

Overview of the JGI Synthetic Biology – DNA Synthesis Program

Yasuo Yoshikuni
3/22/2016



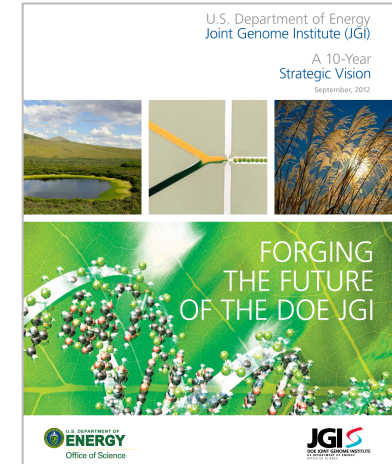
- **Program Overview**
 - Vision, mission and strategy
 - DNA Synthesis Science Program CSP
 - Program Performance
- **Program's Focus Area**
 - Focus Area
 - Plant and Microbial Systems Modulated by Secondary Metabolites
- **Outreach**
 - Meetings to Outreach User Communities

PROGRAM OVERVIEW

JGI's VISION:

Next-Gen. Genome Science User Facility

Specific emphasis on the development of capabilities for the high through-put addition of functional information to sequence data



DNA Synthesis Science Program



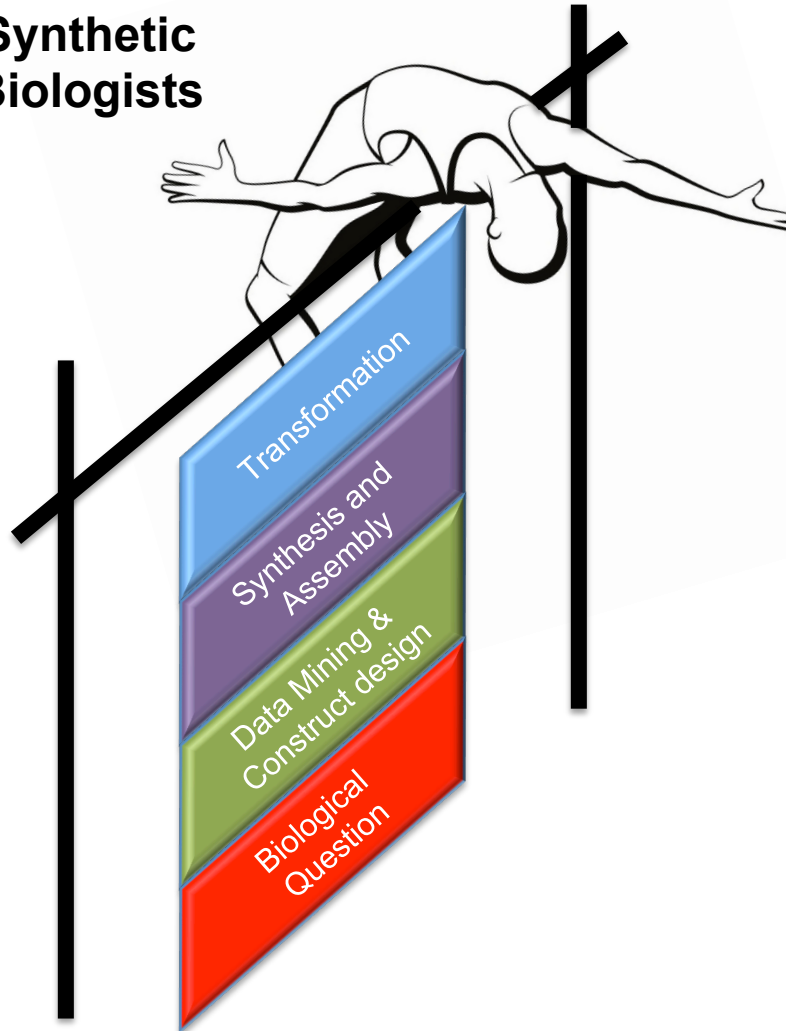
Mission: Enable to perform state-of-the-art science

Strategy: Integrated Pipeline

- Sequence data mining (Gene and Pathway ID)
- Synthesis production platform
 - Sophisticated design platform
- Analyses – Transcripts and Metabolites

Our Mission is to Lower the Bar for Complex Pathway Engineering Projects

**Synthetic
Biologists**



JGI Users



DNA Synthesis Science CSP Project

Simple
Sequence
Data Mining
& Analyses

Synthesis call (~400 Kbp/project)

Biannual CSP: Feb and Jul

Large CSP: Apr (w/ sequencing)



: Apr (JGI-EMSL)



BRCs: Any time.

