

Joining Forces to Characterize Plant – Soil – Microbe Interactions



- Improving Plant Productivity, Crop Protection
- Mitigating the Effects of Drought
- Ensuring Energy & Food Security

When are metabolites produced & consumed?

Which organisms produce & consume metabolites?

What metabolites are there?

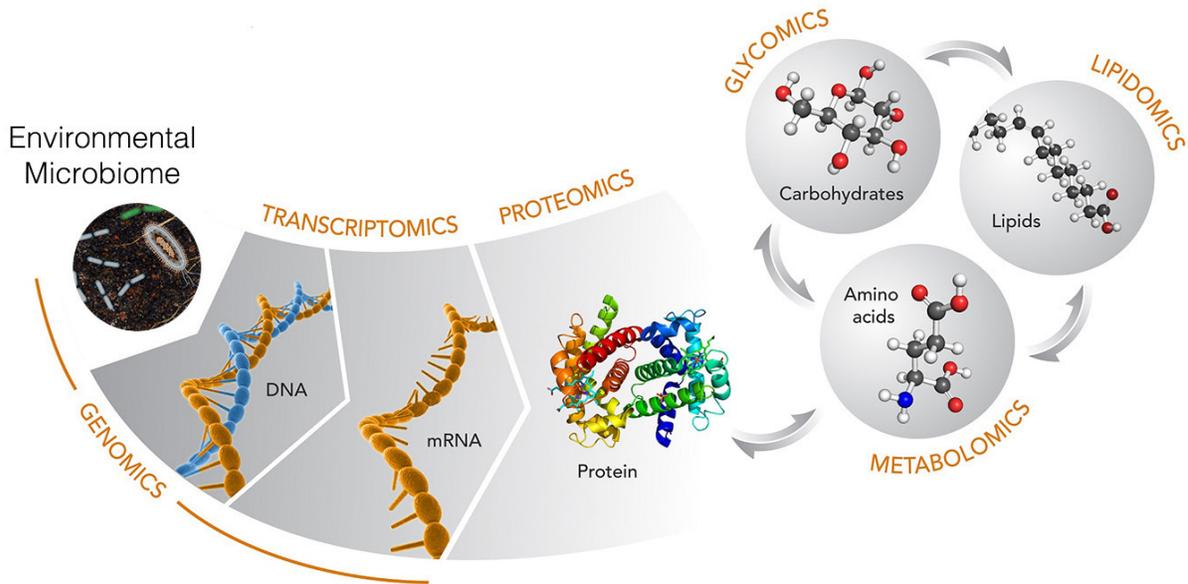
How are metabolites produced & consumed?

Where are metabolites located?

Metabolomics is the characterization of small molecules. Data gleaned from these metabolites — products of plant, fungal, or microbial metabolism — enable scientists to better understand the state of an organism and its response to different types of stimuli, such as nutrients and pollutants. Metabolomics technologies provide direct measurements of biochemical processes that are central to cellular growth, communication, and environmental responses, among others, underpinning nutrient cycling and bioenergy production.

Complementary metabolomics capabilities at the U.S. Department of Energy Joint Genome Institute (JGI) and Environmental Molecular Sciences Laboratory (EMSL) enable users to rapidly obtain functional genomic insights and examine biological-ecosystem dynamics to address the most pressing energy and environmental challenges.

Prospective users can submit a Facilities Integrating Collaborations for User Science (FICUS) proposal that provides access to capabilities across both facilities. The FICUS initiative is described on the opposite side.



Addressing urgent energy and environmental challenges by harnessing the combined capabilities resident at two DOE National User Facilities

Who? DNA Sequencing to identify and characterize biomes and microbiomes

What? Mass Spectrometry Analysis to determine diversity of metabolites present in the environment; NMR to determine metabolite structures

How? Transcriptomics and Proteomics to identify active organisms and pathways; DNA Synthesis to test pathways and enzyme functions

When? Mass Spectrometry Analysis of Stable Isotopes to identify timing and rates of metabolite consumption/production

Where? Mass Spectrometry Imaging to localize metabolites

What is a National User Facility? Our scientific capabilities – people, instruments and facilities – are available for use by the global research community. We support BER's mission to provide innovative solutions to the nation's environmental and energy production challenges in areas such as atmospheric aerosols, feedstocks, global carbon cycling, biogeochemistry, subsurface science and energy materials.



DOE Joint Genome Institute (JGI) @ Lawrence Berkeley National Laboratory:

JGI is a large scale genomic science user facility providing researchers in sequence-to-function analysis of microbes, microbial communities, plants, fungi, and other targets relevant to DOE missions in energy, environment and global carbon and other nutrient cycling. JGI metabolomics technologies are focused on high throughput metabolomics for functional genomics. www.jgi.doe.gov/metabolomics.



Environmental Molecular Sciences Laboratory (EMSL) @ Pacific Northwest National Laboratory:

EMSL is a multi-disciplinary user facility characterizing molecular-level processes critical to gaining a predictive, systems-level understanding of biological and terrestrial systems; making clean, affordable, abundant energy; and restoring legacy waste sites. EMSL's technologies are focused on structurally and spatially resolved metabolomics informing biological-ecosystem dynamics. www.emsl.pnl.gov.



FICUS: One Proposal to Access Both JGI & EMSL Resources

The Facilities Integrating Collaborations for User Science (FICUS) initiative enables researchers to tap genomics and molecular characterization in one research proposal. Areas include biofuels and bio-products; plant-microbe interactions; and biogeochemistry of select inorganic elements. Examples of supported projects can be found here: <http://bit.ly/FICUS2017>.