

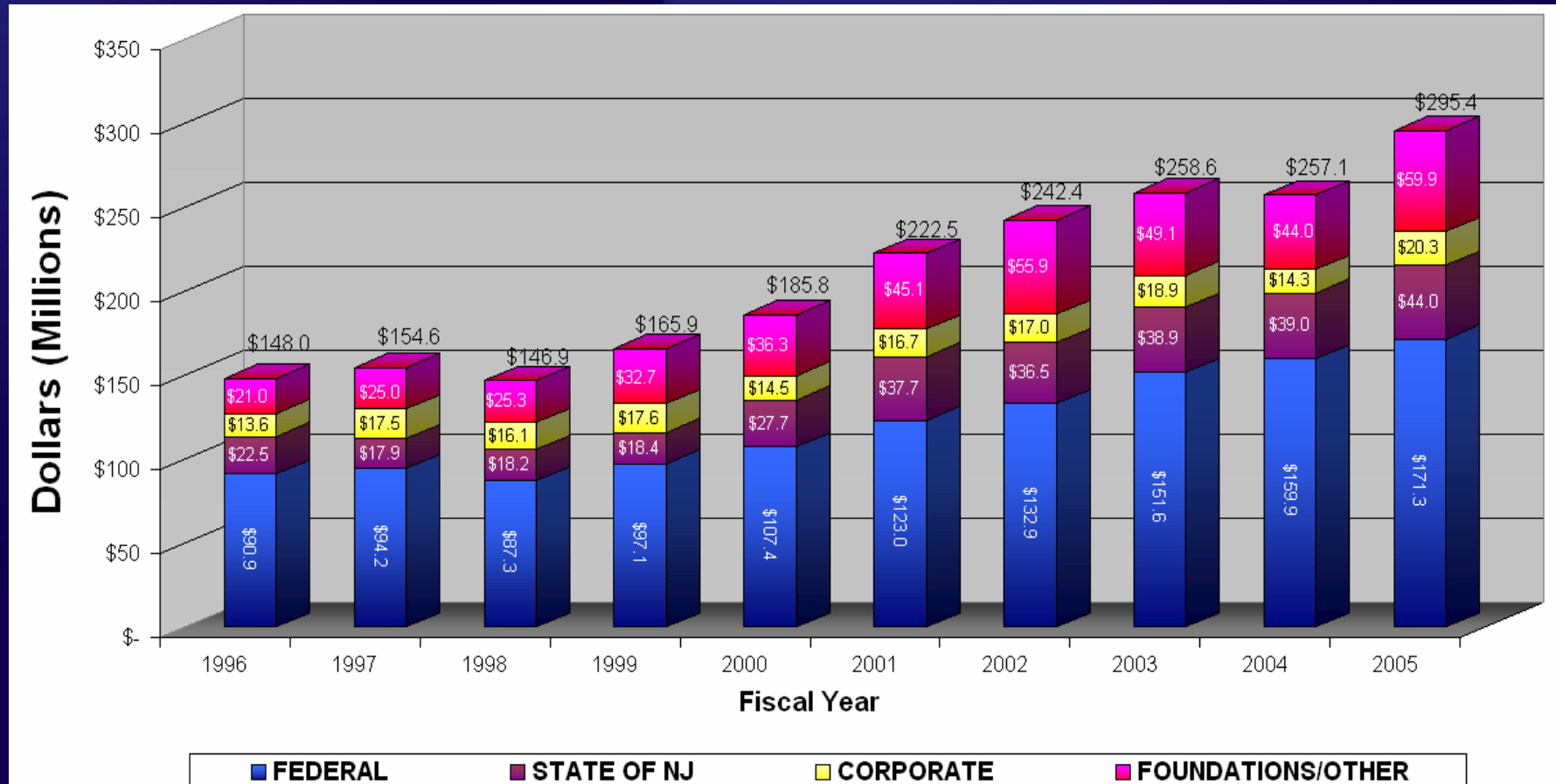
# Succeeding at Research Funding

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# Outline

- Resources for research
- Tips on proposals and programs

# Sponsored Research at Rutgers



# Funding for Research

- Funding Provides the Resources that facilitate research.
- Agencies and Foundations have missions or goals and provide funds to achieve those goals.
- Those goals often are aligned with university and faculty goals
  - Create new knowledge
  - Educate a diverse workforce
- State Funding is tight: Seek Federal support, e.g., graduate students (GAANN, IGERT, NIH training grants), curriculum development, etc.

# NSF Mission

National Science Foundation Act of 1950  
(Public Law 810507):

- To promote the progress of science;
- to advance the national health, prosperity, and welfare;
- to secure the national defense;

# NIH Goals

- 1. foster fundamental creative discoveries, innovative research strategies, and their applications as a basis to advance significantly the Nation's capacity to protect and improve health;**
- 2. develop, maintain, and renew scientific human and physical resources that will assure the Nation's capability to prevent disease;**

# Keck Foundation

- The W.M. Keck Foundation makes grants to research institutions and accredited institutions of higher learning primarily in the areas of Science and Engineering, Medical Research and **Liberal Arts**.
- Eligible institutions in these fields are U.S. accredited universities, colleges, medical schools and major, independent scientific and medical research institutions.

# DARPA MISSION

DARPA's mission is to maintain the technological superiority of the U.S. military and prevent technological surprise from harming our national security by sponsoring revolutionary, high-payoff research that bridges the gap between fundamental discoveries and their military use.

