

## BESD Newsletter February 2011

### Pubs and Products

Borole, A. P., Hamilton, C.Y., and T. A. Vishnivetskaya. 2011. Enhancement in energy conversion efficiency and current density of 3-dimensional MFC anodes using pre-enriched consortium and continuous supply of electron donors. *Bioresource Technol.* Available online. DOI:10.1016/j.biortech.2011.01.045

Brown, S. D., Gilmour, C. C., Kucken, A. M., Wall, J. D., Elias, D. A., Podar, M., Chertkov, O., Held, B., Bruce, D. C., Detter, J. C., Tapia, R., Han, C. S., Goodwin, L. A., Cheng, J.-F., Pitluck, S., Woyke, T., Mikhailova, N., Ivanova, N. N., Han, J., Lucas, S., Lapidus, A. L., Land, M. L., Hauser, L. J., and A. V. Palumbo. 2011. Genome sequence of mercury-methylating *Desulfovibrio desulfuricans* ND132. *J. Bacteriol.* Available online. DOI:10.1128/JB.00170-11

The Department of Energy's (DOE) Biological and Environmental Research (BER) Advisory Committee's Long Term Visions Workshop Report has been made official and public – see [http://science.energy.gov/~media/ber/pdf/BER\\_LTVreport.pdf](http://science.energy.gov/~media/ber/pdf/BER_LTVreport.pdf). Virginia Dale and Gregg Marland contributed to Chapter 4 on Grand Challenges in Energy Sustainability.

Fu, G., Mielenz, J. R., Xiao, X., Ge, Y., Hamilton, C. Y., Rodriguez, M., Jr., Chen, F., Foston, M., Ragauskas, A., Bouton, J., Dixon, R. A., and Z.-Y. Wang. 2011. Genetic manipulation of lignin reduces recalcitrance and improves ethanol production from switchgrass. *P. Natl. Acad. Sci. USA.* Available Online. DOI: 10.1073/pnas.1100310108

Garten, C. T., Jr., Brice, D. J., Castro, H. F., Graham, R. L., Mayes, M. A., Phillips, J. R., Post, W. M., III, Schadt, C. W., Wullschleger, S. D., Tyler, D. D., Jardine, P. M., Jastrow, J. D., Matamala, R., Miller, R. M., Moran, K. K., Vugteveen, T. W., Izaurrealde, R. C., Thomson, A. M., West, T. O., Amonette, J. E., Bailey, V. L., Metting, F. B., and J. L. Smith. 2011. Response of “Alamo” switchgrass tissue chemistry and biomass to nitrogen fertilization in West Tennessee, USA. *Agr. Ecosyst. Environ.* 140: 289-297.

Ghafghazi, S., Sowlati, T., Sokhansanj, S., Bi, X., and S. Melin. 2011. Life cycle assessment of base-load heat sources for district heating system options. *Int. J. Life Cycle Assess.* 16: 212-223.

Jones, R. N. and B. L. Preston. 2011. Adaptation and risk management. *WIREs Climate Change* Available online. DOI: 10.1002/wcc.97

Kowalsky, M. B., Gasperikova, E., Finsterle, S., Watson, D., Baker, G., and S. S. Hubbard. 2010. Coupled modeling of hydrogeochemical and electrical resistivity data for exploring the impact of recharge on subsurface contamination. *Water Resour. Res.* Available online. DOI:10.1029/2009WR008947

Preston, B. L., Yuen, E.J., and R. M. Westaway. 2011. Putting vulnerability to climate change on the map: a review of approaches, benefits, and risks. *Sustain. Sci.* Available online. DOI: 10.1007/s11625-011-0129-1

Warren, J. M., Brooks, J. R., Dragila, M. I., and F. C. Meinzer. 2011. In situ separation of root hydraulic redistribution of soil water from liquid and vapor transport. *Oecologia* Available online. DOI: 10.1007/s00442-011-1953-9

Warren, J. M., Norby, R. J., and S. D. Wullschlegel. 2011. Elevated CO<sub>2</sub> enhances leaf senescence during extreme drought in a temperate forest. *Tree Physiol.* 31: 117-130.