Review (2-3 months)

User
Agreement

Approval by
the DOE &
JGI Director

Internal
Review
~3 Weeks

Scientific
Review
~3 weeks

Technical
Review
~3 weeks

Production

Initiation
call:
Defining
the scope
of work

Sequence
Data
Mining &
Analyses

Biosafety/
Security
Screening:
BLISS

Construct
Design:
SPL
DIVA

Synthesis
Assembly

Transcript
&
Metabolite
Analyses

USERS
4 Mbp/Yr
in total

DNA Synthesis Science CSP Project

Simple
Sequence
Data Mining
& Analyses

Synthesis call (~400 Kbp/project)

Biannual CSP: Feb and Jul

Large CSP: May-Aug (w/ sequencing)



: Apr (JGI-EMSL)



BRCs: Any time.

Review (2-3 months)

37 proposals in FY15
40-45% approved

User
Agreement

Production

Initiation
call:
Defining
the scope
of work

Sequence
Data
Mining &
Analyses

Biosafety/
Security
Screening:
BLISS

Construct
Design:
SPL
DIVA

Synthesis
Assembly

Transcript
&
Metabolite
Analyses

USERS
4 Mbp/Yr
in total

DNA Synthesis Science CSP Project

Simple
Sequence
Data Mining
& Analyses

Synthesis call (~400 Kbp/project)

Biannual CSP: Feb and Jul

Large CSP: Aug (w/ sequencing)



: Apr (JGI-EMSL)



BRCs: Any time.

Review (2-3 months)

