



# Supplemental Funding Options at the National Science Foundation (NSF)

I/UCRC Annual Meeting-January 8, 2009

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**Program Manager**  
**NSF-Directorate for Engineering**  
**Division of Engineering Education and Centers (EEC)**  
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# Presenters

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★ Mary Poats

- Program Manager, Division of Engineering Education and Centers (EEC), Directorate for Engineering (ENG)



★ Anne Emig

- Program Manager, Office of the Director (OD), Office of International Science and Engineering (OISE)
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# Research Experiences for Undergraduates (REU)

## Program Goals

<http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf07569>

- ★ **Expand student participation in all kinds of research-disciplinary, interdisciplinary, or educational in focus-by single investigators, groups, centers, national facilities, etc.**
- ★ **Help develop a diverse, internationally competitive and globally-engaged scientific and engineering workforce**
- ★ **Promote integration of research and education**
- ★ **Encourage faculty to seek talented students traditionally not included in research activities**



# Research Experiences for Undergraduates (REU)

- ★ Supports active research participation by undergraduate students in any of research areas funded by NSF
- ★ Involves students in meaningful ways in ongoing research programs or in research projects specifically designed for the purpose.
- ★ Department of Defense (DoD)-Awards to Stimulate Support for Undergraduate Research Experiences (ASSURE)
- ★ Projects with an International Dimension (<http://www.nsftokyo.org/REU/>)
- ★ Optional Component addressing Ethics in Science or Engineering (<http://www.onlineethics.org/>)





# Research Experiences for Undergraduates (REU)

<http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf07569>

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## ★ REU Sites

- Requires an independent proposal - competitive process
- May be single discipline or multidisciplinary
- Deadline-sometime in August 2009

## REU Supplements

- Supplement to active NSF award
- Research experience for 1 undergraduate student
- Varies with each program/contact Program Director
- ENG Contact: Esther Bolding ([ebolding@nsf.gov](mailto:ebolding@nsf.gov)), Program Manager





# Research Experiences for Teachers (RET) in Engineering (Supplements and Sites)

<http://www.nsf.gov/pubs/2007/nsf07557/nsf07557.htm>

Contact: Mary Poats [mipoats@nsf.gov](mailto:mipoats@nsf.gov)

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- ★ **Build long term collaborative relationships between in-service and pre-service K-12 math and science teachers, community college faculty and the research community**
- ★ **Support active participation of teachers and community college faculty in research and education projects funded by NSF**
- ★ **Facilitate professional development of teachers and community college faculty through strengthened partnerships between higher education institutions and local school districts**
- ★ **Encourage researchers to build mutually rewarding partnerships with teachers and community college faculty**



# Research Experiences for Teachers (RET) in Engineering Supplement

<http://www.nsf.gov/pubs/2007/nsf07557/nsf07557.htm>

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- ★ **Request should be made under an existing NSF award or within a proposal for a new/renewal NSF award. Contact cognizant NSF Program Director for deadline date**
- ★ **Total cost of supplement is \$10,000 per teacher; up to two teachers per supplement request, total \$20,000**
- ★ **Budget includes teacher/faculty stipend and up to \$2,000 for the cost of materials, equipment, software, supplies for developing classroom instructions and experiments**
- ★ **Administrative allowance (limited to 25% of teacher's stipend only) allowed in lieu of indirect costs**



# Research Experiences for Teachers (RET) in Engineering Sites

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- ★ **Project based on independent proposal submitted to ENG in annual competition**
- ★ **Provides groups of in-service and pre-service K-12 teachers and community college faculty with discovery based learning experiences in university labs and facilities which are incorporated into school year classroom activities**
- ★ **Project carried out during summer, academic year or both**



# Research Experiences for Teachers (RET) in Engineering Sites

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- ★ **Must have well-defined focus, with clearly articulated projects and activities**
- ★ **Involves participants in on-going NSF supported research activity for at least 6 weeks**
- ★ **Orientation session required**
- ★ **Sustained follow-up required to ensure research experience translated to classroom practice**
- ★ **Evaluation plan required of proposed project and classroom impact**



