**Resource Needs**

Identify the types of capabilities at CSMB, EMSL, JGI, APS and NEON that you are considering for your research approach. At minimum, your proposal should request resources from two facilities, and be inclusive of EMSL and/or JGI. Note that competitive proposals will typically require use of both EMSL and JGI.

**CSMB Resources**

**BIO-SANS**

Biological Small-Angle Neutron Scattering Instrument (BIO-SANS)

**EMSL Resources**

Additional information about these resources can be found on the [EMSL website](https://www.emsl.pnnl.gov/science/instruments-resources).

**Aerosol Characterization**

Computer-controlled Scanning Electron Microscopy/Energy Dispersed X-ray/Ice Nucleation Stage (CCSEM/EDX)

Ice Nucleation Chamber

Nanospray Desorption Electrospray Ionization Mass Spectrometry (NanoDESI)

Photoacoustic Spectrometer

Single Particle Mass Spectrometry (SPLAT)

**Analytical**

C, H, N, S Analyzer

Confocal Raman Spectrometry

Fluorescence Spectroscopy

Fourier Transform Infrared (FTIR) Microscopy

Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Ion Chromatography

Isotope Ratio Mass Spectrometry

Mössbauer Spectrometry

Pyrolysis Gas Chromatography/Mass Spectrometry (Pyrolysis GC/MS)

Real Time Mass Spectrometry

Sum Frequency/Second Harmonic Generation (SFG/SHG)

X-ray Diffraction (XRD)

X-ray Photoelectron Spectroscopy (XPS)

**Biological Sample Preparations & Cell Separations**

Cell-Free Expression Pipeline

Cryogenic Focused Ion Beam-Scanning Electron Microscopy (Cryo-FIB/SEM)

Fluorescence-Activated Cell Sorting (FACS)

Focused Ion Beam-Scanning Electron Microscopy (FIB-SEM)

Laser Capture Dissection Microscope

Mass Cytometer

Microfluidics and Microfabrication (Clean Room)

Nanoscale Biological Sample Processing (NanoPOTS)

Stereo Zoom Microscope

Super Resolution Fluorescence STORM/PALM

**Chemical Imaging**

Atom Probe Tomography (APT)

Coherent Anti-Stokes Raman Scattering (CARS)/Stimulated Raman

Confocal Raman Spectrometry

Electron Microprobe

Fourier Transform Infrared (FTIR) Microscopy

Imaging Mass Spectrometry

Nanoscale Fourier Transform Infrared (Nano FTIR)

Nanoscale Secondary Ion Mass Spectrometry (NanoSIMS)

Nanospray Desorption Electrospray Ionization Mass Spectrometry (NanoDESI)

Raman Atomic Force Microscopy (Raman AFM)

Scanning Electron Microscopy-Energy Dispersed X-ray (SEM-EDX)

Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS)

Transmission Electron Microscopy-Energy Dispersed X-ray/Electron Energy-Loss Spectroscopy (TEM-EDX/EELS)

X-ray Photoelectron Spectroscopy (XPS)

**Flow & Transport**

Intermediate Scale Flow Cells

Microfluidics and Microfabrication (Clean Room)

Pore Scale Micromodels

Soil Hydraulic Property Measurement

**High Performance Computing & Visualization**

Data Visualization

Linux Clusters

**NMR & EPR**

Electron Paramagnetic Resonance (EPR)

Liquid NMR - Organic Matter/Complex Mixtures (DOM/NOM and lignin)

Liquid NMR - Structural Biology (proteins, protein complexes, etc.)

Liquid NMR for Metabolomics and Natural Products

NMR for Solids

**Omics/Mass Spectrometry**

Imaging Mass Spectrometry

Nanoscale Biological Sample Processing (NanoPOTS)

Omics/Mass Spectrometry for Bottom-Up Proteomics

Omics/Mass Spectrometry for Intact Proteins/Top-down Proteomics

Omics/Mass Spectrometry for Lipidomics

Omics/Mass Spectrometry for Metabolomics

Organic Matter Analysis (SOM/DOM)

**Optical Microscopes**

Airyscan

Confocal, FLIM & Multi-Photon Fluorescence Microscope

Holographic 3D Live Cell Imaging

Lattice Light Sheet

Pore Scale Micromodels

Single-Molecule Fluorescence Microscopy

Structured Illumination Microscope & Confocal

**Plant Growth & Soil Incubation**

Portable Photosynthesis System (LI-COR)

Reach-in Plant Growth Chambers

Soil Incubation

Walk-In Plant Growth Chambers

**Sequencers**

Ion Proton B Sequencer

Ion S5 Sequencer

NextSeq550 Sequencer

**Structural Tomography & Topography**

Atom Probe Tomography (APT)