User
Agreement

Internal
Review
~3 Weeks

Biosafety, Biosecurity,
Biocontainment, and
Environment Risks



Nathan Hilson

Production

Initiation
call:
Defining
the scope
of work

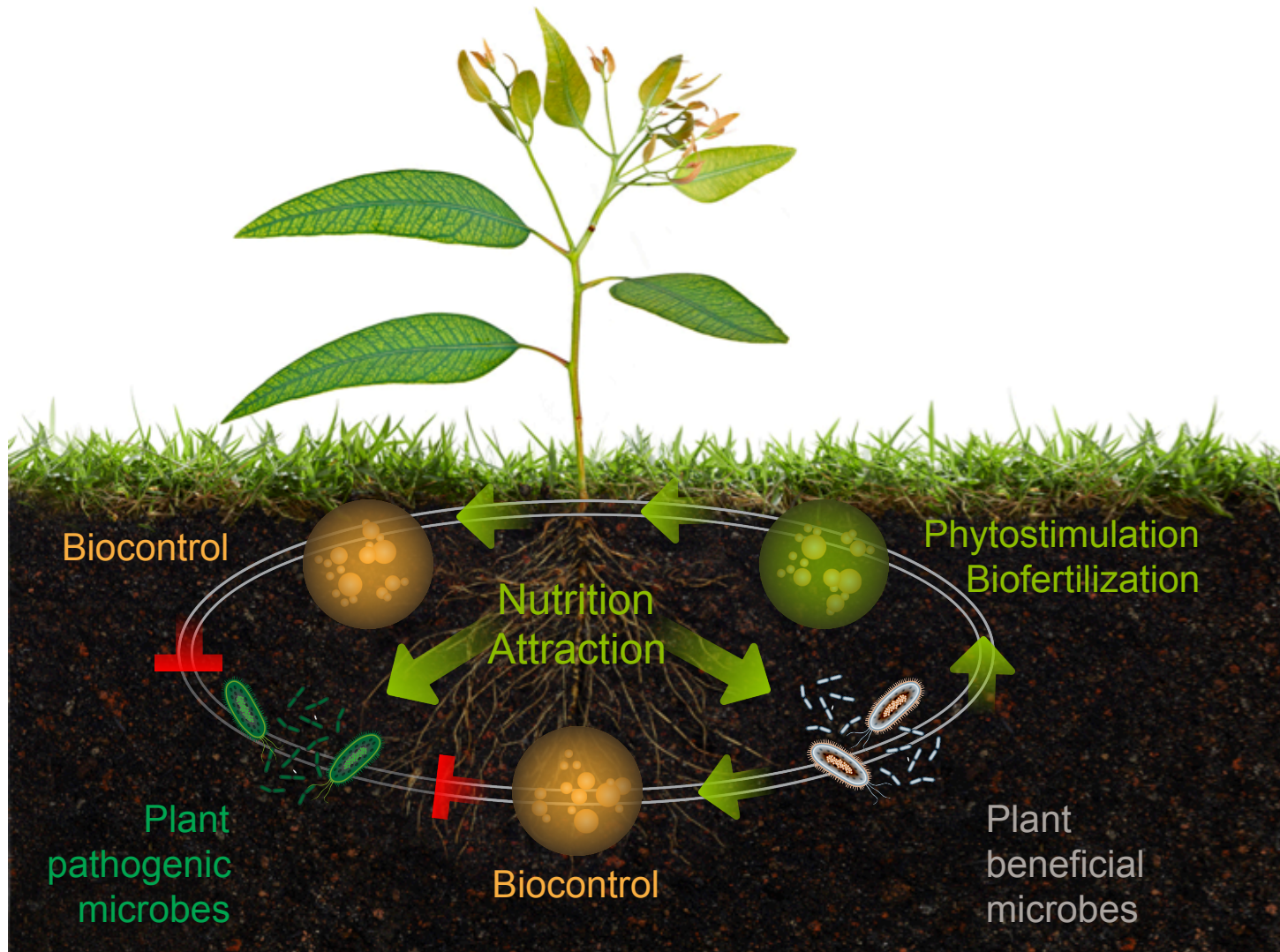
Biosafety/
Security
Screening:
BLISS

Screen against
Select agent & toxin (CDC)
Export control lists (US commerce)

USERS
4 Mbp/Yr
in total

FOCUS AREA

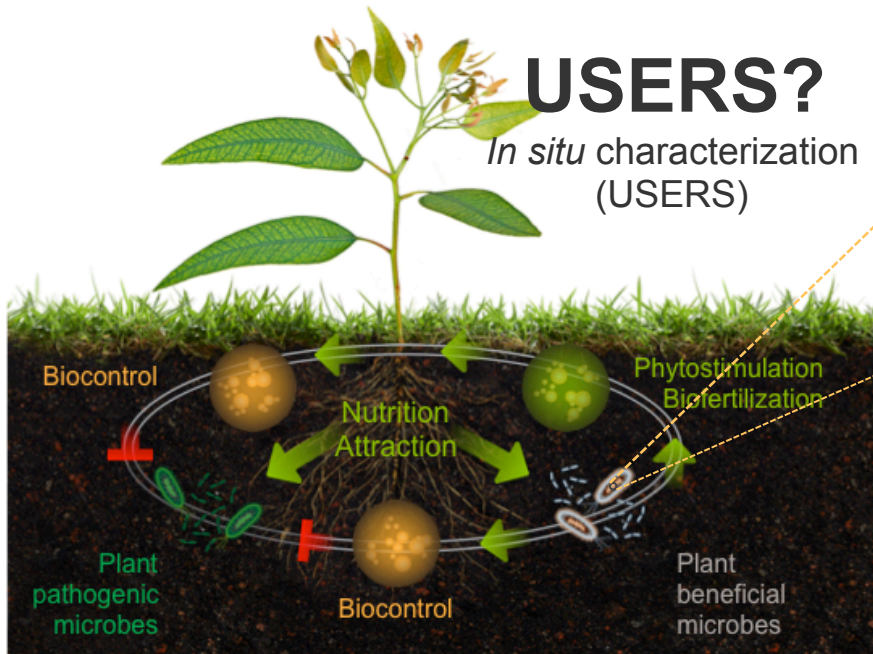
Focus Area: Plant and Microbial Systems Modulated by Secondary Metabolites