Yazdanpanah, F., Sokhansanj, S., Lau, A., Lim, C. J., Bi, X., and S. Melin. 2011. Airflow versus pressure drop for bulk wood pellets. *Biomass and Bioenergy*. Available online. DOI:10.1016/j.biombioe.2011.01.042

Zhang, Y.-H. P., and J. R. Mielenz. 2011. Renewable hydrogen carrier – Carbohydrate: constructing the carbon-neutral carbohydrate economy. *Energies* 4: 254-275.

### **Notable Achievements**

Aloke Kumar, along with his coauthors, recently received the Best Paper Award from the American Society of Mechanical Engineers (ASME). The paper's complete citation is: Wereley, S. T., Kumar, A., Kwon, J.-S., Ravindranath, S., and J. Irudayaraj. 2010. Application of optically induced electrokinetic manipulation technique on live bacteria. International Mechanical Engineering Congress and Exposition (IMECE) 2010: Proceedings of the ASME IMECE, Vancouver, British Columbia.

Paul Gilna presented "Overview of Oak Ridge National Laboratory and BioEnergy Science Center (BESC)," at Mitsubishi Heavy Industries, Kobe, Japan, on January 25<sup>th</sup>.

Amy Wolfe traveled to Vancouver, B.C., for a January 28<sup>th</sup> Scientific Advisory Committee Meeting for a Genome BC-funded project at the University of British Columbia. Wolfe is the Social Science and Humanities advisory committee member for a project entitled, "The development of genomic tools for monitoring and improving passive mitigation of mine drainage."

Liyuan Liang and David Watson participated in DOE Environmental Management (EM)-30 Quarterly Program Review meeting in Augusta, GA, on February 1<sup>st</sup>. David Watson presented the research findings conducted by the team at Oak Ridge National Laboratory (ORNL) in the last quarter, and the talk was received well.

Erin Webb, Shahab Sokhansanj, and Anthony Turhollow participated in a meeting on February 1<sup>st</sup> with representatives from Nexterra (manufacturer of gasification units being used in ORNL biomass steam plant) about Nexterra technologies and potential areas of joint research. Participants from other ORNL divisions: Stuart Daw, Charles Finney, Jim Keiser, Bruce Pint, and Jim Conklin.

Yetta Jager gave an invited presentation to the Great Lakes Fishery Trust Workshop entitled, "Enhancing Lake Sturgeon Passage at Hydroelectric Facilities," Detroit, MI, February 1<sup>st</sup>-2<sup>nd</sup>.

Rebecca Efroymsen has been selected as a peer reviewer for the United States Environmental Protection Agency (USEPA) report "Biofuels and the Environment: First Triennial Report to Congress." The peer review meeting will be held in Washington, DC, in March 2011.

On February 2<sup>nd</sup> Virginia Dale gave a talk at the University of Tennessee on “Sustainability indicators for bioenergy” for the Sustainable Technology Through Advanced Interdisciplinary Research (STAIR) weekly seminar.

On February 3<sup>rd</sup> Allen McBride and Rebecca Efroymsen provided comments to DOE’s Office of the Biomass Program to forward to Raffi Balian at the State Department regarding the United States Department of Agriculture’s (USDA) reworking of the water indicators for the Global Bioenergy Partnership (GBEP).

On February 6<sup>th</sup>-9<sup>th</sup>: Keith Kline presented “Bioenergy, Land-Use Change and Food Security” at the Advance 2011 Biodiesel Conference and Expo (see <http://www.biodieselconference.com/2011/>) in Phoenix, AZ. He participated on a panel on “Views of Food and Fuel” that included Harry Baumes (United States Department of Agriculture [USDA]), Steve Kaffka (California Biomass Collaborative) and producers. The session highlighted why food-fuel competition issues will likely remain important for any bioenergy crop in coming years.

Erin Webb traveled to Idaho National Laboratory (INL) February 7<sup>th</sup>-11<sup>th</sup> to discuss joint efforts in feedstock logistics modeling and China biofuels collaboration with INL Bioenergy Program staff.

On February 8<sup>th</sup> Shahab Sokhansanj participated in the review of the design drawings and the operation of the University of British Columbia (UBC) Bioenergy Research and development of Combined Heat and Power (CHP). The Nexterra biomass gasification system with capability to co-generate steam and electricity will be completed and operational early 2012.

