# Precision Medicine Innovation Co-Laboratory: An OHSU/PNNL Collaboration

## Our History and Mission

Pacific Northwest National Laboratory (PNNL) draws on signature capabilities in chemistry, Earth sciences, and data analytics to advance scientific discovery and create solutions to the nation's toughest challenges in energy resiliency and national security. As a biotechnology research resource for proteomics funded by the National Institute of General Medical Sciences, PNNL has an international reputation in the development and application of cutting-edge technologies for mass spectrometric analysis and imaging of proteins and metabolites.

The Precision Medicine Innovation Co-Laboratory—or PMedIC—was launched in 2018. This partnership between Oregon Health and Science University (OHSU) and PNNL offers collaborative research and educational experiences for staff, faculty, clinicians, and students at the campuses of both institutions. Our mission is to generate, interpret, and apply multidimensional patient data, such as genetic, proteomic, and metabolic profiles, and integrate this information with imaging and clinical results to customize disease treatment and improve human health.

## Highlighted PNNL Capabilities
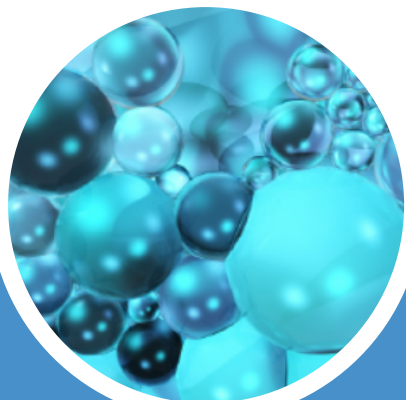


### MASS SPECTROMETRY

- Proteomics and phosphoproteomics of small cell populations (potentially single-cell)
- Targeted proteomics quantifying up to 200 different proteins in a single multiplex
- Top-down proteomics of intact proteins
- Quantitative characterization of multiple post-translational modifications
- Global metabolomics and lipidomics analyses
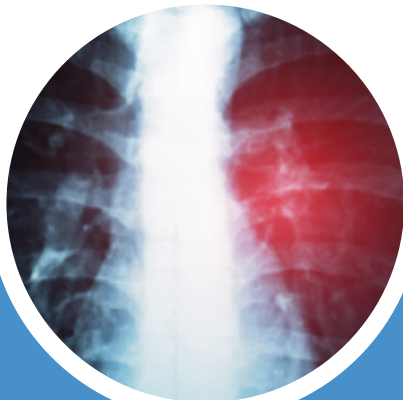
### IMAGING

- Ultrahigh resolution optical
- High resolution cryo and dynamic electron microscopy
- X-ray tomography and nanotomography
- High resolution elemental mapping
- Automated mass spectrometry imaging of thousands of proteins

### DATA SCIENCE

- Proteomic data interpretation at multiple levels, including web-based software to enable downstream omics data processing
- Multi-omics integration, visualization, and interpretation
- Standards-free metabolite identification
- Cutting edge machine learning methods (e.g., deep learning, transfer learning, graph analytics)
- Supercomputer access and high-performance computing

## Example Projects involving OHSU and PNNL Collaborations

### PACIFIC NORTHWEST CRYO-EM CENTER

State-of-the-art electron microscopy user facility funded by the National Institutes of Health Common Fund serves researchers from a diverse range of backgrounds to tackle the most challenging scientific problems and train the next generation of cryo-electron microscopy specialists and users.

### UNDIAGNOSED DISEASES NETWORK METABOLOMICS CORE

Integrating analysis and bioinformatics with clinical and genetic expertise to link novel metabolites or patterns of metabolites to underlying metabolic and genetic differences, as well as clinical signs and symptoms. This knowledge is translated into specific clues revealing genetic causes for a patient's disease.

### PROTEOGENOMIC TRANSLATIONAL RESEARCH CENTER FOR CLINICAL PROTEOMICS

Combine deep and broad measurements of protein and phosphoprotein abundance from ex vivo experiments using primary leukemia cells from patients with acute myelogenous leukemia to model the effects of targeted therapeutic agents on the activation state of key signaling pathways.

### When should I use PNNL or the OHSU Protein Shared Resource?

Consider forming a collaborative relationship with PNNL if proteomics will be a major part of your research portfolio (for example, on the scale of a specific aim in a grant proposal.) Additionally, a collaboration with PNNL is useful to incorporate unique mass spectrometry into your research, such as working with ultra-small samples, multiplexed validation, or using top-down mass spectrometry to measure protein post-translational modifications.

### How do I pay for work at PNNL?

A master agreement between OHSU and PNNL allows users to pay for mass spectrometry work at PNNL through a simple purchase order system, just like ordering DNA sequencing from an outside vendor. PNNL continuously strives to hold down costs, as quality proteomic analyses are expensive. There are (limited) funds available to jump start pilot projects. Additionally, we can work with you to identify other sources of funding.

### How do I collaborate with PNNL?

If you think a capability at PNNL would be useful in your research, please contact the co-directors or strategic partnerships director (see below) and share your science challenge. We will facilitate an introduction to the most appropriate collaborator(s) at PNNL. We can also facilitate physical visits and development of a small pilot project, if needed. PNNL will work with you to design a proof-of-principle experiment; successful pilot data generation will ideally lead to a joint grant proposal, which we can help facilitate.

### How do I become a graduate student/postdoctoral fellow trainee at PNNL?

Faculty with students and/or fellows who have scientific questions that would benefit from using PNNL expertise can contact us. We will assist to identify the most appropriate collaborator(s) at PNNL. The terms of the collaboration can be quite flexible—from trainees spending a few weeks running their own samples under the direction of a PNNL mentor, to longer training periods where students can master specific techniques.

## Who can I contact?

### OHSU Strategic Partnerships

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### PMedIC Co-directors

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