# Concurrent Session Descriptions - Annual Retreat 2014

## TUESDAY, MAY 20, 2014
## (4:00 – 5:30 pm)

### MICROBIAL RESPONSES TO LIGNOCELLULOSIC STRESS AND POTENTIAL ROUTES FOR INHIBITOR DETOXIFICATION OR CONVERSION (RECITAL HALL LOWER LEVEL)

*Detailed Description:* Most microbes are sensitive to lignocellulosic stress experienced during hydrolysate fermentation. Among these, lignocellulose-derived inhibitors including aromatic aldehydes, amides, and carboxylates impact bacterial growth and utilization of both $C_6$ and $C_5$ sugars. This session will provide an overview on strategies to develop microbial strains with increased tolerance to lignocellulosic stress and increased conversion capabilities, as well as biological systems that are able to metabolize lignols derived from lignocellulosic biomass. An emphasis on possible mechanisms for the latter process, and strategies for their potential use as detoxifiers before or during the fermentation process will be provided.

*Organizer:* Eduardo Morales
*Speakers or Key Participants:*
- Zach Oshlag: *HYDROLYSATE DETOXIFICATION/LIGNOTOXIN CONVERSION*
- Kate Helmich: *BREAKING DOWN ETHER LINKAGES IN LIGNIN*
- Bill Alexander - *ACETAMIDE UTILIZING YEAST STRAINS, PHENYLALANINE/TYROSINE AMMONIA LYASE- EXPRESSING YEAST STRAINS FOR LT CONVERSION*

*Facilitator:* Peris Navarro

### IMPROVING BIOMASS TRAITS - GENES IN (MODEL AND) CROP SPECIES (DISCOVERY BALLROOM SOUTH)

*Summary:* This session will focus on discussing how to prioritize genes related to biomass improvement for transformation into bioenergy crops for further Center-wide studies.

*Detailed Description:* The session will start with an overview of promising candidate genes identified in model plants and crop species by Area 1 research projects for various traits like flowering time, oil production, lignin modification etc. This session will focus on having an inter-area discussion about the prioritization of genes to be transformed into bioenergy crops for further Center-wide study. The goals of this session include more transparency and better communication across the Center regarding biomass improvement traits and the generation of a set of guidelines on which genes or biomass traits should be pursued. A white paper detailing the discussions of the session will be written in collaboration with key stakeholders and presented to the Management Team following the Retreat.

*Organizers:* David Cavalier, Marlies Heckwolf, and Maggie Phillips
*Key Participants:*
- *Project Leads or members of their labs who will speak to their work: Curtis Wilkerson, John Ralph, Federica Brandizzi, Shawn Mansfield, John Sedbrook, Shawn Kaeppler, Natalia de Leon, Rick Amasino, Mike Casler, John Ohlrogge, Christoph Benning, Brian Fox, Bruce Dale, Eric Hegg, Bob Landick, Randy Jackson, Heidi Kaeppler, Linda Danhof, Cliff Foster and Nick Santoro*

*Facilitator: David Cavalier*

### GENOME-ENABLED DISCOVERY OF ENZYMES FOR BIOMASS DECONSTRUCTION (DISCOVERY BALLROOM NORTH)

*Summary:* Utilizing genome-enabled science (bioinformatics, transcriptomics, biochemistry and structural biology) to identified a superior enzymes cocktail for enzymatic deconstruction of biomass.

*Detailed Description*: Efficient deconstruction of biomass requires multi-component enzyme cocktails that need large quantity of enzymes. Utilizing genome resources through Joint Genome Institute in order to improve this cocktails by selecting enzymes which possess broad substrate specificity from bacteria or fungal, have the potential to simplify current biomass-degrading enzyme cocktails.

*Organizer: Lai Bergeman*
*Speakers*:
- Taichi Takasuka
- Johnnie Walker
- Mike Mbughuni
- Jonathan Walton - *EXPLORING EVOLUTIONARY SPACE IN FUNGAL CELLULASES*

*Facilitator: Lai Bergeman*

# Concurrent Session Descriptions - Annual Retreat 2014

## WEDNESDAY, MAY 21, 2014 (AM)
## (10:45 am – 12:15 pm)

### ENERGY, CLIMATE AND BIOFUELS: WHY THE PUBLIC HAS TROUBLE UNDERSTANDING THE ISSUES (RECITAL HALL LOWER LEVEL)

*Summary:* You might be surprised to learn how little your students and the public understand about your biofuel research and the issues driving it. Learn about how current education research on learning progressions can provide insights and practical approaches to improve how you teach and communicate about biofuels, energy and climate science.

