

**2016 Genomic Sciences Program Annual PI Meeting  
March 6-9, 2016**

**Sunday, March 6<sup>th</sup>**

5:00 pm - 8:00 pm      **Early registration and poster set-up**

**Monday, March 7<sup>th</sup>**

7:00 am - 8:30 am:      **Registration**  
Location: Fairfax Foyer

7:30 am - 8:30 am:      **Breakfast on your own**

8:30-9:00      **Welcome and Introduction to the Meeting**  
Location: Fairfax Ballroom

8:30-8:40      **Sharlene Weatherwax**, Associate Director, DOE Office of Biological and  
Environmental Research  
Opening Remarks

8:40-8:50      **Todd Anderson**, Director, Biological Systems Science Division, DOE  
BER  
Meeting Introduction

8:50-9:00      **Dawn Adin**, Program Manager, DOE BER

9:00 - 10:30      **Plenary Session: Bioenergy Research Centers: Where We Were – Where We Are**  
Location: Fairfax Ballroom  
Moderator: Kent Peters

**Speakers:**

9:00-9:30      Jay Keasling (Lawrence Berkeley National Laboratory)  
*JBEI: Building the Future of Low Carbon Transportation through  
Integrated Basic Science*

9:30-10:00      Tim Donohue (University of Wisconsin, GLBRC)  
*On the Road to Producing Sustainable Fuels and Chemicals from Plant  
Biomass*

10:00-10:30      Paul Gilna (Oak Ridge National Laboratory) and  
Lee Lynd (Dartmouth College)  
*BioEnergy Science Center (BESC) Update: Progress on Biological  
Conversion of Lignocellulose*

10:30-11:00      **Break**

11:00-12:00 **Keynote Presentation: Victoria Orphan (California Institute of Technology)**  
*A charged relationship: how syntrophic microorganisms oxidize methane in nature*  
Location: Fairfax Ballroom  
Moderator: Joe Graber

12:00-2:00 **Lunch on your own**

1:00-5:30 **KBase Developers' Workshop**  
**Location: Wolf Trap**  
Maximum 40 for the lecture, and 30 for the hands-on session.

**Description of Session:** This session will show developers how to extend the KBase platform by adding their own applications. A lecture in the first 2 hours provides the background and basic steps needed to integrate an existing command-line tool. Then a hands-on training session will be held where KBase project team members will assist participants in adding their tools to KBase. Participants must sign up here: [https://docs.google.com/forms/d/1XmuFITSBnkKXrl\\_ci6EWyY-Lkd\\_gvrDIm8YLfq2rInI/viewform](https://docs.google.com/forms/d/1XmuFITSBnkKXrl_ci6EWyY-Lkd_gvrDIm8YLfq2rInI/viewform) or email Meghan Drake ([drakemm@ornl.gov](mailto:drakemm@ornl.gov)) for more information.

2:00-5:00 **Breakout Session A: Deciphering and Designing Metabolic Pathways using Systems Biology**  
Location: Fairfax Ballroom A  
Moderator: Pablo Rabinowicz

**Description of Session:** Recent progress in the development of genomics and other 'omic technologies is uncovering a vast and growing diversity of metabolic capabilities in microbes and plants. The ability to understand and predict those metabolic activities will allow us to harness their potential to produce fuels and other bioproducts from biomass and other renewable sources. This session will highlight recent advances in our understanding, modeling, and engineering metabolism for the production of biofuels in different organisms.

**Speakers:**

- 2:00-2:30 Natalia Dudareva (Purdue University)  
*Modeling and Engineering of the Phenylpropanoid Network in Plants*
- 2:30-3:00 Sean Hackett (Princeton University)  
*Systems-Level Analysis of Mechanisms Controlling Yeast Metabolic Flux*
- 3:00-3:30 **Break**
- 3:30-4:00 Christopher Rao (University of Illinois at Urbana–Champaign)  
*A Systems-Ecology Investigation of Macroalgae Degradation by Marine Vibrios*
- 4:00-4:30 Jamey Young (Vanderbilt University)  
*Novel Stable Isotope Methods to Identify Flux Bottlenecks in Photosynthetic Hosts*

4:30-5:00 John Dueber (University of California, Berkeley)  
*Repurposing the Yeast Peroxisome for Compartmentalizing  
Heterologous Metabolic Pathways*

2:00-5:00 **Breakout Session B: Development of Sustainable Bioenergy Cropping Systems in  
Changing Environments**  
Location: Fairfax Ballroom B  
Moderator: Cathy Ronning

**Description of Session:** Recent advances in systems biology and omics technologies are beginning to map the complex networks of plant and microbial growth, development, and metabolism. We are now poised to apply these tools to examine the impacts of a fully sustainable, bioenergy agriculture on ecosystems. This session features six new projects that seek to develop a mechanistic understanding of how candidate biofuel plants interact with environmental factors to affect long-term plant feedstock performance as well as the ecosystem outcomes that define sustainability.