# *REU and RET Program Evaluations*

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★ SRI International

★ <http://www.sri.com/policy/csted/reports/>





# *Grant Opportunities for Academic Liaison with Industry (GOALI)*



## The Mechanisms

- ★ Faculty and Students in Industry
- ★ Industry Scientists and Engineers in Academe
- ★ Industry-University Collaborative Research Projects





# *How to Get GOALI Information*

- ★ Go to [www.nsf.gov](http://www.nsf.gov).....NSF Home Page
- ★ Click on Engineering
- ★ Click on GOALI..... NSF 07-522
- ★ Click on HTML.....Get GOALI text

Questions call Don Senich (703) 292-7082 or  
Glenn Larsen (703)-292-4607



# Nanotechnology Undergraduate Education (NUE) in Engineering Program

NSF 08-544 (in revision)

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- ★ **Integrate nanoscale science and engineering into curricula with emphasis on:**
    - Nanoscale engineering education with relevance to nanodevices and systems and societal dimensions of nanotechnology
    - New approaches to undergraduate engineering education through interdisciplinary collaborations
  - ★ **Undergraduate STEM courses**
  - ★ **Teaching modules – lecture, lab, software, etc.**
  - ★ **Incorporating undergraduate research opportunities based on nanoscale science and engineering into the engineering curriculum**





# Nanotechnology Undergraduate Education (NUE)

NSF 08-544 in revision

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- ★ April 2009 (est.)-Full proposal
- ★ Up to 10 awards (est.)
- ★ Up to \$200,000 total for up to two years
- ★ Contact: Mary Poats [mpoats@nsf.gov](mailto:mpoats@nsf.gov)



*Innovations in Engineering Education,  
Curriculum, and Infrastructure (IEECI)  
2009*

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Susan C. Kemnitzer, telephone: (703) 292-5347, email: [skemnitz@nsf.gov](mailto:skemnitz@nsf.gov)



# *EEC seeks proposals in four areas:*

<http://www.nsf.gov/pubs/2008/nsf08610/nsf08610.htm?org=NSF>

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★ 1. Innovations in Teaching and Learning  
(Expansion)



★ 2. Educational Opportunities Using  
Cyberinfrastructure and Virtual or Mixed Reality  
(Exploratory)



★ 3. Integrating Sustainability into Engineering  
Education (Exploratory)

★ 4. Future Directions for U.S. Engineering  
Doctoral Programs (Exploratory)



# *Anticipated Awards*

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★ Deadline is March 11, 2009



★ 8.5 M for 35 to 40 awards

- 10 expansion projects with maximum award amount of \$400,000
- 25 to 30 exploratory projects with maximum award amounts of \$150,000 or \$200,000 for multiple institutions.



★ Expect about 200 proposals (almost twice as many as 2008)

- Second year of program
- More time for proposal preparation which includes December holidays.



# *1. Innovations in Teaching and Learning (Expansion)*

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- ★ Projects will be supported that contribute to significant breakthroughs in understanding how students learn engineering so that our undergraduate and graduate programs prepare engineers to meet the needs of the changing economy and society.



# *Innovations in Teaching and Learning*

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## ★ **Engineering Epistemologies:**

- Research on what constitutes engineering thinking and knowledge within current and future social and economic contexts.



## ★ **Engineering Learning Mechanisms:**

- Research on engineering learners' developing knowledge and competencies in context, with special interest in evolving areas such as nanotechnology, service learning, and the intersection of biology and engineering.



## ★ **Engineering Learning Systems:**

- Research on the instructional culture, institutional infrastructure, and epistemology of engineering educators. Of special interest here is research on effective learning systems for the burgeoning role of distance education.

## ★ **Engineering Diversity and Inclusiveness:**

- Research on how diverse human talents contribute solutions to the social and global challenges and relevance of the profession.

