2017 Genomic Sciences Program Annual PI Meeting
February 5-8, 2017

Sunday, February 5th

5:00 pm - 8:00 pm **Early Registration and Poster set-up**

Monday, February 6th

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

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

8:30-9:00 **Welcome and Introduction to the Meeting**
Location: Regency 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 **Ramana Madupu**, Program Manager, DOE BER

9:00 - 10:30 **Plenary Session: Bioenergy Research by Early Career Scientists**
Location: Regency Ballroom
Moderator: Kent Peters

Speakers:

9:00-9:30 Udaya C. Kalluri (BESC, Oak Ridge National Laboratory)
Functional genomics and systems biology studies to improve biomass properties of Populus

9:30-10:00 Jenny Mortimer (JBEI, Lawrence Berkeley National Laboratory)
Progress towards optimized lignocellulosic feedstocks for bioenergy and the bioeconomy

10:00-10:30 Daniel Amador-Noguez (GLBRC, University of Wisconsin)
Metabolomics in microbial biofuel production

10:30-11:00 **Break**

11:00-12:00 **Keynote Presentation: Robin Buell** (Michigan State University)
Use of Natural Variation to Identify Loci Associated with Agronomic Phenotypic Traits Critical for Biofuel Feedstocks
Location: Regency Ballroom
Moderator: Cathy Ronning

Parallel Sessions

KBase Sessions

9:00-5:00 **Session 1 (all Day) KBase Software Development Kit (SDK) Workshop**

Location: Potomac V
Description of Session: This session will explain how to add your own applications to the KBase platform using the SDK. A lecture in the first two hours provides background and describes the basic steps to integrate an existing open source command-line tool. Then, a hands-on training session will be held where KBase team members will assist participants to add their applications.

Participants must sign up here: KBase Session Signup or email Meghan Drake (drakemm@ornl.gov) for more information.
(Maximum 20 attendees)

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

12:00-5:00 **Session 2: KBase Tutorial Presentations**
Location: Conference Theater

Description of Session: This session will have a series of one hour presentations briefly covering tutorials on how to perform key analyses in KBase, followed by hands-on time for you to try out KBase on your laptop.
Tutorials will include:

- Assemble and Annotate
- Metabolic modeling and flux balance analysis
- RNA-seq

KBase staff will be present to answer questions and provide assistance.
To best prepare, please sign up here: KBase Session Signup or email Meghan Drake (drakemm@ornl.gov) for more information.
(Maximum 40 attendees at one time)

2:00-5:20 **Breakout Session A:** New Mesoscale to Molecules *In Situ* Imaging Technologies for Biological Systems
Location: Washington Room
Moderator: Prem Srivastava

Description of Session: The intended goal of this breakout session is to showcase the development of new non-destructive, *in situ* imaging and measurement technologies to visualize the spatial and temporal relationships of key metabolic processes governing phenotypic expression in plants and microbes of potential interest to Genomic Science research

Speakers:

2:00–2:05 Prem Srivastava
Welcome and Opening Remarks – Breakout Session Objectives

Breakout Session Presentations (Each speaker is allocated 15 min for presentation and 5 min for discussions –Qs & As)

2:05–2:25 Jennifer Pett-Ridge (Lawrence Livermore National Laboratory)
Imaging root processes at multiple scales: what we can and can't see

2:25 – 2:45 **Himadri Pakrasi** and David Fike **(**Washington University)
Development of a new analytical SIMS platform for mapping bioessential elements in microbial cells

2:45 – 3:05 Wayne Versaw (Texas A&M University) and
Maria J. Harrison (Boyce Thompson Institute, Cornell University)
Development of bioimaging sensors to monitor the distribution of phosphate in live plants with high spatiotemporal resolution

3:05-3:20 **Break**

3:20-3:40 Gary Stacey (University of Missouri, Columbia),
Akos Vertes (George Washington University) and
Lili Pasa-Tolic (Pacific Northwest National Laboratory)
Toward targeting and analyzing plant cells by a molecular microscope utilizing ultrahigh-resolution mass spectrometry