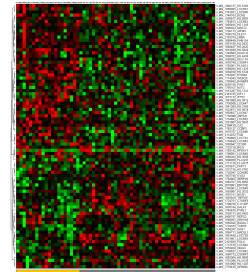
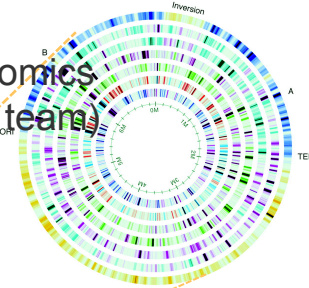
Facilitate Users to Study Microbial and Plant Systems Modulated by Secondary Metabolites

USERS?

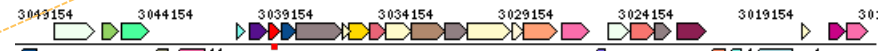
In situ characterization
(USERS)



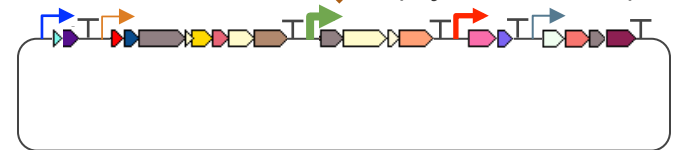
Genomics
Transcriptomics
(Microbial team)



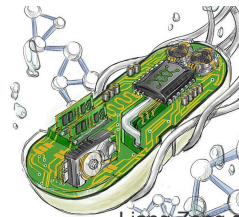
Bioinformatics
BC identification
(Microbial team)



Refactor, Codon opt.
DNA Synthesis
(Syn Bio team)



Strain
Engineering
(Syn Bio team)



Liang Zong and Yan Liang



Bioconversion
(Syn Bio team)



Purification & Characterization
(Metabolomics team)

OUTREACH

Microbial and Plant Systems Modulated by Secondary Metabolites Meeting 2016

- **Scheduled on May 2-4, 2016**
- **Objectives**
 - To be more knowledgeable
 - Recruit new users
 - Provide users opportunities to identify high impact projects
 - Identify users' needs
- **Attendees**
 - ~20 external speakers
 - ~80 attendees



JGI **JOINT GENOME INSTITUTE**
A DOE OFFICE OF SCIENCE USER FACILITY

Microbial and Plant Systems Modulated by Secondary Metabolites Meeting
May 2-4, 2016, Walnut Creek, California

This meeting will bring together a diverse group of investigators interested in the role of secondary metabolites in plant-microbe and microbe-microbe interactions. The meeting's goals include mediating an exchange of ideas and approaches for studying and manipulating the impact of secondary metabolites on environmental systems. Meeting participants will also learn about JGI capabilities (large-scale DNA sequencing, data mining and synthesis capabilities) available to them.

The U.S. Department of Energy Joint Genome Institute's recently developed DNA Synthesis Science Program provides access to a large-scale DNA synthesis capacity and integrated genomics pipelines where biosynthetic pathways present in microbial and plant genomes are computationally mined, refactored, and synthesized to facilitate expression in heterologous hosts.