## ★ **Engineering Entrepreneurship:**

- Research on, and the development of, entrepreneurial behavior.



## 2. *Educational Opportunities Using Cyberinfrastructure and Virtual or Mixed Reality (Exploratory)*

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- ★ EEC seeks proposed research efforts which will use existing computing, communication, and interactive technology to improve learning in engineering.
  - The proposed project must use technology reasonably available to universities and must not require custom or unusually high cost or high maintenance products so that the barrier to widespread adoption is low.
  - The project must demonstrate improved learning and/or improved retention and include dissemination of the project product as well as the research results.



# *Educational Opportunities Using Cyberinfrastructure and Virtual or Mixed Reality*

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- ★ How can interactive visualization be used to increase students' understanding of abstract concepts or phenomena which are not directly observable ?
- ★ How can interactive advanced simulations of social and well as technical context be used to increase students' experience with more complex, integrated, and realistic engineering problems?
- ★ How can collateral pathways through course material be provided to match a diversity of learning styles?
- ★ How can wider access be provided to either unique resources available only at large universities or research centers or to instrumentation and observation in environments with a high access cost (e.g. inside a volcano, under the sea, in space)?
- ★ What are the most effective professional development resources that can be made widely available to students in engineering programs and life-long learners?



### *3. Integrating Sustainability into Engineering Education (Exploratory)*

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★ The EEC seeks proposals which develop greater student understanding of and technical expertise in critical issues of sustainability. Sustainability means “meeting the needs of the present without compromising the ability of future generations to meet their needs.” Sustainable development marries two important themes: that environmental protection does not preclude economic development and that economic development must be ecologically viable now and in the long run.



★ Dealing with sustainability requires the ability to think creatively about complex systems from an engineering, environmental, ethical and economic perspective simultaneously.



★ At present our undergraduate and graduate students have too few opportunities to develop this important capability, and we seek proposals which will reverse this situation.



# *Integrating Sustainability into Engineering Education*

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- ★ How can principles of sustainability be infused into traditional courses and design projects?
- ★ How can engineering programs be improved by the development of new minors, or majors, or even more innovative strategies?
- ★ How can engineering programs integrate hands-on approaches of engaging students in internships with companies with exemplary sustainable operations, or research experiences involving sustainability questions?



## 4. *Future Directions for U.S. Engineering Doctoral Programs (Exploratory)*

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★ We seek proposals for exploratory projects on a wide range of ideas motivated by the following questions. For example,



- What are current attitudes of undergraduates toward pursuing a Ph.D. and academic career?
- How much do stipends and career earnings expectations impact student decisions?
- What changes might recently graduated PhDs suggest?
- What are the significant differences among disciplines?
- Are college management practices, like promotional and tenure guidelines, in alignment with improving pedagogy in Ph.D. programs?
- How does one measure quality in PhD programs?



★ Partnerships across universities and other interested parties are particularly encouraged.



# *Ethics Education in Science and Engineering (EASE)*

<http://www.nsf.gov/pubs/2008/nsf08530/nsf08530.htm>

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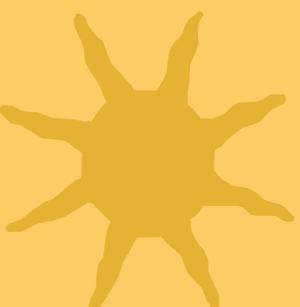
- ★ Accepts proposals for research and educational projects to improve ethics education in all of the fields of science and engineering that NSF supports, especially in interdisciplinary or inter-institutional contexts.
- ★ Proposals must focus on improving ethics education for graduate students in those fields, although the proposed programs may benefit advanced undergraduates in addition to graduate students.
- ★ Deadline: March 2, 2009
- ★ Contact: Sue Kemnitzer [skemnitz@nsf.gov](mailto:skemnitz@nsf.gov)