3:40-4:00 Leslie Shor, **Daniel Gage**, and Yongku Cho (University of Connecticut)
Optogenetic Tools to Modulate Microbial System Functions in Emulated Soil Micro-environments

4:00–4:20 Tuan Vo-Dinh, (Fitzpatrick Institute for Photonics, Duke University)
Monitoring and Imaging Genomic Targets in Plant System Using Plasmonic Nanoprobes

4:20–4:40 Ken Kemner (Argonne National Laboratory)
Argonne Small Worlds: Integrated dynamic 3D imaging of microbial processes and communities in rhizosphere environments

4:40 – 5:00 James Evans (Pacific Northwest National Laboratory)
New technologies for dynamic and multimodal bioimaging

5:00 – 5:20 Soichi Wakatsuki (SLAC National Accelerator Laboratory)
Diffract-before-destroy approach using x-ray Free electron laser for imaging in bioenergy and C- and N-cycling studies

2:00-5:00 **Breakout Session B: USDA-DOE Plant Feedstocks Genomics for Bioenergy**
Location: Regency Ballroom
Moderator: Cathy Ronning

Description of Session: The joint USDA-DOE Plant Feedstocks Genomics for Bioenergy program supports fundamental genomics based research leading to the development of improved and more sustainable plant feedstocks for the production of biofuels and other bio based products. The session will include presentations by the 2014 awardees on recent accomplishments in developing improved oilseed and lignocellulosic feedstocks.
The 2016 awardees will follow with a series of "speed talks" highlighting newly funded research spanning a wide variety of candidate feedstocks, including oilseed crops.

2:00-2:10 Introduction
Cathy Ronning (DOE BER) and Jeff Steiner (USDA NIFA)
Overview of the Program

Speakers: *2014 Awardees:*

2:10-2:30 Todd Mockler (Donald Danforth Plant Science Center)
The Brachypodium ENCODE Project – From Sequence to Function: Predicting Physiological Responses in Grasses to Facilitate Engineering of Biofuel Crops

2:30-2:50 Patrick Brown (University of Illinois at Urbana-Champaign)
Coordinated Genetic Improvement of Bioenergy Sorghum for Compositional and Agronomic Traits

2:50-3:10 John Mullet (Texas A&M University)
Genomics of Energy Sorghum's Water Use Efficiency/Drought Resilience

3:10-3:25 **Break**

3:25-3:45 Erik Sacks (University of Illinois at Urbana-Champaign)
Quantifying Phenotypic and Genetic Diversity of Miscanthus sacchariflorus to Facilitate Knowledge of Directed Improvement of M. x giganteus (M. sinsensis x M. sacchariflorus) and Sugarcane

3:45-4:05 Amy Brunner (Virginia Polytechnic Institute and State University)
Regulation of Populus growth in response to nutrient availability

and daylength

4:05-4:25 John McKay (Colorado State University)
Biofuels in the Arid West: Germplasm Development for Sustainable Production of Camelina Oilseed

2016 Awardees' Speed Talks:

4:25-4:30 Ana Alonso (Ohio State University)
Development of Resources and Tools to Improve Oil Content and Quality in Pennycress

4:30-4:35 Jack Brown (University of Idaho)
Developing Non-Food Grade Brassica Biofuel Feedstock Cultivars with High Yield, Oil Content, and Oil Quality that are Suitable for Low Input Production Dryland Systems

4:35-4:40 Hussein Abdel-Haleem (USDA ARS Maricopa; John Dyer, PI)
Genomics and Phenomics to Identify Yield and Drought Tolerance Alleles for Improvement of Camelina as a Biofuel Crop

4:40-4:45 Chaofu Lu (Montana State University)
Systems Biology to Improve Camelina Seed and Oil Quality Traits

4:45-4:50 Serge Edmé (USDA ARS Lincoln)
Genetics and Genomics of Pathogen Resistance in Switchgrass