On February 11<sup>th</sup> Keith Kline and Gangheng Wang provided comments on the draft of The Environment Paper Network’s “Forest Carbon Accounting in Products – A Proposed Methodology” that presents their Working Group’s proposed methodology for accounting for the carbon footprint of forest products

Yetta Jager gave an invited presentation to the National Oceanic and Atmospheric Administration (NOAA) Fisheries workshop held in Alexandria, VA, February 8<sup>th</sup>-10<sup>th</sup>, to discuss modeling needs, passage issues, and monitoring of Atlantic and shortnose sturgeon along the eastern U.S. coast, as well as designation of genetically distinct populations for proposed listing of Atlantic sturgeon under the Endangered Species Act (ESA).

On February 11<sup>th</sup>, 18<sup>th</sup> and 28<sup>th</sup>, Gangsheng Wang and Keith Kline participated in the ISO PC-248 “Sustainability Criteria for Bioenergy” greenhouse gas emission methods work group calls, contributing to the development of proposed criteria and guidelines.

Work by Jonathan Mielenz’s group was featured in an ORNL press release on February 14<sup>th</sup> ([http://www.ornl.gov/info/press\\_releases/get\\_press\\_release.cfm?ReleaseNumber=mr20110214-00](http://www.ornl.gov/info/press_releases/get_press_release.cfm?ReleaseNumber=mr20110214-00)). This note coincided with the online release of the *PNAS* article, “Genetic manipulation of lignin reduces recalcitrance and improves ethanol production from switchgrass.” (<http://www.pnas.org/content/108/9/3803.full.pdf+html>). ORNL coauthors on the article include Mielenz as well as Choo Hamilton and Miguel Rodriguez Jr.

On February 15<sup>th</sup> and 16<sup>th</sup> Chris Abernathy attended the 2011 Sun Grant/DOE Regional Biomass Feedstock Partnership Annual Meeting in Knoxville, TN. On the 15<sup>th</sup> Chris gave a presentation

called "Sun Grant Initiative (SGI) Resource Development Data Quality and Status." Also attending were Robin Graham, Mark Downing, Laurence Eaton and Matt Langholtz.

On February 16<sup>th</sup> Shahab Sokhansanj participated in the Office of the Biomass Program (OBP) thermochemical biannual review. The review was held in Denver, CO. Shahab presented a poster titled "Optimization of Pelletizing Torrefied Feedstock."

Abhijeet Borole, Bob Cottingham, and Liyuan Liang participated in a review of Oak Ridge Associate Universities (ORAU)/ORNL High-Performance Computing Grant Program on February 16<sup>th</sup>-17<sup>th</sup>. This program provides funding for University PIs to do research using ORNL high-performance computing resources, where they can collaborate with ORNL PIs to advance the science.

On February 17<sup>th</sup> Robin Graham toured the Vonore Cellulosic Ethanol Facility with Laura McCann, ORNL's DOE sponsor for feedstocks, along with others who were in Knoxville for the Regional Partners Annual Meeting.

Benjamin Preston participated in Climate Science Day on the Hill on February 16<sup>th</sup>-17<sup>th</sup>. The event was organized by 10 scientific societies as a non-partisan opportunity for scientists of many disciplines to build relationships and provide Members of Congress access to the best possible climate science. Preston partnered with Manuel Lerda of the University of Virginia and met with staff from five offices: Rep. Eric Cantor (VA), Rep. Rob Wittman (TN), Rep. Stephen Fincher (TN), Rep. Robert Hurt (VA), and Sen. Bob Corker (TN).

Amy Wolfe gave a presentation entitled, "Societal acceptability of energy and environmental technologies: Choices, behaviors, and implications for society and science" at the Oak Ridge Forum for Science and Religion on February 17<sup>th</sup>.

On February 18<sup>th</sup> Shahab Sokhansanj was a member of the Stage Gate of a DOE-funded logistics project in Greenville, AL. The DOE Golden Field Office organized and led the review. The project under review was the Auburn high tonnage biomass supply system. Members of the project consortium attended were Auburn University, USDA Forest Services, Tigercat, Corley Land Services of Chapman Alabama, Precision Grinder Inc. and Peerless Trucking.