# *Cyber-Enabled Discovery and Innovation*

(*CDI*) <http://www.nsf.gov/pubs/2008/nsf08604/nsf08604.htm>



- ★ Multi-disciplinary research seeking contributions to more than one area of science or engineering, by innovation in, or innovative use of **computational thinking**
- ★ Computational thinking refers to computational...
  - ...Concepts
  - ...Methods
  - ...Models
  - ...Algorithms
  - ...Tools



# Three CDI Themes

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- ★ **From Data to Knowledge:** *enhancing human cognition and generating new knowledge from a wealth of heterogeneous digital data;*
- ★ **Understanding Complexity in Natural, Built, and Social Systems:** *deriving fundamental insights on systems comprising multiple interacting elements; and*
- ★ **Building Virtual Organizations:** *enhancing discovery and innovation by bringing people and resources together across institutional, geographical and cultural boundaries.*





## *More Information on CDI:*

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- ★ Contact: Eduardo Misawa(ENG) or members of the team listed in the solicitation
- ★ [cdi@nsf.gov](mailto:cdi@nsf.gov) ; (703) 292-8080;





# NSF Graduate Teaching Fellows in K-12 Education (GK-12)

[http://www.nsf.gov/pubsys/ods/getpub.cfm?ods\\_key=nsf08556](http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf08556) (in revision)

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- ★ **Designed to improve communication skills of the Nation's future STEM professionals, the STEM skills and understanding of the Nation's teachers, and the STEM knowledge of K-12 students.**
- ★ **Highly qualified graduate students serve as STEM resources in the K-12 classrooms, 5 hours/week in preparation, all in partnership with a K-12 teacher**

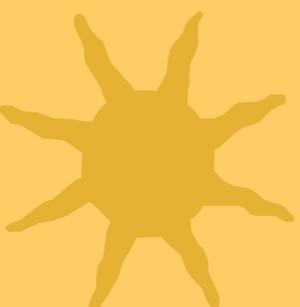


# NSF Graduate Teaching Fellows in K-12 Education (GK-12)

[http://www.nsf.gov/pubsys/ods/getpub.cfm?ods\\_key=nsf08556](http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf08556) (in revision)

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- ★ Available to academic institutions that award MS/MA or PhD degrees in STEM
- ★ Awards are for 5 years, \$600,000/year
- ★ In 2007/2008 academic year:
  - Graduate stipend of \$30,000/year
  - Cost of education allowance \$10,500/year
  - Funds available for support of teachers, K-12 schools and program infrastructure
  - Contact Information: [sortega@nsf.gov](mailto:sortega@nsf.gov)





# *NSF Graduate Research Fellowship Program*

<http://www.nsf.gov/pubs/2008/nsf08593/nsf08593.htm>

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- ★ Research-based Master's and PhD

- Disciplines within NSF mission

- ★ Award is portable

- 3 years funding over 5 year period



- ★ Stipend

- \$30K



- ★ Rising graduate and 1<sup>st</sup> year graduate students

- ★ Institution Cost of Education

- \$10,500



# *NSF Graduate Research Fellowship Program*

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- ★ Cycle—
- ★ Solicitation: August – November
- ★ Panels: January – February
- ★ Selection: March



- ★ Current Program—
- ★ 3,300 Fellows
- ★ 78 Fellows Abroad
- ★ 180 Institutions
- ★ Contact: William Hahn [whahn@nsf.gov](mailto:whahn@nsf.gov)





# Course, Curriculum and Laboratory Improvement (CCLI)

<http://www.nsf.gov/pubs/2009/nsf08546/nsf08546.htm>



- ★ **Educational Materials Development**  
-Full-scale development; Proofs-of-concept
- ★ **Adaptation and Implementation**  
-Course; Curriculum
- ★ **National Dissemination**  
-Workshops; Short Course
- ★ **Assessment of Student Achievement**
- ★ **Contact: Russell Pimmel ([rpimmel@nsf.gov](mailto:rpimmel@nsf.gov))**