4:50-4:55 Deanna Funnell-Harris, (USDA ARS Lincoln)
Resistance to Stalk Pathogens for Bioenergy Sorghum

4:55-5:00 Erik Sacks (University of Illinois)
Introgression of Novel Disease Resistance Genes from Miscanthus into Energycane

2:00-5:00 Breakout Session C: Microbial Systems for Biofuel Production
Location: Regency Salon C
Moderator: Dawn Adin

Description of Session: The Genomic Science Program contains a diverse set of projects focused on expanding the microbial toolkit of platform organisms with metabolic capabilities and stress tolerance characteristics to meet the energy challenges of future generations. This breakout session will highlight projects showing the variety of scales the overall portfolio covers to investigate systems for potential biofuel production – from ponds to multi-species/co-culture relationships to single cell studies to cell-free *in vitro* analyses.

Speakers:

2:00-2:30 Juergen Polle (Brooklyn College,The City University of New York)

The Effect of Carbon Flux Topology and Synchronized Culture Growth on Microalgal Productivity

2:30-3:00 Michelle O'Malley (University of California, Santa Barbara)
Unlocking the Potential of Early-Branching Fungi for Biomass Breakdown and Conversion

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

3:30-4:00 Jake McKinlay (Indiana University)
Factors governing mutualism dynamics in a hydrogen-producing co-culture

4:00-4:30 Tae Seok Moon (Washington University in St. Louis)
Systems and synthetic biology of Rhodococcus opacus *to enable conversion of lignin-derived aromatic compounds into lipids*

4:30-5:00 Jim Bowie (University of California, Los Angeles)
Synthetic Biochemistry: Making Biofuels and Commodity Chemicals the Cell-Free Way

5:00-7:00 **Poster Session (odd-numbered posters)**
Location: Independence Center A

Tuesday, February 7th

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

8:30-10:00 **Plenary Session: DOE User Facilities & Community Resources**
Location: Regency Ballroom
Moderator: Roland Hirsch

Speakers:

8:30-8:50 Adam Arkin (Lawrence Berkeley National Laboratory, KBase**)**
From sequence through expression to metabolic modeling of microbes plants and their communities: How KBase can accelerate your research and help your teams collaborate and communicate on complex systems biology problems

8:50-9:10 Axel Visel (Lawrence Berkeley National Laboratory, DOE-JGI)
Next-Generation Genome Science at the DOE Joint Genome Institute

9:10-9:30 Lili Pasa-Tolic (Pacific Northwest National Laboratory, EMSL)
Exploring the rhizosphere using advanced technologies at EMSL

9:30-9:50 Sean McSweeney (Brookhaven National Laboratory)

Biological and Systems Science Opportunities at the DOE Light and Neutron Facilities

9:50-10.00 Q&A

10:00-10:30 **Break**

10:30-12:00 **Plenary Session: USDA-DOE Plant Feedstocks Genomics for Bioenergy**
Location: Regency Ballroom
Moderator: Jeff Steiner (USDA-NIFA)

Speakers:

10:30-11:00 Isabelle Henry (University of California, Davis; Luca Comai, PI)
A population of copy number variants for poplar functional genomics

11:00-11:30 Maria Harrison (Boyce Thompson Institute)
Genetic Dissection of AM Symbiosis to Improve the Sustainability of Feedstock Production

11:30-12:00 John Sedbrook (Illinois State University; M. David Marks, University of Minnesota, PI)
Advancing Field Pennycress as a New Oilseed Biodiesel Feedstock that does Not Require New Land Commitments

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

Parallel Sessions

12:00-5:30 **KBase Experience Room**
Session 3
Location: Conference Theater

Description of Session: This is an asynchronous learning opportunity for you to try out KBase on your laptop while KBase staff are available to answer questions and provide help and advice if needed. To best prepare, please sign up here: KBase Session Signup or email Meghan Drake (drakemm@ornl.gov) for more information.
(Maximum 40 attendees at one time)

2:00-5:15 **Breakout Session D: Computational Biology- SciDAC session**
Location: Washington Room
Moderators: Paul Adams & Leonid Oliker, Lawrence Livermore National Laboratory