*Detailed Description:* Most students and the general public have inaccurate and incomplete understandings about the carbon transforming processes associated with energy systems, biofuel production and climate change. We discuss how learning progressions research provides a framework for understanding how students develop increasing sophisticated descriptions of the energy and matter transformations associated with bioenergy production. With hands-on activities and discussions, we share practical approaches to improve your teaching and communication in this area.

*Organizer*: Leith Nye
*Speakers or Key Participant**s***:
- Joyce Parker, MSU
- Charles (Andy) Anderson, MSU
- Elizabeth de los Santos, MSU

*Facilitator*: Joyce Parker

**Desired outcomes for participants:**
- Awareness of how students and the public think about human energy systems and climate change
- Awareness of more effective teaching and communication strategies

### ECOLOGICAL AND EVOLUTIONARY APPROACHES IN BIOENERGY (DISCOVERY BALLROOM SOUTH)

*Summary:* Exploring how natural diversity may improve biofuel production.

*Detailed Description:* Presentations from Plants, Deconstruction, and Conversion labs that utilize natural and experimental evolution to identify traits that may help improve biofuel production. Speakers will discuss their approach for using ecology and evolution in their research and how their work applies to the biofuels pipeline.

*Organizer: Lai Bergeman*
*Speakers or Key Participant**s***:
- Marlies Heckwolf (from Natalia de Leon's lab)
- Adam Book (from Cameron Currie's lab)
- Peris Navarro (from Chris Hittinger's lab)
- Trey Sato

*Facilitator: Lai Bergeman*

### BREEDING SWITCHGRASS FOR SUSTAINABILITY AND PRODUCTIVITY (DISCOVERY BALLROOM NORTH)

*Summary:* Presentations and discussion on desirable switchgrass traits and possibilities for breeding switchgrass for these traits.

*Detailed Description:* Switchgrass is a productive, genetically diverse species with high N-use and water-use efficiency. As a result, it has excellent potential as a biofuels crop, particularly if bred for desirable sustainability and productivity traits. This session is an opportunity for Area 1 and Area 4 to present results and brainstorm pathways for future research. Goal outcomes include: identifying desirable traits for switchgrass and listing achievable goals for future breeding efforts.

*Organizer:* Sarynna Lopez Meza
*Speakers or Key Participants:*
- Mike Casler - *NATURE AND PLANT BREEDERS DEFINE LANDSCAPE ADAPTATIONS OF SWITCHGRASS*
- Dennis Pennington - *PRODUCTIVITY RESULTS FROM SWITCHGRASS VARIETY TRIALS*
- Randy Jackson - *NITROGEN RETRANSLOCATION ACROSS SWITCHGRASS VARIETIES*
- Shiyu Chen - *BREEDING SWITCHGRASS FOR REDUCED RECALCITRANCE USING DNA MARKERS*
- Guillaume Ramstein - *GENOMEWIDE ASSOCIATION ANALYSIS FOR BIOFUEL TRAITS IN ENERGY GRASSES*
- Joseph Evans - *EXOME CAPTURE AS A SUCCESSFUL GENOTYPING TOOL FOR SWITCHGRASS*

*Facilitator: Sarynna Lopez Meza and Sarah Roley*

# Concurrent Session Descriptions - Annual Retreat 2014

## WEDNESDAY, MAY 21, 2014 (PM)
## (3:30 – 5:00 pm)

### CAREER OPPORTUNITIES IN THE BIOENERGY FIELD (RECITAL HALL LOWER LEVEL)

*Summary*: Career opportunities in the field of bioenergy are diverse and the landscape is rapidly changing. Participants in this session will interact with each other, and engage with a panel representing a range of professional roles in the field of bioenergy. Both industry and academic opportunities will be considered. Come with questions and be prepared for discussion.

*Organizer*: Leith Nye
*Speakers or Key Participants*:
- Christopher Hill, Iogen Corporation
- Steve Slater, GLBRC
- Mary Blanchard, Wisconsin Energy Institute

*Facilitator*: John Greenler

**Desired outcomes**:
- Learn about different potential career paths from representative from the academic and private sector
- Discuss practical approaches for success in different career paths
- Share and discuss questions and concerns associated with bioenergy careers with colleagues