**Speakers:**

2:00-2:20 Gloria Coruzzi (New York University)  
*EvoNet: A Phylogenomic and Systems Biology Approach to Identify  
Genes Underlying Plant Survival in Marginal, Low-Nitrogen Soils*

2:20-2:40 Sarah Evans (Michigan State University)  
*Connecting Nitrogen Transformations Mediated by the Rhizosphere  
Microbiome to Perennial Cropping System Productivity in Marginal Lands*

2:40-3:00 Mary Firestone (University of California, Berkeley)  
*Establishment to Senescence: Plant-Microbe and Microbe-Microbe  
Interactions Mediate Switchgrass Sustainability*

3:00-3:30 **Break**

3:30-3:50 Tom Juenger (University of Texas, Austin)  
*Climate Adaptation and Sustainability in Switchgrass: Exploring Plant-  
Microbe-Soil Interactions Across Continental-Scale Environmental  
Gradients*

3:50-4:10 Peggy Lemaux (University of California, Berkeley)  
*Epigenetic Control of Drought Response in Sorghum (EPICON)*

4:10-4:30 Daniel Schachtman (University of Nebraska, Lincoln)  
*Systems Analysis of the Physiological and Molecular Mechanisms of  
Sorghum Nitrogen Use Efficiency, Water Use Efficiency, and Interactions  
with the Soil Microbiome*

4:30-5:00 Program Discussion

5:00-7:00 **Poster Session (odd-numbered posters)**  
Location: Tysons Ballroom

## **Tuesday, March 8<sup>th</sup>**

7:30-8:30      **Breakfast on your own**

8:30-10:00    **Plenary Session: DOE User Facilities & Community Resources**

Location: Fairfax Ballroom

Moderator: **Roland Hirsch**

**Speakers:**

8:30-9:00      Susannah Tringe (Lawrence Berkeley National Laboratory, DOE-JGI)  
*Emerging DNA Sequencing and Synthesis Capabilities at the DOE Joint Genome Institute*

9:00-9:30      James Evans (Pacific Northwest National Laboratory, EMSL)  
*Electron Microscopy and Bioimaging at EMSL*

9:30-10:00     Chris Henry (Argonne National Laboratory, KBase)  
*Catalyzing Science, Deciphering Data, and Embracing Third-Party-Development in the DOE Systems Biology Knowledgebase (KBase)*

10:00-10:30    **Break**

10:30-12:00   **Plenary Session: New Developments in Computation and Modeling**

Location: Fairfax Ballroom

Moderator: **Ramana Madupu**

**Speakers:**

10:30-11:00    Dan Jacobson (Oak Ridge National Laboratory)  
*Pleiotropic and Epistatic Network-Based Discovery via Integrated Omics Analysis of Populus trichocarpa*

11:00-11:30    Ronan Fleming (Luxembourg University)  
*Conserved Moieties in Metabolic Networks: Identification and Applications*

11:30-12:00    Costas Maranas (Pennsylvania State University)  
*Constructing Predictive Kinetic Models of Metabolism for Guiding Strain Design*

12:00-2:00     **Lunch on your own**

1:00-5:30      **KBase Experience Hands-on Session**

**Location: Wolf Trap**

Maximum 30 per hour.

**Description of Session:** This session is intended to give you an opportunity to test the latest tools available in KBase in an interactive setting. You can upload your own microbial data to analyze, or test KBase using microbial and plant data already stored in the system. Members of the KBase team will be there to help you start using KBase on your laptop. To best prepare for this opportunity please sign up here:

[https://docs.google.com/forms/d/1ORO3B2uNPmFRrZmfzr\\_hFTT6SDRjLm-BTvLzDEhkTv4/viewform](https://docs.google.com/forms/d/1ORO3B2uNPmFRrZmfzr_hFTT6SDRjLm-BTvLzDEhkTv4/viewform) or email Meghan Drake ([drakemm@ornl.gov](mailto:drakemm@ornl.gov)) for more information.

2:00-5:00 **Breakout Session C: Confronting the Challenges of Systems Biology in Eukaryotic Systems**

Location: Fairfax Ballroom A

Moderator: Dawn Adin

**Description of Session:** Studies of eukaryotic systems present unique challenges due to the cellular and metabolic complexity of the organism. High-throughput experimental and computational methods discovered in model systems are being paired with advanced molecular biology tools to investigate the modular architecture and complex networks essential to all eukaryotes. This session will highlight how such new technologies are being used to enable successful research and advance our fundamental knowledge of eukaryotic organisms.