Description of Session: The Genomic Science Program strives to understand and facilitate genome-enabled, mechanistic understanding of complex biological processes across scales and biological complexity. Multi-scale modeling of biological systems provides a conceptual framework for the integration of information and simulation of data models from two or more distinct temporal and/or spatial scales, representing multiple levels of biological organization (from molecules, to organisms, to populations and environmental ecosystems), multiple types of processes (physical, chemical, physiological), and across multiple species. This joint session with the Scientific Discovery through Advanced Computing (SciDAC) Institutes (https://science.energy.gov/ascr/research/scidac/scidac-institutes/) from DOE's Office of Advanced Scientific Computing Research (ASCR) will explore new conceptual and programming paradigms at the intersection of applied mathematics and computer science for systems–level investigations, providing an opportunity to foster interaction between the Genomic Science Program and SciDAC researchers.

Speakers:

2:00–2:05	Ramana Madupu (BER) & Ceren Susut (ASCR) *Welcome and Opening Remarks – Breakout Session Objectives*
2:05–2:20	Habib Najm (QUEST SciDAC Institute, Sandia National Laboratories) *An Overview of the QUEST Institute*
2:20–2:35	Leonid Oliker (SUPER SciDAC Institute, Lawrence Berkeley National Laboratory) *SUPER Institute Partnerships and Capabilities*
2:35–2:50	Arie Shoshani (SDAV SciDAC Institute, Lawrence Berkeley National Laboratory) The Data Management, Analysis, and Visualization Institute: examples and tools
2:50–3:05	Esmond G. Ng (FASTMath SciDAC Institute, Lawrence Berkeley National Laboratory) *Applied Mathematics, FASTMath, and Partnerships*
2:50–3:05	Costas Maranas (Penn State) *Computational Bottlenecks in Metabolic Networks and Protein Design*
3:05–3:20	Gloria Coruzzi & Kranthi Varala (NYU) *EvoNet: Phylogenomics meets Systems Biology*

	3:20–3:35	Bill Cannon (Pacific Northwest National Laboratory) *Some Challenges in Multiscale Modeling: Molecules to Microbiomes*
	3:35–3:50	Rommie Amaro (UC San Diego) *TBD*
	3:50-4:05	Jeremy Smith (Oak Ridge National Laboratory) *Exascale Concepts in Biological Simulation*
	4:05-4:15	**Break**
	4:15-5:15	Panel Discussion Leads: Lori Diachin (Lawrence Livermore National Laboratory) Paul Adams (Lawrence Berkeley National Laboratory)

2:00-5:00 **Breakout Session E: "Microbiomics": DOE Microbiome Research for Energy & Environment**
Location: Regency Ballroom
Moderator: Dawn Adin

Description of Session: Although the formal definition varies, "microbiomes" can be broadly considered as communities of microorganisms associated with a plant, animal, or environment of interest. Fostering more productive and sustainable agricultural practices, developing innovative new energy production systems, managing environmental contaminants, and even responding to impacts of global climate change could all potentially benefit from an expanded understanding of microbiomes. This breakout session will present new findings on the microbiomes of a variety of hosts and environments important to DOE missions in energy and the environment. By integrating genomic sequencing, systems biology approaches, next generation analytical technologies, and computational modeling, DOE Genomic Science research is shedding new light on "who?, what?, when?, where?, and how?" questions relating to the composition, structure, and functional properties of microbiomes.