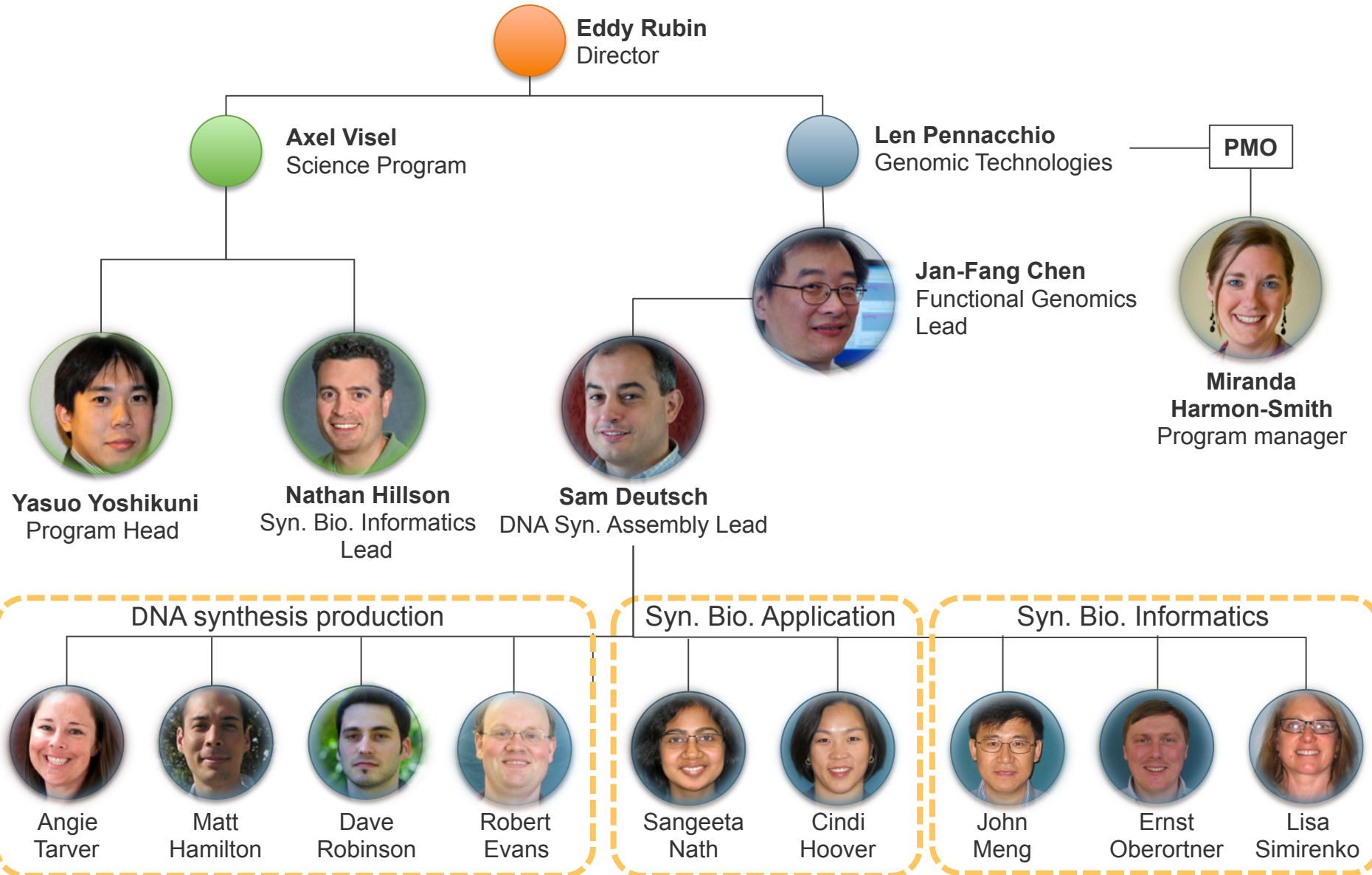
Registration is limited to 90 participants. Sign up early to ensure your place!
Registration opens January 11, 2016.
Register Here: <http://bit.ly/JGI-2ndary-metabolites>

Confirmed Speakers

- Emily Balskus, Harvard
- Gabriele Berg, Ohio University of Technology
- Clint Chapple, Purdue University
- Jeff Dangl, University of North Carolina, Chapel Hill
- Lars Dietrich, Columbia University
- Monica Hultine, Ghent University
- Ikhtas Khan, National Center for Natural Products Research
- Mark Lange, Washington State University
- Joyce Loper, USDA-ARS, Oregon State University
- Bradley Moore, Ecophys Institute of Oenology
- Sarah O'Connor, John Innes Centre, UK
- Anne Osbourn, John Innes Centre, UK
- Roslin Peters, Iowa State University
- Jos Raaijmakers, MBO Wageningen
- Mohammad Seyedzayandost, Princeton University
- Lloyd Summer, The Samuel Roberts Noble Foundation
- Dorothea Thell, Virginia Tech University
- Julia Vorholt, ETH Zurich

Acknowledgement



Thanks for Your Attention!

Yasuo Yoshikuni
yyoshikuni@lbl.gov