### GAMMA VALEROLACTONE-DERIVED HYDROLYSATE (GVLH): CHEMICAL AND BIOLOGICAL PROPERTIES (DISCOVERY BALLROOM SOUTH)

*Detailed Description:* Gamma-valerolactone is a solvent that has been used to produce lignocellulosic hydrolysate with high sugar content and a clean lignin stream that bypasses the need for hydrolytic enzymes, thus potentially reducing production costs. GLBRC has begun to analyze the chemical composition of GVLH and examine the capabilities for microbial conversion and chemical upgrade. This session will focus on what we have learned thus far about the properties of GVLH and how the center can leverage unique advantages of this process.
*Organizer:* Donna Bates
*Speakers or Key Participants:*
- Jeremy Luterbacher – HYDROLYSATE PRODUCTION AND SCALE UP ACTIVITIES
- Jeff Piotrowski – CHEMICAL GENOMIC PROFILING OF GVLH
- John Ralph - PROPERTIES OF GVLH LIGNIN

*Facilitator*: Donna Bates

### CROSS-AREA ACTIVITIES OPPORTUNITIES (DISCOVERY BALLROOM NORTH)

*Summary*: Benchmarks have been established for plants, deconstruction, and conversion - how can Sustainability inform choice of feedstocks and downstream processes?

*Detailed Description:* Present an overview of various topics followed by discussion. The main goal of this session is to get ideas for new collaborations.
- Cover Crops Project (A1-4 Collaboration)
- Assessing N resorption in perennial grasses (A1-4 Collaboration)
- Feedstock Project (A2-3-4 Collaboration)
- Pretreatment and Conversion Considerations (A2-3 Collaboration)

*Organizer:* Sarynna Lopez Meza
*Speakers or Key Participants:*
- Gregg Sanford, Shawn Kaeppler, Natalia de Leon
- Rick Amasino
- Ken Keegstra, Bob Landick, Becky Ong, Gregg Sanford
- Becky Ong, Bruce Dale, Bob Landick, Trey Sato, Yaoping Zhang

*Facilitator:* Randy Jackson

# Concurrent Session Descriptions - Annual Retreat 2014

## THURSDAY, MAY 22, 2014
## (8:30 – 10:00 am)

### NEXTGEN FUELS AND VALUE-ADDED PRODUCTS (RECITAL HALL LOWER LEVEL)

*Detailed Description:* This session will present ongoing and future work in GLBRC towards the production of next generation biofuels. The focus of the presentations will include the production of fatty acids, acetylated-triacylglycerols in plants and yeast, and isobutanol production in bacteria. Advantages of each organism and challenges for the production of each biofuel will be discussed.

*Organizer:* Eduardo Morales
*Speakers or Key Participants:*
- John Ohlrogge and Trey Sato – PRODUCTION OF acTAGs IN PLANT VEGETATIVE TISSUES AND YEAST
- Fachuang Lu and Jeff Piotrowski – CHEMICAL AND BIOLOGICAL PROPERTIES OF DEFERULATES FROM HYDROLYSATE
- Stahl group – CHEMICAL COMMODITIES FROM LIGNIN

*Facilitator:* John Ohlrogge

### KBASE: DRIVING METABOLIC ENGINEERING, 'OMICS DATA ANALYSIS, AND ECOLOGY FOR PLANTS, MICROBES, AND MICROBIAL COMMUNITIES IN THE DOE SYSTEMS BIOLOGY KNOWLEDGEBASE (DISCOVERY BALLROOM SOUTH)

*Summary:* DOE Systems Biology Knowledgebase (Kbase) tools and services: update and tutorial on selected tools (hands-on and interactive – please bring your laptop!)

*Detailed Description:* This session will introduce GLBRC researchers to useful KBase tools, including the new graphical Narrative interface for constructing, sharing, and publishing systems biology workflows. We will demonstrate existing workflows in metabolic engineering, microbial physiology, plant SNP analysis, and microbial ecology. KBase staff will assist participants in applying these workflows to their own data and research problems. The demo will address microbial and plant genomes, as well as metagenomic data. The demo will also address workflows available for transcriptomic and proteomic data analysis.

*Organizer:* Chris Henry / David Benton
*Speakers or Key Participants:*
- Chris Henry (ANL) (KBASE MICROBES AREA)
- Tom Brettin (ANL) (KBASE INFRASTRUCTURE AND DESIGN)
- Sunita Kumari (CSHL) (KBASE PLANTS AREA)

*Facilitator:* Chris Henry

### COMPARING GLBRC PROCESSES (DISCOVERY BALLROOM NORTH)

*Description:* Discuss metrics and procedures for common comparison of GLBRC and biomass processing schemes. Potentially, prepare a proposal for the Management Team for a project to support the comparison.

*Organizer:* Sarynna Lopez Meza
*Speakers/Facilitators:*
- Bruce Dale
- Chris Saffron