Speakers:

2:00-2:30	Kristen DeAngelis (University of Massachusetts Amherst) *The "Who" and "How" of Microbial Control of Soil Carbon Cycling in a Warming World*
2:30-3:00	Dale Pelletier (Oak Ridge National Laboratory) *The* Populus *Microbiome: Who? What? Where? When? And Why?*
3:00-3:30	**Break**
3:30-4:00	Javier Ceja-Navarro (Lawrence Berkeley National Laboratory)

Multi-domain Microbial Pathways for Lignocellulose Transformation are Spatially Segregated through the Passalid Beetle Digestive Tract

4:00-4:30 Kara De Leon (University of Missouri)
Laboratory to Field and Back Again: The Sulfate-Reducing Bacteria Story

4:30-5:00 Rachel Neurath (University of California, Berkeley)
Soil Carbon Association with Fresh Mineral Surfaces in the Rhizosphere

2:00-5:00 **Breakout Session F: Plant Systems Biology and Engineering Approaches for the Development of Biofuels and Bioproducts**
Location: Salon C
Moderator: Pablo Rabinowicz

Description of Session: Plant biomass is a potential source of raw materials to produce fuels and other chemicals. Gaining a systems-level understanding of bioenergy crops and developing the technologies to manipulate their functional properties will advance towards harnessing lignocellulose as a sustainable energy resource. This session will present recent advances in plant systems and synthetic biology for the production of renewable fuels and products.

Speakers:

2:00-2:30 Ana Alonso (Ohio State University)
Application of Metabolomics and Fluxomics to Study Fatty Acid Synthesis in Alternative Crops

2:30-3:00 Dominque Loqué (Lawrence Berkeley National Laboratory)
Synthetic biology and Bioengineering to Optimize the Next Generation of Energy Crops

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

3:30-4:00 Jerry Tuskan (Oak Ridge National Laboratory)
Biodesign of Biofuels Crops: Accelerated Domestication of Perennial Plants

4:00-4:30 Rebecca Smith (University of Wisconsin)
The Zip-Lignin Strategy: Native and Engineered Zips

4:30-5:00 Roger Thilmony (USDA-ARS, Albany, CA)
Genomic and Biotechnological Tools for Perennial Grass Improvement and Transgene Containment

5:00-7:00 **Poster Session (even-numbered posters)**
Location Independence Center A

Wednesday, February 8th

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

8:30-9:00 **Workshop Brief: Technologies for Characterizing Molecular and Cellular Systems Relevant to Bioenergy**
Location: Regency Ballroom
Speaker: Amy Swain, Program Manager, DOE BER

9:00-10:20 **DOE 2016 Early Career Research Award Presentations**
Location: Regency Ballroom
Moderator: Pablo Rabinowicz

9:00-9:20 Kirsten Hofmockel (Pacific Northwest National Laboratory)
Molecular interactions of the plant-soil-microbe continuum of bioenergy ecosystems

9:20-9:40 Wellington Muchero (Oak Ridge National Laboratory)
Host-microbial genetic features mediating symbiotic interactions in the bioenergy crop Salix

9:40-10:00 Kabir Peay (Stanford University)
Does mycorrhizal symbiosis determine the climate niche for Populus *as a bioenergy feedstock?*

10:00-10:20 James Moran (Pacific Northwest National Laboratory)
Spatially resolved rhizosphere function: Elucidating key controls on nutrient interactions

10:20-12:00 **Plenary Session: Genomic Science Research Enabled by BER Technology Resources**
Location: Regency Ballroom
Moderator: Amy Swain

Description of Session: Genomic Science projects benefit from advanced BER-supported technologies. This session will describe science advances made possible by BER-supported resources at the light and neutron facilities, and how to access those resources. It will also include the introduction of a new, high resolution and very high throughput mass spectrometric capability.

Speakers:

10:20-10:45 Greg Hura (Lawrence Berkeley National Laboratory)
Structure and dynamics at the nanoscale: efficient X-ray methods that inform microbial engineering efforts

10:45-11:10 Hugh O'Neill (Oak Ridge National Laboratory)

Characterizing plant and microbial structural transformations for bioconversion using neutrons

11:10-11:35 Ritimukta Sarangi (SLAC National Laboratory)
Studying metals in microbial and plant systems using X-ray spectroscopy

11:35-12:00 Richard Smith (Pacific Northwest National Laboratory)
Disruptive advances in post genomic multi- omic measurements: how they will enable new understandings of microbiomes

12:00 **Adjournment**