil is now a Ph.D. student at University of Texas-Austin.

Madhavi Martin was invited to participate as a Physics judge in the initial judging event at the Siemens Science, Engineering, and Math Competition held in Princeton, NJ, during October 14th-17th. Madhavi has been invited for the last 11 years to be a lead judge in the area of Physics. This competition includes High school students participating from all 50 states of the United States. The top prize for the competition is \$100,000.

During October 16th-19th Tammy Beaty and Jim Lay exhibited in the OneData Booth at the American Society of Agronomy-Crop Science Society of America-Soil Science Society of America (ASA-CSSA-SSSA) Joint International Meeting, San Antonio, TX.

Brennan Smith attended the HYDRO 2011 Conference in Prague, Czech Republic, on October 17th-19th. This is primarily a European forum for hydropower technology and development, and affords exchange with researchers from leading European energy agencies, technology providers, regulators, and other stakeholders. The U.S. no longer leads in hydropower research, development, and deployment, so tracking European activities provides valuable data in research planning. Brennan also participated in International Energy Agency (IEA) Hydropower Agreement and Annex meetings on October 20th-21st. This allows DOE (through ORNL) to influence IEA research and information dissemination activities.

On October 18th Laurence Eaton and Esther Parish met with Sam Jackson and Mladen Grbovic of the University of Tennessee (UT) to discuss upcoming Geographic Information System (GIS) tasks designed to assist the UT GIS Lead for the Sun Grant Initiative’s Southeast Regional Center under a new subcontract.

Loukas Petridis was part of the local organizing committee of the 2011 Conference in Computational Physics.

During October 18th-19th Keith Kline presented “Perspectives on Land-Use Change Analyses” to open a Session on “Land-Use Change and Greenhouse Gas Emissions – New Data, New Approaches & Estimation Questions” at the Coordinating Research Council (CRC) Lifecycle Analysis Workshop, at Argonne National Laboratory.

Donna Kridelbaugh, post-Masters research associate in the Biosciences Division (BSD), presented a talk entitled “Nitrogen and Sulfur Requirements for Cellulolytic Growth of *Clostridium thermocellum* ATCC 27405 on a Minimal Nutrient Medium” at the Kentucky-Tennessee American Society for Microbiology (ASM) branch meeting on October 22nd in Gallatin, TN. She also participated in the business meeting. It was decided that the 2012 meeting will be held at Maryville College and all ASM members are reminded to please support the branch activities by adding a branch membership during this year’s online renewal process.

Rebecca Efroymsen is leading the development of an issue paper on the identification and use of ecological endpoints for a biofuel feedstock ecological risk assessment. The work is being done for Versar, Incorporated. Along with Environmental Protection Agency (EPA) conceptual models for assessing ecological risk from biofuel feedstock production, this paper will form the basis of an upcoming EPA workshop.

On October 24th Kline Kline participated in the Sao Paulo Research Foundation (FAPESP) conference in Washington, D.C., and side-discussions on collaborations related to land-use change and bioenergy production in Brazil.

Glenn Cada made a presentation on the topic of electromagnetic fields and aquatic organisms to the Scientific Advisory Committee of the Electric Power Research Institute (EPRI) Electric and Magnetic Fields (EMF)/radio-frequency (RF) Health Assessment and Safety Program in Phoenix, AZ, October 25th.

Also on October 25th Virginia Dale gave presentations on “Environmental Stewardship” for bioenergy crop production during the Biomass Production Field Day in Vonore, TN, sponsored by the University of Tennessee, the U.S. Department of Energy, Genera Energy, Ceres Inc., and DuPont Danisco Cellulosic Ethanol (<http://www.biomassfieldday.com>). Over the two days, over 1,000 people heard about biomass production, preprocessing, and conversion. Mark Downing also attended the event and ORNL’s large poster on its bioenergy research program was displayed.

On October 25th Keith Kline gave a briefing and presentation titled, “Updates: ISO PC-248 Sustainability Criteria for Bioenergy and Perspectives on Land-Use Change Analyses” to staff at DOE Office of Biomass Programs DOE-Office of the Biomass Program-Sustainability (Ranyee Chiang, Alicia Lindauer, Kristen Johnson) and EERE-International (Dan Birns, Rob Sandoli, Helena Berger).

During October 25th-26th Laurence Eaton attended a DOE/Office of Science sponsored U.S.-European Commission (EC) Life Cycle Analysis (LCA) workshop at the University of Illinois on October 25th and gave a presentation entitled “Resource Analysis and LCA of Biomass Products: Models, Results, and Steps Toward Integration for Policy Analysis.” The workshop focused on the sustainability of biomass production for bioenergy with discussion on the critical needs for making economic and environmental LCAs more effective and realistic, focusing on biofuels. He will follow up with workshop attendees on steps toward integrating LCA performance characteristics in feedstock production modeling. A call is tentatively scheduled for November 9th at 9:00AM EST and will be hosted by ORNL with participation from NREL.

On October 25th-27th Chris Lenhardt attended the October 2011 National Aeronautics and Space Administration (NASA) Advanced Cosmic Ray Composition Experiment for the Space Station (ACCESS) review panel.

Gerald Tuskan was invited to serve on the Science Advisory Board (SAB) for the Umea University Plant Sciences Department in Umea, Sweden, during October 25th-30th. The SAB reviewed ongoing and planned research projects and submitted a written report to the department chair. Dr. Tuskan will serve a three-year term on the 5-member SAB and will make annual trips to review the departmental efforts.

On October 26th in Denver, CO, Mark Peterson and Eric Pierce gave presentations at the Interstate Technology & Regulatory Council's (ITRC) Scientific Opportunities for Monitoring of Environmental Remediation Sites (SOMERS) Workshop.

Rajesh Dham and Michael Spray visited ORNL on October 26th-27th to discuss the Hydropower Advancement Project with ORNL Water Power Staff.

Scott Brooks hosted Rich Landis, Jim Dyer, Erin Mack, Bill Berti, and Nancy Grosso from DuPont to discuss collaborative research interests related to Mercury (Hg) transformations in the environment. Dwayne Elias, Carrie Miller, Baohua Gu, Feng He, David Kocman, Ami Riscassi, and Terry Mathews also participated in the discussions. Lab tours were also conducted.

On October 26th Matt Langholtz attended the Florida Energy Summit in Orlando, FL, and gave a presentation entitled "Overview of the Billion-Ton Update." The Farm-to-Fuel track of the summit focused on the potential of dedicated feedstocks for biofuels production in the Southeast.

A user proposal from Chris Schadt and Gerald Tuskan has been accepted for FY12. The proposal is one of approximately 10 large community sequencing projects for metagenomics accepted this year and will allow for about 10Gbp of DNA sequencing. Chris and Gerald, with additional help from the PMI SFA team, will examine the role of plant genotype vs. environmental factors in structuring rhizosphere microbial communities in *Populus trichocarpa* using the established association genetics/common garden populations in the Pacific Northwest that is also being resequenced with the help of the Joint Genome Institute (JGI) as part of the BioEnergy Science Center (BESC).

BESD New Arrivals

Nan Zhao arrived in October to work as a postdoctoral research associate with Tim Tschaplinski.

Ryan McManamay also arrived in October to work as a postdoctoral research associate with Mark Bevelhimer. Ryan will be studying environmental issues and mitigation associated with hydropower.