# Integrative Graduate Education and Research Traineeship (IGERT) Program

<http://www.nsf.gov/pubs/2009/nsf09519/nsf09519.htm>

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- ★ **IGERT is a flagship NSF program addressing needs of the future in People and Ideas**
  - Funding for U.S. graduate student stipends and project education costs – not for research costs
  - Awards are ~\$3.5M over 5 years
  - Prelim. 3/13/09 Full: By Invitation 09/14/09
- ★ **Intended to catalyze a cultural change in graduate education – for students, faculty, and institutions**
  - Faculty and university have opportunity to experiment and innovate with graduate education and training
  - Interdisciplinary theme provides framework to integrate education and research





# IGERT Program

contact: Carol Van Hartesveldt [cvanhart@nsf.gov](mailto:cvanhart@nsf.gov)

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- ★ **Facilitates graduate student development in addition to new knowledge generation**
  - Boundary-crossing experiences for students
  - Professional and personal skills – communication, teamwork, teaching, ethics, leadership
  - Career development – internships, international perspectives
- ★ **Addresses diversity issues through recruitment and mentoring**
  - Women and minority groups underrepresented in science and engineering





# Faculty Early Career Development (CAREER)

<http://www.nsf.gov/pubs/2008/nsf08557/nsf08557.htm>

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- ★ *CAREER: The Faculty Early Career Development (CAREER) Program is a Foundation-wide activity that offers the National Science Foundation's most prestigious awards in support of the early career-development activities of those teacher-scholars who most effectively integrate research and education within the context of the mission of their organization.*
- ★ *Deadline: For ENG proposals, July 22, 2009*
- ★ *Contact Sharon Middledorf [smiddled@nsf.gov](mailto:smiddled@nsf.gov)*



# Advanced Technological Education (ATE)

<http://www.nsf.gov/pubs/2007/nsf07530/nsf07530.htm>

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- ★ Emphasis on two-year colleges; expected to have leadership role in all ATE projects
  - ★ Provides grants to strengthen education of technicians for careers in high-technology fields that drive our nation's economy
  - ★ Involves partnerships between academic institutions and employers to promote improvement in the education of science and engineering technicians at the undergraduate and secondary school levels
  - ★ Deadline dates: Preliminary proposal-April 23, 2009 and Full proposal-October 15, 2009
  - ★ Contact: Gerhard Salinger ([gsalinge@nsf.gov](mailto:gsalinge@nsf.gov))

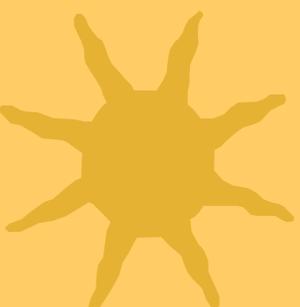




# Informal Science Education Supplements

<http://www.nsf.gov/pubs/2008/nsf08547/nsf08547.htm> (in revision)

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- ★ Supplements to develop learning activities from PI's research for all ages, interests, and backgrounds to increase appreciation for and understanding of science and engineering
- ★ \$50,000 maximum award for up to 24 months
- ★ Examples: museum exhibit, television documentary
- ★ Contact: [DRLISE@nsf.gov](mailto:DRLISE@nsf.gov)



# *Important Points!!*

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- ★ **THOROUGHLY Review the Program Solicitation!**
- ★ **Questions??? Contact Cognizant Program Director**
- ★ **Don't forget to address in Project Summary:**
- ★ **Intellectual Merit – Revised**
  - Encouragement for transformative efforts
- ★ **Broader Impacts – Frequently Missed**
  - <http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>





## *Important Points!!*

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- ★ **Serve on NSF panels**
- ★ **Submit timely Annual and Final Reports...holds up you and every Co-PI on subsequent proposals!**
- ★ **Send us your Program Highlights!!**





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*Thank You!!!*

*Have a great meeting!!*