



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

NSF 11-024

Dear Colleague Letter: US-China Collaborative Research in Advanced Sensors and Bio-inspired Technology (ASBIT) Opportunity

The U.S. National Science Foundation (NSF) and the National Natural Science Foundation of China (NSFC) jointly seek to enhance opportunities for collaborative activity between US and Chinese investigators and intend to jointly support transformative, cross-disciplinary, collaborative research on Advanced Sensors and Bio-Inspired Technologies (ASBIT).

For the support of the US portion of the collaborative research, requests for supplemental funding to existing NSF grants will be accepted by the Civil, Mechanical and Manufacturing Innovation (CMMI) and/or Chemical, Bioengineering, Environmental, and Transport Systems (CBET) Divisions of NSF's Directorate for Engineering (ENG).

Building on the transformative innovations in science and engineering achieved through NSF support of multidisciplinary research teams, the Directorate for Engineering initiated the Emerging Frontiers in Research and Innovation (EFRI) program. This program specifically supports interdisciplinary teams embarking on rapidly advancing frontiers of fundamental engineering research. In FY 2009 an EFRI initiative titled BioSensing & BioActuation: Interface of Living and Engineered Systems (BSBA) was announced and 12 awards were made (see: http://www.nsf.gov/eng/efri/fy09awards_BSBA.jsp). Subsequently, global interest in BSBA and related research has proliferated, with BSBA research opportunities arising in major countries across both Asia and Europe in 2010. This international support for related research activities presents a unique opportunity for US researchers to engage in pioneering multidisciplinary research on Advanced Sensors and Bio-Inspired Technologies (ASBIT) that is also multinational in nature. This Dear Colleague Letter announces one specific opportunity.

Innovations in many application areas of major national need, ranging from environment monitoring to infrastructure protection, are expected to be possible through the adoption of bio-inspired technological solutions to the design of micro- or nano-scaled transduction components, sensing materials, and information processing strategies. China, through its National Natural Science Foundation (NSFC), shares similar interest in technological innovations towards such national need. Therefore, the NSF's Engineering Directorate, through its CMMI and CBET Divisions, is accepting requests for supplemental funding to conduct collaborative research on Advanced Sensors and Bio-inspired Technology that explicitly involve collaboration between researchers in the US and China.

The main objective of this collaborative research opportunity is to leverage the different perspectives and expertise of U.S. and Chinese researchers working in this emerging and rapidly growing interdisciplinary field to address major societal needs that are of interest to both countries. This will be accomplished by fostering bilateral collaborations aimed at conducting strategic research on the development of advanced sensors and the use of bio-inspired technologies. This initiative will focus on common national-need application areas that include infrastructure protection and sustainability, detection and control of environmental pollution, food contaminants and security agents, and mega-scale natural disaster mitigation.

Three ASBIT engineering research topics that will be granted highest priority for support through awards made in response to this Dear Colleague Letter require knowledge of how living systems interface with their physical environment. The topics are:

1. Engineering of system-level autonomy with bio-inspired attributes:
 - biological systems process comprehensive, spatially distributed information with much greater efficiencies than currently can be realized using multiple discrete state inputs and state controllers.
 - next generation of engineering systems are envisioned that are autonomous, cognitive and have capabilities of self-sensing, self-monitoring, self-healing, self-renewing and self-regenerating.
2. Creation of biology inspired new materials for biosensing and response mechanisms:
 - bio-inspired multifunctional materials with distributed sensing and control capabilities could have great use in, for example, next-generation artificial skins for sustainable buildings (e.g. a breathable building skin), and intelligent mechanical systems.
 - creation of extremely durable, highly ductile, self healing materials needed to develop next generation structural fuse components for earthquake-tolerant bridge concepts might be achieved through cross-disciplinary research in bio-inspired technologies.
 - multifunctional nanomaterials with predefined physical, chemical, or biological detection characteristics are required for advanced biosensing applications.
3. Development of bio-inspired micro- and nano-scale sensing and transduction components:
 - biological systems sense and react to their environment with great speed.
 - transduction processes within cells, and/or the reactions triggered by input to tactile sensors, auditory systems or visual stimuli can be used to guide design of micro- and nano-scale systems that incorporate both sensors and actuation/reaction components.
 - new micro- and nano-scale sensing and actuation technologies that are based on cellular or biological system transduction should feature small size, low power demand, improved functionality and enhanced reliability compared to current state of the art transducers.
 - fundamental understanding and study of bio-macromolecules (proteins, peptides, etc.) confinement and orientation at the micro- and nano-interfaces is crucial for high-throughput biosensing development and applications.

The supported research projects will forge powerful partnerships between US and Chinese research and education communities and will support the development and training of the next generation of researchers, educators and global leaders in the interdisciplinary field of advanced sensors and bio-inspired technologies in a cross-cultural environment.

PREPARATION AND SUBMISSION INSTRUCTIONS

Requests for supplemental funding for an existing award should be submitted prior to a Target Date of March 30, 2011. Requests for supplemental support must be submitted electronically via FastLane in accordance with the guidance in Chapter I.E. of the NSF Award and Administration Guide (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag).

One section of the supplemental request should elaborate on the role and value of international collaboration in the proposed research. In addition, the CV of the Chinese collaborator should be provided to NSF. The collaborating PI from China must submit a separate proposal for support of their effort to the NSFC (<http://www.nsf.gov.cn/Portal0/default124.htm>).

Merit Review: In addition to the two NSB-approved merit review criteria of intellectual merit and broader impacts, reviewers will consider: mutual benefits, true intellectual collaboration with the foreign partner(s), benefits to be realized from the expertise and specialized skills, facilities, sites and/or resources of the international counterpart, and active research engagement of U.S. students and early-career researchers, where such individuals are engaged in the research.

Funding decisions will be made by joint NSF and NSFC concurrence. The number of awards made by NSF in response to this Dear Colleague Letter will depend on the quality of the supplement requests received and the availability of funds. Principal Investigator(s) are encouraged to contact the appropriate NSF program director whose program is most germane to the proposal topic via email or telephone prior to submission of a proposal in response to this Dear Colleague Letter.

PRIMARY CONTACTS

The cognizant program officers for this opportunity are:

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ADDITIONAL INFORMATION

The Office of International Science and Engineering (OISE) will consider requests to support the participation of U.S. researchers and students for the initial phases of an international collaboration as described in the Catalyzing New International Collaborations solicitation (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12815&org=OISE&from=home). Catalytic grants would be made with the strong expectation that the next phase would involve submission of a follow-on proposal to the relevant ENG program for continued funding.

Sincerely,

Thomas W. Peterson
Assistant Director
Division for Engineering
National Science Foundation