



National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

NSF-NRI Graduate Student and Postdoctoral Fellow Supplements to NSF Centers in Nanoelectronics (NSF 10-031)

Submission Deadline: May 10, 2010.

Dear Colleague:

Since 2005,¹ the National Science Foundation (NSF) has undertaken a cooperative effort with the Semiconductor Industry Association (SIA) through the industry's Nanoelectronics Research Initiative (NRI)² to provide supplemental funding opportunities to NSF centers involved in long-term nanoelectronics research. The supplemental funding supports additional graduate students and postdoctoral fellows to work in collaborative efforts with participating NRI company assignees on exploring new concepts beyond the scaling limits of CMOS (Complementary Metal Oxide Semiconductor) technology. Such efforts are intended to enhance nanoelectronics research and education, strengthen industry linkages with NSF centers, and develop future cadres of industry and faculty researchers to help drive the field.

NRI is encouraging exploratory nanoelectronics research at universities on topics with the potential for maintaining the historical scaling of both computational power and cost of information processing (<http://nri.src.org>). NSF is leveraging its significant fundamental research investments in nanoelectronics that have been made through its National Nanotechnology Initiative investment and its core programs in nanoscale science and engineering (<http://www.nsf.gov/crssprgm/nano/>). These research investments contribute to the fundamental research base and the creation of new knowledge that are critical to sustaining the U.S. leadership and competitiveness in the global semiconductor industry.

NSF and NRI are continuing this cooperative supplement opportunity for a fifth year. The supplement research topics must be consistent with the goals of the NSF centers and must also align with the goals of NRI to find a novel, non-FET based logic switch as a successor to CMOS technology. NRI is focused primarily on research on devices utilizing new computational state variables other than the control of electronic charge by a potential barrier utilized in current FET technology. For this supplement opportunity,

¹ [NSF 05-598](#); [NSF 06-051](#); [NSF 07-051](#); [NSF 09-016](#)

² NRI is administered by the Nanoelectronics Research Corporation (NERC), a subsidiary of the Semiconductor Research Corporation (SRC). Five SIA member companies are currently participating in NRI: AMD/GLOBALFOUNDRIES, IBM, Intel, Micron Technology, and Texas Instruments.

NRI is particularly interested in three areas: Circuit architectures for doing computation with non-FET devices; directed self-assembly and bottoms-up fabrication of specific non-FET device structures; and nano-engineering of phonon flow in non-FET devices and circuits to control heat and enable non-equilibrium behavior. Since the primary limitation to scaling is increasing power density, all of the non-FET devices and architectures should focus on opportunities for achieving low energy consumption while maintaining high computational speed, and NRI is open to new ideas in this area in general.

NSF and NRI will each provide \$1,000,000 in funds, for a total investment of \$2,000,000, subject to the availability of funds. This will allow approximately five or six NSF centers to receive supplemental funding, in the range of \$200,000 to \$400,000 total funding each, for duration of two or three years. All NSF centers (this includes networks) involved in nanoelectronics research are eligible to apply, including those that were awarded supplements in the previous competitions. In addition to the continued active engagement of the Network for Computational Nanotechnology (NCN), Nanoscale Science and Engineering Centers (NSEC), and Materials Research Science and Engineering Centers (MRSEC), the Engineering Research Centers (ERC), Science and Technology Centers (STC), and National Nanotechnology Infrastructure Network (NNIN) are encouraged to consider applying this year. Note that the NSF center must have an active award that extends for the duration of the supplemental funding, through 2011 or 2012 for a two or three year award, respectively. Please contact one of the NSF officials listed below if there is a question of eligibility.

Only one of the PIs in a project is required to be associated with an NSF center, and investigators are encouraged to partner with each other to address the challenges proposed (e.g. a circuit researcher with a device researcher). Proposers are also encouraged to contact the NRI director (listed below) or any of the NRI centers (<http://nri.src.org>) to learn what switching phenomena and device areas are currently showing promise.

For NSF centers new to the NSF-NRI competition, the supplemental funding request should include: (1) summary of the center's current research in the area of nanoelectronics, and (2) description of the proposed new work on exploratory beyond-CMOS research in which the additional graduate students and/or postdoctoral fellows would be involved. The request must also attach, as a Supplementary Document, a letter of support from the NRI. Early contact with industry via NRI is necessary to secure this support letter, and applicants are strongly encouraged to contact the NRI director at least one month prior to the submission deadline. NRI will assist in the development of industry-relevant aspects of the proposed plan.

For NSF centers that were awarded supplements in previous competitions,³ the supplemental funding request should include: (1) summary of the center's current research in the area of nanoelectronics, (2) progress report for previous supplements

³ See NSF web site at: <http://www.nsf.gov/crssprgm/nano/> for listing of supplement awards from FY2006-2009.

including involvement of industry liaisons, and (3) description of the proposed new work on exploratory beyond-CMOS research in which the additional graduate students and/or postdoctoral fellows would be involved. The proposed new work must differ significantly from previous supported supplement topics. The request must also include a letter of support from the NRI.

Supplemental funding requests must be prepared in accordance with the NSF Award and Administration Guide, Chapter I.E.4, and be submitted electronically via FastLane. (See: http://www.nsf.gov/pubs/policydocs/pappguide/nsf10_1/aag_1.jsp#IE4). The length of the supplemental funding request summary of proposed work should not exceed six (6) text pages. Please note that NSF requires that each proposal requesting funding to support postdoctoral researchers must include a description of the mentoring activities that will be provided for these individuals. The postdoctoral mentoring plan should be included as a one page supplementary document.

Following submission of the supplemental funding request to FastLane, **please email confirmation** to <NSF-NRIsupplement@nsf.gov> giving the supplement number assigned by FastLane, the name of the PI and of the NSF center, and the title of the supplement. This will assure that we accurately track all submissions. The deadline for submission of supplemental funding requests via FastLane is 5 pm local time, May 10, 2010. Applicants should contact NRI at least one month prior to this deadline in order to secure a letter of support in time.

Supplemental funding requests will be reviewed internally by NSF program officers from the participating directorates. Funding decisions will be made jointly by NSF and NRI on topics of interest to NRI participants consistent with the mission of the respective NSF centers. NSF and NRI will use their own award mechanisms in jointly funding these supplements. NSF support will be provided up-front as supplemental funding to the existing awards. NRI funds will be awarded as unrestrictive gifts, with no overhead or intellectual property requirements.

NSF and NRI will provide joint oversight for the supplement awards. Annual progress reports on work conducted under the supplemental funding will be submitted to NSF and NRI, and participation in the NRI annual review is expected.

Please contact the following officials should you need additional information:

- Directorate for Engineering
 - Lawrence S. Goldberg, E-mail: lgoldber@nsf.gov
- Directorate for Mathematical and Physical Sciences
 - Thomas Rieker, E-mail: trieker@nsf.gov
- Directorate for Computer and Information Science and Engineering
 - Sankar A. Basu, E-mail: sabasu@nsf.gov
- Nanoelectronics Research Initiative (NRI)
 - Jeffrey Welser, E-mail: jeff.welser@src.org

Sincerely,

Thomas W. Peterson
Assistant Director for Engineering

Edward Seidel
Acting Assistant Director for Mathematical and Physical Sciences

Jeannette Wing
Assistant Director for Computer and Information Science and Engineering