

BIOSCIENCES AREA FY25 LDRD PRIORITIES



Please use this image as a reference for strategic priorities for Biosciences. For LDRD proposals, the Area topics are based on the **Research Challenges** in the second row of the image, which can be applied to any of the **Societal Challenges** in the top row or other strategic topics relevant to Biosciences. Proposals should be defined with specific end-of-project outcomes, with a focus on mission relevance or use-inspired applications. Proposals will be judged on scientific merit, the potential for clear impact on a field of study, and alignment with potential future directions for external funding (e.g. DOE, NIH, DOD).

Proposals can span more than one Area topic or Multi-Area topic. You will have the opportunity to select a primary and secondary topic in the LDRD form.

Self-Driving Labs [POCs: Nigel Mouncey & Junko Yano]

Experimental and computational research and engineering to enable automated experimentation. Areas of interest include:

- Developing algorithms for remote control of instrumentation
- Developing algorithms that can adapt experimental conditions without human intervention
- Developing technologies for miniaturizing lab processes or increasing throughput
- Developing robust and networked sensors for monitoring biological experiments
- Developing workflows, protocols, and programming interfaces for linking automated unit operations
- Engineering automation pipelines for precise control of experimentation

Computing, analysis, and data acquisition & management [POCs: Junko Yano & Nigel Mouncey]

New approaches for biological computing, data analysis, and data management that meet FAIR principles create standardized workflows, enable AI/ML, and organize data for future analysis.

Areas of interest include:

- Developing standardized workflows for the integration of different types of data
- Developing methods for multiscale analysis of biological phenomena and processes
- Developing new modalities for real-time and in situ data capture
- Developing and applying AI/ML approaches to gain non-intuitive insight into biological phenomena and processes

Predictive Biology [POCs: Susannah Tringe & Blake Simmons]

Research and development of experimental and computational capabilities to enable accurate predictions of biological processes and phenomena, as well as possible interventions to realize desired phenotypes. Areas of interest include:

- Predicting function from gene sequence
- Predicting enzyme structure and potential ligands from sequence
- Predicting microbiome functions and dynamics to enable microbiome manipulation and engineering, e.g. for improved plant resilience
- Predicting and modeling interventions for soil carbon restoration and storage
- Predicting responses to disease and other health outcomes
- Predicting how solutions work at scale (e.g. biomanufacturing, environmental biology, etc.).

Emerging Strategic Research Directions [POC: Katy Christiansen]

While the above topics represent strategic priorities for Biosciences and Berkeley Lab, proposals for hypothesis-driven, emerging, and exploratory concepts of potential strategic interest for Biosciences are encouraged. Competitive proposals will focus on new avenues of research or technology development that may become Area-wide strategic priorities in the future if successful. Concepts with broader impacts on an area of research or technology are desired.

For example, past Biosciences LDRDs have supported the development of fabricated ecosystems (EcoFABs and EcoPODs) and laid the groundwork for a biological engineering biofoundry through a proof-of-principle project, key to the establishment of the Agile BioFoundry. Proposals for this topic area should consider the following questions:

- What is unique about this research area and proposal, and how is it different from current projects?
- Does this topic represent a new area of growth for Biosciences that builds on our strengths as a national lab and has a breadth of vision suited to an Area-wide strategic priority?
- What is the strategic opportunity for Biosciences, Berkeley Lab, the national lab complex, and/or the U.S. research enterprise?
- Emphasize evidence for strategic importance: strategic opportunities pictured above,

Berkeley Lab priorities, strategic documents from potential funders, National Academies reports, and other resources.

- What is the title of this new research area or strategic focus? How would you describe it in less than 5 words?

Guidance

- Proposals should include a consideration of mission relevance or use-inspired application areas; applicants are encouraged to focus on strategic opportunities pictured above, Berkeley Lab priorities, strategic documents from potential funders, National Academies reports, and other resources. Focus on relevance to a particular scientific or technical challenge with broader utility.
- Applicants are encouraged to submit only one proposal as the lead PI. Applicants can be collaborators on more than one proposal.
- Applicants should begin working with a resource analyst early in the LDRD process for accurate budget projections.
- Applicants should confirm collaborators early in the LDRD process to ensure availability and allow for accurate budgeting.
- Applicants should consider realistic time frames for hiring, equipment access, or other necessary elements of the proposal.
- Applicants should reach out early and often with questions about the LDRD process and ask for advice from former applicants.