Atomic Force Microscopy (AFM)

Cryogenic Transmission Electron Microscopy for Environmental Microbiology

Cryogenic Transmission Electron Microscopy for Structural Biology

Environmental Transmission Electron Microscopy (TEM)

Helium Ion Microscopy (HIM)

Optical Coherence Tomography

X-ray Computed Tomography (XCT)

**Synthetic Surfaces**

Microfluidics and Microfabrication (Clean Room)

Molecular Beam Epitaxy (MBE)

**JGI Resources**

For each capability selected, please indicate the approximate number of samples being requested for each type. More information on the products listed can be found here: <https://jgi.doe.gov/our-science/product-offerings/>.

|  |  |
| --- | --- |
| **Cell Sorting and SIP Capabilities** | |
| ***Capabilities Available*** | ***Approx. # of Samples*** |
| FACS sorting of bacterial/archaeal cells (limit 4 samples) |  |
| Stable Isotope Probing (SIP) fractionation (limit 36 samples) |  |

|  |  |
| --- | --- |
| **DNA Synthesis (limit 500 kb)** | |
| ***Capabilities Available*** | ***Approx. # of Constructs*** |
| Constructs <5kb |  |
| Constructs 5-10kb |  |
| Constructs >10kb |  |
| Combinatorial libraries |  |
| sgRNA library |  |
| Data mining |  |
| Strain engineering/CRAGE |  |

|  |  |
| --- | --- |
| **Ecosystem Fabrication (EcoFAB)** | |
| ***Capabilities Available*** | ***Approx. # of Devices*** |
| Plant EcoFAB (limit 50 devices) |  |

*More information available at https://eco-fab.org/*

|  |  |
| --- | --- |
| **Metabolomics** | |
| ***Capabilities Available*** | ***Approx. # of Samples*** |
| Non-polar metabolite analysis (LC/MS) (limit 500 samples) |  |
| Polar metabolite analysis (LC/MS) (limit 200 samples) |  |

*More information available at* [*https://jgi.doe.gov/our-science/science-programs/metabolomics-technology/metabolite-analyses/*](https://jgi.doe.gov/our-science/science-programs/metabolomics-technology/metabolite-analyses/)

|  |  |
| --- | --- |
| **Sequencing** | |
| ***Capabilities Available*** | ***Approx. # of Samples*** |
| Algal *de novo* genomes |  |
| Algal resequencing |  |
| Algal RNA-seq |  |
| Bacterial/archaeal *de novo* genomes |  |
| Bacterial/archaeal resequencing |  |
| Bacterial/archaeal RNA-seq |  |
| Bacterial/archaeal single cells |  |
| Fungal *de novo* genomes |  |
| Fungal resequencing |  |
| Fungal RNA-seq |  |
| Metagenomes (no iTags) |  |
| Metatranscriptomes |  |
| Plant *de novo* genomes |  |
| Plant resequencing |  |
| Plant RNA-seq |  |
| Stable Isotope Probing (SIP) metagenomes |  |
| Other sequencing request |  |

*NOTE: JGI has recently discontinued support for the following products: these should not be included in your request: smRNA, bisulfite sequencing, ChIP-seq, ATAC-seq. More details here:* [*https://jgi.doe.gov/user-programs/phased-out-products/*](https://jgi.doe.gov/user-programs/phased-out-products/)

**NEON Resources**

If you are proposing to use soils from the NEON Biorepository, you must also include a [letter of support from NEON](https://www.neonscience.org/resources/research-support/letters-support) for the specific samples in your Letter of Intent. The letter must be included as an appendix in your Project Description file.

For more information about the available samples, visit: https://www.neonscience.org/samples/find-samples

**NEON Biorepository**

Samples from the NEON Biorepository

**APS Resources**

**X-ray Fluorescence Imaging**

2ID-E nano XRF tomography

2ID-D nano XRF and Ptychography under cryo temp

8BM micro XRF 2D

**X-ray Computed Tomography**

2BM micro tomography

7BM pinkbeam tomography

32ID nano tomography

**Macromolecular Crystallography (MX)**

21ID-D fully tunable (6.5 - 20keV)

21ID-F fixed energy @12.7keV

21ID-G fixed energy @12.7keV

**Protein production and MX structure determination by the APS staff**

Gene cloning\*

Protein production\*

Protein crystallization\*

Structure determination\*

*\*These capabilities are also available to users who wish to come onsite and do the work themselves. Hands-on training provided.*

**Plant Growth**

Reach-in Plant Growth Chamber