EMERGING MATHEMATICS IN BIOLOGY (EMB) WEBINAR

January 11, 2024, 11am-12pm EST

Submit questions using the Q&A icon in Zoom 

- **Program page:** https://www.nsf.gov/pubs/2024/nsf24513/nsf24513.htm
- **Webinar page:** https://new.nsf.gov/events/emb-webinar-updated-funding-opportunity-nsf-24-513/2024-01-11
- **Submission target date:** March 11, 2024.
- **Program Officers:**

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SYNOPSIS OF PROGRAM
NSF 24-513

The **eMB** program supports research in mathematical biology that addresses significant biological questions by applying nontrivial mathematics or developing new theories particularly from foundational mathematics including Artificial Intelligence/Machine Learning.

With an emphasis on uses of foundational mathematics to advance our understanding of complex and heterogenous biological systems at all scales (molecular, cellular, organismal, population, ecosystems, etc.) and focused topics, the **eMB** program encourages innovative projects from strong interdisciplinary teams with the objective of developing more reliable mathematical tools for enhanced understanding of biological systems and greater societal impacts.

POSSIBILITIES FOR RESEARCH TOPICS

- New mathematics motivated by biological applications for which current mathematical theories and methods are inadequate.

- Focused topics in math and bio applications include but not limited to:
  - Applications of foundational mathematics in genomics and other omics applications
  - Mathematical foundations for the uses of AI/ML theory and methods in biomathematics
  - Improved modeling approaches and tools for emerging and reemerging infectious diseases
  - Modeling of the effects of climate change and clean energy on biological systems
  - Modeling systems dynamics across biological scales
  - Modeling responses of organisms to their multi-dimensional physical environment
  - Modeling interactions of organisms with the biotic environment
  - Neuroscience
  - Applications of mathematics in biotechnology.
  - Analysis of social behavior from individual behavior to emergent properties of social groups/populations.

EMB PROPOSAL REQUIREMENTS

- Proposals may be submitted for up to three years duration
- All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via Research.gov
- There are no restrictions or limits on number of proposals per PI or co-PI. However, a proposal that is a duplicate of, or substantially similar to, another proposal or a pending proposal at NSF will be returned without review.
- All proposals should include metrics to assess the success of proposed **research**

EMB REVIEW CRITERIA

In addition to the Intellectual Merit and Broader Impacts, the eMB proposals will be assessed on:

- Significance of biological questions to be addressed
- Innovative applications of mathematical theories and methods to study biological systems and/or development of new mathematics
- Integration of mathematics and biology (including the applicability of mathematical modeling results/tools to real biological systems)
- Strengths of interdisciplinary teams and expertise
- Impact of research outcomes on the math and bio communities

ADDITIONAL SOLICITATION-SPECIFIC REVIEW CRITERIA

For eMB proposals, reviewers will also be asked to evaluate to what extent:

1. the proposal is collaborative in nature and involves the coordinated interaction of two or more PIs/co-PIs, with balanced participation from both the mathematical sciences and the biological sciences;
2. the proposed activities (a) use innovative mathematical tools to generate biological insights or (b) represent novel application of traditional but not trivial mathematical tools to generate new biological insights;
3. the mechanistic understanding of the biological problem will be advanced by the application of the proposed mathematical or modeling approaches.

COMMON INQUIRIES

- In what key ways does the eMB program differ from the core NSF Mathematical Biology program?
  - Development of new mathematics in biology. More focused research topics in mathematical and biological applications, particularly topics that are of key interests to BIO programs due to the participation of Biological Science Directorate in this solicitation.
- What does new mathematics mean?
  - Mathematical theories, methodologies, or modeling approaches that have not been used before in biology but can help advance biological understanding and represent significant mathematical challenges (from any fields supported by DMS programs).
- Do new statistical modeling or new machine learning methods count as “new mathematical methodology”?
  - Yes, with a significant component on foundational mathematics.

COMMON INQUIRIES

- Is it necessary to have an interdisciplinary team (i.e. is the proposal required to have PIs, Co-PIs or senior personnel with expertise from both mathematics and biology/epidemiology, even for support from DMS)?
  - Not for projects supported by DMS. But reviewers will be asked to evaluate the strength of interdisciplinary expertise from both the mathematical and biological sciences.
- Are there any restrictions on what organisms can be studied?
  - Any organisms suitable for BIO programs are also suitable for eMB.
- What is the nature of the biological problems to be addressed by this call? On the spectrum that ranges from high-level theory down to specific application, where are they supposed to lie?
  - All problems are considered but there are focused topics (see slide 3.

COMMON INQUIRIES

- Does the proposal have to have experimentalists or real data?
  - They are not required, but a strong link between mathematical results and biological applications (including the applicability of modeling tools to real biological systems) is one of the program specific review criteria.
- What sort of supporting data is expected for these proposals?
  - Supporting data is not required. However, proposals must include compelling illustrations for the mathematical novelty and how the math can improve biological understanding, and specific metrics to assess the success of the proposed research must be included.
- Are proposals that are heavy on theory and limited in data integration welcome?
  - Yes, with a clear demonstration that the mathematical theory is applicable to real biological systems.

COMMON INQUIRIES

- Does the 12-month moratorium (which is required for the core MB program) apply to eMB?
  - No. Submission to eMB is independent of the MB program. A resubmitted proposal must undergo a substantial revision.
- Are there limits on the number of proposals that may be submitted per PI or Co-PI?
  - No. There are no restrictions or limits.
- Is there a limit to the size of the eMB awards?
  - No. There are no restrictions or limits. But the budget should be consistent with the proposed research and, as described in the solicitation, the Anticipated Funding Amount is $2,000,000 to $6,000,000 and the Estimated Number of Awards is 10 to 15.

COMMON INQUIRIES

- Can foreign researchers be included in the application from a US submitting institution?
  - Yes (subaward). Collaborative proposals and subawards are allowed.
- Can one apply to this program as well as the usual NSF Math Bio program with an open deadline?
  - Yes. There are no restrictions or limits.
  - However, each proposal must be significantly different from other proposals including those pending at NSF in order to be considered for review. A proposal that is a duplicate of, or substantially similar to, a pending proposal at NSF will be returned without review.

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Thank you!

Questions?

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Thank you for attending the eMB Webinar

We look forward to receiving proposals from you!