



NATIONAL SCIENCE FOUNDATION
2415 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22314

NSF 20-074

Dear Colleague Letter: Conferences for Building Computational Literacy in Biological Sciences

April 24, 2020

Dear Colleagues:

The National Science Foundation's (NSF) Directorate for Biological Sciences (BIO) seeks to highlight the importance of computational thinking in biology and STEM education. This activity is a part of NSF's contribution to the Office of Science and Technology Policy's (OSTP) [2018 report](#) "Chartering a Course for Success: America's Strategy for STEM Education". The report includes several recommendations, including the one highlighted in this letter: building computational literacy.

The OSTP report represents the Federal Government's five-year strategic plan for STEM education, based on a vision for a future where all Americans will have lifelong access to high-quality STEM education and the United States will be the global leader in STEM literacy, innovation, and employment.

BACKGROUND

Computational thinking (CT) encompasses a set of processes that defines a problem, breaks it down into components, and develops formal models to solve the problem, which could ultimately be solved by a computer. The solutions are then evaluated, changes to the process are iterated, and the entire process is repeated to generate better solutions to the original problem. Although the concept was developed in computer science, it is increasingly seen as a set of broadly valuable thinking skills that helps people solve problems, design systems, understand human behavior, and that can be learned at a very young age without involving computer coding. In an increasingly technological and complex global economy these types of approaches to problem solving are increasingly relevant both now and in preparing the next generation of researchers.

CT provides a unique approach to problem solving which can provide new insights into potential solutions to the biggest problems in Biology. Modern biological research often

involves large and dynamic data sets which require computational tools and skills to fully utilize. CT can be a valuable addition to many areas in education, giving every learner the capacity to evaluate information, break down a problem, and develop a solution through the appropriate use of data and logic. Acquisition of CT skills would better prepare biological scientists to engage in or collaborate with experts in data science, mathematical modeling, and machine learning in order to fully explore the richness of biological data to understand biological function, and with engineers, they can leverage biology's innovations to enhance the bioeconomy.

SUMMARY OF THE OPPORTUNITY

With this Dear Colleague Letter (DCL), BIO encourages proposals to conduct conferences, workshops or other training events that will provide short term training opportunities to students, researchers, or teachers in order to promote computational thinking in biological research. Such activities are typically identified as conferences in the *NSF Proposal & Award Policies & Procedures Guide* ([PAPPG](#)) and will hereafter be referred to as conferences.

The activities should prioritize providing hands on and interactive learning opportunities. Activities should bring ideas from computational modeling, big data and artificial intelligence, computer science, algorithm development and/or related topics that involve computational thinking and apply them to biological contexts. Trainings should bring together participants from a range of backgrounds to learn ways to integrate CT into biology, discuss challenges facing the use of CT in biology, and provide opportunities for participants to discuss their own applications of CT.

PREPARATION INSTRUCTIONS

Information on preparing and submitting conference proposals, including required elements of the proposal, is contained in Chapter II.E.7 of the [PAPPG](#). Proposals should be directed to either the Division of Biological Infrastructure (DBI), Division of Environmental Biology (DEB), Division of Integrative Organismal Systems (IOS), or the Division of Molecular and Cellular Bioscience (MCB), within BIO. Each proposal submitted in response to this DCL should be grounded in CT applications to biological research relevant to one of those divisions. PIs are encouraged to contact a Program Officer in one of these divisions about suitability of the proposed conference prior to submission. The proposal should address the intended audience and a plan to evaluate the success of the opportunity. Proposals budgets should be well-justified for the scope of the proposed activities but should be less than \$100,000 for one- or two- year award duration. All proposals submitted in response to this DCL must include the prefix 'COSTEM:' in front of the title. These conference proposals can be submitted at any time.

POINTS OF CONTACT

Inquiries or questions about this DCL and submission of conference proposals can be directed to any Program Officer in each of the 4 divisions at BIO-CT@nsf.gov.

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