



National Science Foundation

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Dear Colleague Letter for Biological and Computing Shared Principles (BCSP)

Directorate for Biological Sciences
Directorate for Computer & Information Science & Engineering
Offices of the Assistant Directors

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The biological and computing research communities have a history of mutual influence; the transfer of questions, ideas, techniques, and technologies has resulted in significant advances in both fields. As these fields become more integrated, the conversations between biology and computing are becoming less about applying one discipline to another, and more about convergence of the central ideas and problems requiring the theoretical, experimental, and methodological competencies of both biology and computing.¹

The Biological Sciences (BIO) and Computer & Information Science & Engineering (CISE) Directorates invite proposals that advance research focused on principles shared between the two disciplines. Proposals that include sustained, synergistic collaborations, leading to new advances in both disciplines, will be the most competitive. Proposals should address **shared principles** that contribute to conceptual advances in both biology and computing. We recognize that new ideas are emerging rapidly at the crossroads of the biological sciences and computing, and we encourage investigators to pursue novel focus areas that identify **shared principles**. Potential topics could include, but are not limited to:

- Knowledge extraction
- Cross-scale/Multi-scale information flow, processing, and analysis
- Adaptation to unanticipated novel conditions
- Robustness and reliability
- Representations and coding
- Integrated and continual learning
- Self-repair and maintenance
- Pattern recognition and pattern generation
- Network structure, function and dynamics
- Functions of stochasticity
- Co-evolution and defense against adaptive adversaries
- Molecular computation
- Theoretical biology and theory of biological computation

This is not a special competition or new program. Proposals should be submitted to existing programs. Several are receptive to proposals targeting shared principles between biology and computing: Cyber Physical Systems (CPS), CAREER and all BIO and CISE core programs. Other existing or future programs may also become appropriate and will be listed on the Biological and Computing Shared Principles web site (<http://www.nsf.gov/bcsp>). Proposals submitted in response to this letter should prefix their title with “**BCSP:**” so that they can be easily identified. Investigators are strongly encouraged to contact the working group (email: bcsp@nsf.gov) to determine if their proposed ideas respond to the BCSP goals. Proposals must meet the requirements of the program to which they are submitted. Target and deadline dates may be found by searching for the appropriate program at <http://www.nsf.gov/funding>.

This Dear Colleague Letter is expected to be in effect from FY2012 through FY2014. We look forward to hearing from you.

Sincerely,

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Biological and Computing Shared Principles web site: <http://www.nsf.gov/bcsp>.

ⁱ National Academy of Sciences, 2005. *Catalyzing Inquiry at the Interface of Computing and Biology*

National Academy of Sciences, 2008. *The Role of Theory in Advancing 21st-Century Biology: Catalyzing Transformative Research*. Shared Principles Between the Computing and Biological Sciences: Report on an NSF Workshop, May 25-26, 2010 (<http://web.cecs.pdx.edu/~mm/SharedPrinciplesWorkshopMay2010/>)