**Speakers:**

- 2:00-2:30 Jonathan Schilling (University of Minnesota)  
*Using Space for Time to Discern a Carbohydrate-Selective Oxidative Mechanism in Wood-Degrading Fungi*
- 2:30-3:00 Federica Brandizzi (Michigan State University)  
*Mechanisms for Matrix Biosynthesis in Grasses*
- 3:00-3:30 Jeffrey Skerker (University of California, Berkeley)  
*Functional Genomics in Fungi using Randomly Barcoded T-DNAseq (RB T-DNAseq): Lipid Production in the Oleaginous Yeast *Rhodospiridium toruloides**
- 3:30-4:00 **Break**
- 4:00-4:30 Shiyu Ding (Michigan State University)  
*Lipid Production in Single Oleaginous Yeast Cells Using In Vivo Label-Free Imaging*
- 4:30-5:00 Michael Betenbaugh (John Hopkins University)  
*Trials and Triumphs in Systems Biology of Autotrophic-Heterotrophic Co-Cultures*

2:00-5:00 **Breakout Session D: Linking Microbial Community Structure and Function**

Location: Fairfax Ballroom B

Moderator: Joe Graber

**Description of Session:** In nature, diverse communities of microbes engage in a wide variety of interactions, ranging from cooperative to competitive to antagonistic. The sum of these microbial interactions, along with their relationships with other types of organisms and connections to abiotic factors, form the basis of biogeochemical cycles. This session will highlight new advances in our ability to examine the structure of microbial communities, analyze their functional properties, and understand their activities in the context of ecosystem processes.

**Speakers:**

- 2:00-2:30 Bruce Hungate (Northern Arizona University)  
*Quantitative Microbial Ecology: Where Community Interactions Meet Element Cycles*
- 2:30-3:00 Rhona Stuart (Lawrence Livermore National Laboratory)  
*Tracing community utilization of light-derived extracellular organic matter*
- 3:00-3:30 **Break**
- 3:30-4:00 Karsten Zengler (University of California, San Diego)  
*Multi-dimensional interactions define dynamics in microbial communities*
- 4:00-4:30 Amy Schaefer (University of Washington)  
*Co-option of bacterial quorum sensing for interkingdom signaling*
- 4:30-5:00 Nicholas Justice (Lawrence Berkeley National Laboratory)  
*Unraveling Community Assembly and Organism Interactions with Massively Parallel Enrichment Culturing*

2:00-5:00 **Breakout Session E: Novel Imaging and Advanced Technologies for Systems Biology**

Location: Ash Grove Ballroom

Moderator: Roland Hirsch and Prem Srivastava

**Speakers:**

- 2:00-2:25 Tuan Vo-Dinh (Duke University)  
*Molecular Sentinels: a new generation of nanoprobes for molecular sensing and genomic target monitoring*
- 2:25-2:50 Aaron Wright (Pacific Northwest National Laboratory)  
*New chemical probes for microbial protein profiling reveal a role for vitamin B12 in controlling folate and methionine metabolism*
- 2:50-3:15 Leslie Shor (University of Connecticut)  
*A synthetic soil microsystem for imaging pore-scale water dynamics with microscale control of microbial EPS production*
- 3:15-3:30 **Break**
- 3:30-3:55 Brian Davison (Oak Ridge National Laboratory)  
*Neutron scattering and simulation provide insights into fundamental mechanisms of biomass pretreatment*
- 3:55-4:20 Xavier Mayali (Lawrence Livermore National Laboratory)  
*Dual stable isotope labeling and NanoSIMS analysis to investigate microscale autotroph-heterotroph interactions*
- 4:20-4:45 Jose A. Rodriguez (University of California, Los Angeles)  
*Atomic structures of amyloid peptide nanocrystals revealed by 3D electron diffraction*

5:00-7:00      **Poster Session (even-numbered posters)**  
Location: Tysons Ballroom

**Wednesday, March 9<sup>th</sup>**

8:00-9:00      **Breakfast on your own**

9:00-10:00     **DOE 2015 Early Career Research Awards**  
Location: Fairfax Ballroom  
Moderator: Pablo Rabinowicz

9:00-9:30      Jeffrey Gardner, University of Maryland, Baltimore County  
*Functional Characterization and Regulatory Modeling of Lignocellulose  
Deconstruction in the Saprophytic Bacterium Cellvibrio japonicas*

9:30-10:00     Elizabeth Sattely, Stanford University, Palo Alto, CA  
*Defining the Minimal Set of Microbial Genes Required for Valorization of  
Lignin Biomass*

10:00-11:30    **Plenary Session: Biosystem Design**  
Location: Fairfax Ballroom  
Moderator: Pablo Rabinowitz

**Speakers:**

10:00-10:30    Eduardo Blumwald (University of California, Davis)  
*Genomic and Biotechnological Tools for Perennial Grass Improvement  
and Transgene Containment*

10:30-11:00    Thomas Brutnell (Donald Danforth Plant Science Center)  
*Setaria viridis: A Model System for Bioenergy Grasses*

11:00-11:30    Jennifer Reed (University of Wisconsin-Madison)  
*Metabolic Modeling for Pathway and Strain Design*

11:30            **Close-out and Adjournment:**