ORNL Distributed Active Archive Center (DAAC) staff member, Ranjeet Devarakonda participated in Lullabot's Drupal 7 workshop in Washington, DC, February 19<sup>th</sup>-20<sup>th</sup>.

Erin Webb traveled to Lexington, KY, to visit the University of Kentucky Department of Biosystems and Agricultural Engineering and Department of Mechanical Engineering to discuss collaborative experiments for modeling field drying of energy crops and simulations of biomass supply chains.

Annetta Watson is the lead author on two papers published in February 2011 and is also the Guest Editor of the journal issue in which the papers are published. The journal Editor-in-Chief, Dr. Barry Johnson, Assistant Surgeon General (retired), has characterized these papers as "significant" and "remarkable because of their comprehensiveness and purpose."

- Journal of Human and Ecological Risk Assessment. Special Reports: Developing Health-Based Pre-planning Clearance Goals for Airport Remediation Following Chemical Terrorist Attack. Annetta Watson, Guest Editor. January-February 2011.
  - Watson, A., Hall, L., Raber, E., Hauschild, V., Dolislager, F., Love, A., and M.

L. Hanna. 2010a. Developing Health-Based Pre-planning Clearance Goals for Airport Remediation Following Chemical Terrorist Attack: Introduction and Key Assessment Considerations. *Human and Ecological Risk Assessment* 17: 2-56.

- Watson, A., Dolislager, F., Hall, L., Raber, E., Hauschild, V., and A. Love. 2010b. Developing Health-Based Pre-planning Clearance Goals for Airport Remediation Following Chemical Terrorist Attack: Decision Criteria for Multipathway Exposure Routes. *Human and Ecological Risk Assessment* 17: 57-121.

The link below provides access to this special report issue and no-cost download of the two papers as well as commentaries prepared by journal technical reviewers.

<http://www.informaworld.com/smpp/title~db=all~content=g933437334>

On February 23<sup>rd</sup> Keith Kline submitted comments to the California Air Resources Board (CARB) regarding methods used to estimate carbon intensity for new and revised proposed biofuel pathways under the Low Carbon Fuel Standard, stressing that allocation of emissions and benefits in alternative fuel pathways should be applied in a consistent manner, and ideally one that complies with ISO standards for life-cycle assessment.

Shahab Sokhansanj participated in a consortium to prepare and forward a proposal titled “Response to Ontario Power Generation’s request for expressions of interest for torrefaction research.” The British Columbia Bioenergy Network (BCBN) led the proposal. Other members were FPIInnovations, Global Biocoal Inc., NORAM Engineering and Constructors, Ltd., Briquetting Systems Inc., and Cogent Inc.

A team within ESD has received accolades for their new DVD training video, which has received multiple requests for use by other Federal Agencies. The emergency preparedness DVD, "Remediation Guidance for Major Airports After a Chemical Attack: Pre-Planning, Issues and Tools," was produced for the Department of Homeland Security by a multi-Laboratory team that included ORNL staff members John Sorensen, Barbara Sorensen, Annetta Watson, Bob Bock, Cyril Thompson, and Fred Dolislager. Bob Norville, the Training Manager for the Federal Emergency Management Agency (FEMA), has requested that 500 copies of the DVD be made and distributed to State and local agencies. This is a strong acknowledgement of the DVD's quality and high value for training purposes.

James Elkins served as a review panel member for the National Aeronautics and Space Administration (NASA): Exobiology and Evolutionary Biology program. The session was held in Bethesda, MD, February 22<sup>nd</sup>-25<sup>th</sup>.

