



**National Science Foundation**  
**4201 Wilson Boulevard**  
**Arlington, Virginia 22230**

Directorate for Biological Sciences  
Office of the Assistant Director

October 17, 2008

NSF 08-078

Subject: Life in Transition (LiT)

Dear Colleague:

The Biological Sciences Directorate (BIO) is augmenting funding to support emerging areas of interdisciplinary research, many of which lie at the intersection of the life and physical sciences. Priority will be given to projects that address fundamental questions about **Life in Transition (LiT)** including: *how the living world has and is adapting to and transforming the Earth's climate, the diverse strategies by which living systems obtain and use energy, and life's origins and indispensable properties.*

- Earth's history is deeply entwined with the evolution and proliferation of life, and living systems continue to alter and shape Earth's air, land, and water today. Earth has experienced a number of geological and climate altering events resulting in profound transformations of the living world including vast episodic extinctions of many life forms. What are the principles and mechanisms of resilience and sustainability that enable some life forms to survive, adapt to, and transform their environment? What are the positive and negative feedback mechanisms affecting the interaction of the living and nonliving worlds, including Earth's climate system? How do the inherent properties of robustness and fragility of biotic networks and feedback loops determine the resilience and susceptibility of life to environmental change? What realistic expectations about the direction and magnitude of planetary change can be drawn from a comprehensive understanding of how the living world has and is shaping Earth's climate?
- The search for undiscovered life on Earth - including a vast and still poorly known microbial world yet to be incorporated into fundamental concepts of life's history - has begun to expand our knowledge of biological energy transduction systems. How is energy transduction managed by living systems of all types and scales and across the diverse range of physical environments found on Earth? How can knowledge of these systems contribute to our understanding of life's origin and adaptation to changing environments; inform the search for life on other worlds; and inspire and enable development of scalable biology-based energy technologies?
- The rapidly growing molecular, paleontological, and geological record of life on Earth can delimit the likely conditions under which life evolved, but cannot explain how life arose on Earth. What are the likely pathways that led from pre-biotic inorganic chemistry and geochemistry to the biochemistry of life, and then to one or more ancestors to all of life on Earth? What constitutes a

“core metabolism” and what aspects of metabolic function are related to biological diversification beyond that core? How can the reductive and constructive approaches of molecular engineering (synthetic biology) define the indispensable properties of life or reengineer natural designs and systems?

We seek to foster transformative advances within and among programmatic areas that integrate concepts and observations across diverse fields of scholarship relevant to **Life in Transition**. We are particularly interested in collaborative, interdisciplinary proposals that address the aforementioned topics in **Life in Transition**. The most competitive proposals will integrate questions and approaches across disciplines; e.g., in two or more divisions in the Biological Sciences (DEB, DBI, IOS, MCB) or one division in the Biological Sciences and a division in another NSF Directorate. In addition, the core programmatic areas within BIO will continue to address these areas and provide a robust and adaptable framework to build our understanding of the biological sciences.

**This is not a special competition or new program. Relevant proposals are to be submitted to an existing BIO cluster/program according to the regular target or deadline dates.** Target and deadline dates for applicable programmatic areas may be found on cluster web pages in each division of BIO, accessible from the BIO homepage at [www.nsf.gov/BIO](http://www.nsf.gov/BIO). *For full proposals submitted via FastLane, standard [Grant Proposal Guidelines](#) apply. For full proposals submitted via Grants.gov, see NSF Grants.gov Application Guide; A Guide for the Preparation and Submission of NSF Applications via Grants.gov (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: <http://www.nsf.gov/bfa/dias/policy/docs/grantsgovguide.pdf>.)*

This Dear Colleague Letter is expected to be in effect from FY2009 through FY2011. Titles of proposals emphasizing **Life in Transition (LiT)** should be prefaced with "**LiT:**". The review process will follow standard practices of the BIO program to which the proposal is submitted. Investigators are strongly encouraged to contact the Life in Transition Working Group ([bio-litwg@nsf.gov](mailto:bio-litwg@nsf.gov)) to determine if their proposed ideas respond to the LiT goals, discuss relevant topics of interest, and gain advice on how best to prepare a proposal for this activity. We look forward to discussing your ideas.

Sincerely,

James P. Collins  
Assistant Director for Biological Sciences  
National Science Foundation