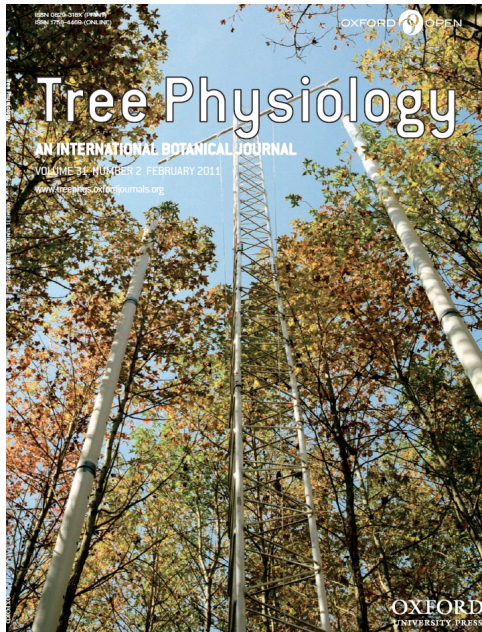
On February 28<sup>th</sup> comments developed by Keith Kline, Matt Langholtz, Allen McBride, Debo Oladosu, and Virginia Dale were transmitted to the Environmental Protection Agency regarding their draft report to Congress on biofuels and the environment.

The proposal, “Comparative genomic sequencing of new species and isolates of *Geobacter*, *Desulforegula* and *Desulfovibrio* originating from a low diversity consortia during in situ reduction of U(VI)” has been accepted to the Joint Genome Institute’s (JGI) Community Sequencing Program. The lead-PI on the proposal is Chris Schadt with Dwayne Elias, Steve Brown, Joel Kostka, and Tom Gihring as collaborators.

Yetta Jager provided geographic information system (GIS) maps of empirical upland and lowland switchgrass yields to researchers (SongLin Fei and John Lhotka) at the University of Kentucky

Department of Forestry for a research project to evaluate the economic feasibility of bioenergy plantations (switchgrass vs. short rotation tree crops) in the Ohio River Valley region. These researchers are planning to use the model to compare switchgrass yields with those of tree groups.

Abhijeet Borole was invited to present a technology showcase on the Electrofuels proposal submitted in 2010 at the Advanced Research Projects Agency-Energy (ARPA-E) summit, February 28<sup>th</sup>-March 2<sup>nd</sup>. Potential sponsors that showed interest included the Energy Efficiency and Renewable Energy (EERE) Office of the Biomass Program, Fuel Cell Technologies Program, DuPont, Virent and other companies.



The newly published article, “Elevated CO<sub>2</sub> enhances leaf senescence during extreme drought in a temperate forest” by co-authors Jeff Warren, Rich Norby and Stan Wullschleger received the cover of the latest issue of *Tree Physiology*. Read the article online at <http://treephys.oxfordjournals.org/content/early/2011/03/22/treephys.tpr002.full>.

The cover depicts *Liquidambar styraciflua* (sweetgum) trees and apparatus of the ORNL Free-Air CO<sub>2</sub> Enrichment (FACE) experiment.

### **BESD New Arrivals**

Budi Gunawan arrived in February to work as a postdoctoral research associate with Vince Neary. Budi will assist with the design and supervision of hydroacoustic measurement studies in the field, develop hydroacoustic instrument deployment strategies for large rivers and tidal channels, develop hydroacoustic instrument deployment strategies for measuring near and far field flow, and wake effects, of MHK devices, apply and improve DOE algorithms to process hydroacoustic measurement, calculate turbulence statistics, power spectra and space-time correlations from measurements, and communicate to scientists, engineers, policy-makers, and the public the importance of hydrodynamic and turbulence measurements for accelerating the development of emergent hydropower technologies and assessing potential environmental impacts of these technologies.

Vijay Loganathan arrived in February to work as a postdoctoral research associate with Melanie Mayes. Vijay will be responsible for experiments and modeling involving the transport of uranium through unsaturated sands and soils from the DOE's 300 Area on the Hanford Reservation in eastern WA.

Gangsheng Wang arrived in February to work as a postdoctoral research associate with Mac Post

and Keith Kline. Coming to ORNL from Washington State University (Pullman), he recently completed a Ph.D. in Biological/Agricultural Engineering. He also holds a Ph.D. in Physical Geography from the Chinese Academy of Sciences (CAS), Beijing, China (2005), and an M.S. in Hydrology and Water Resources (Wuhan University, China, 2002). Gangsheng will conduct research on greenhouse gas (GHG) emissions associated with agricultural land use and land-use change. Planned tasks include the application of a cropland ecosystem model for bioenergy feedstock sustainability analyses, GHG calculation methods, data and uncertainty analysis. He will be located in CCSI, building 2040, room E-272.