# Finding out about Opportunities

- ORSP Funding Resources
  - <http://orsp.rutgers.edu/funding.php>
  - GrantNet (Rutgers Monthly Newsletter of Funding Opportunities & Important Notices)
  - Sponsored Programs Information Network (SPIN)
  - Grants.gov
  - My NSF
- <http://www.foundations.org>
- <http://www.fundsnet services.com/national.htm>

# Anticipating Future Funding

- Look at Budget Request
  - Office of Science and Technology Policy
  - <http://www.ostp.gov/>
  - Agencies
    - <http://www.nsf.gov/about/budget/fy2007/>
    - <http://nihroadmap.nih.gov/>
    - <http://www.mbe.doe.gov/budget/07budget/Start.htm>
- Visit/Talk to officials at Agencies

# Responding to Solicitations

- Read entire solicitation and make sure proposal address all issues
  - Science
  - Evaluation
  - Diversity
  - Education
  - Management Plans
  - Collaboration Plan
- Make Sure Proposal Summary (Abstract) is easy to read and conveys all important issues
- Make sure title is descriptive of content
- Finish Submission one day early

# Course, Curriculum, and Laboratory Improvement (CCLI)

- **NSF 06-536**
- **National Science Foundation**  
Directorate for Education and Human Resources  
Division of Undergraduate Education  
**Full Proposal Deadline:** May 10, 2006
- The program supports efforts to create new learning materials and teaching strategies, develop faculty expertise, implement educational innovations, assess learning and evaluate innovations, and conduct research on STEM teaching and learning. The program supports three types of projects representing three different phases of development, ranging from small, exploratory investigations to large, comprehensive projects.
- **Important Project Features**
  - *Quality, Relevance, and Impact:*
  - *Student Focus:*
  - *Use of and Contribution to Knowledge about STEM Education:*
  - *STEM Education Community-Building:*
  - *Expected Measurable Outcomes:*
  - *Project Evaluation*

# Make Your Ideas Stand Out



# Make Your Ideas Stand Out



- Proposal Summary is extremely important
- Reviewer forms an initial impression that is seldom changed
- The proposal summary should be the ideal review of your proposal
  - Problem
  - Importance
  - Impact
- Submit in at least one day early → First in order.

# The NIH Process



CSR Receipt  
and Referral



Study  
Section



Institute/  
Program  
Director



Institute Funding  
Decision



Advisory Council



# How can you help yourself at NIH?

- Take advantage of opportunities for input
  - Use cover letter to request study section assignment
  - Use cover letter to request institute assignment or dual assignment

There are no guarantees!

# Increase acceptance rate by visiting funding agency before submitting proposal



- Learn more about what types of projects agency is looking for (e.g., balance between theory and observation)
- Explain to agency your ideas and accomplishments
- Find additional solicitations or agencies for support

# Meeting with Funding Officials

## Who to Talk to

- Organizer(s) of Review Panel
- Author(s) of Solicitation
- People who set budgets (usually the immediate supervisor of those people)

## What to talk about

- What you want to do
- Why it's important and novel
- What you've done in the past
- Why you think it fits the goals of the agency

Visit **BEFORE**, not after submitting

# Finding out what works

- Ask in department, college, or others in field (advisor) for proposals.
- Look at agency web site to see what was funded last year
- Freedom of Information Act: Get copy of any funded proposal and reviews (redacted).
- Volunteer to be a reviewer. (Great for seeing what doesn't work also).

# Common problems of noncompetitive proposals

- Problem not clearly articulated.
- Failure to differentiate the current work from others. i.e., seem to be completely unaware of relevant literature.
- Do not say WHY the research should be done
- Errors in the plan of attack
- An effort where the PI fails to identify the research issues
- Poor page space planning & Incremental work.  
Rule of thumb: Proposed New Work should be AT LEAST 60% of the project description
- Not understandable to generalist in field

# Common Problems of “near misses”

- Failure to differentiate from their own work.
- Solid, Incremental work without a truly fresh perspective. “The natural next step”
- Not very innovative, e.g., similar topics and approaches have been funded in the past or your most recent publication contains the same problem and approach.
- Great problem without a reasonable chance that they can accomplish it. Missing evaluation plan.
- Loosely integrated collaboration: two or more good ideas but not interrelated. (common to multidisciplinary and CAREER)
- Missing Expertise
- Important within subfield, but doesn't make the case that its important to larger field. (Decrease word error rate in small vocabulary interface)
- No mention of education, diversity, etc. (at a minimum, participate in school and university programs)

# Common Problems of center proposals

- Research that only one community cares about.
- Appeal to disciplines not at NSF (no cofunding), e.g., medicine, art.
- No Management Plan. Need plan for administration, outreach, science (even a board of advisors)
- Multi-site- Need collaboration plan
- Only mentions general school or university plans for education and diversity
- No Evaluation of education and diversity programs.
- Lack of breadth and depth. Just one superstar.
- Centers are often multi-site. Diversify your partnerships.
- Partners are weak
- Partnership is weak

# Diversity

- For small, single PI grants, at a minimum mention department and university programs, your participation in them, past accomplishments (mentored undergrad who went to grad school, Ph.D., who took faculty position, etc.)
- For larger grants (IGERT, Centers, etc.) agencies expect PIs to have active programs, keep track of stats, and assessment.
  - “inclusion” vs. outreach
  - Mentoring and pipeline issues
  - Coordinate with other programs: NEAGEP, RISE, etc.

# My proposal wasn't accepted.

## Should I resubmit? Probably, but...

- The reviewers didn't get it:
  - Was the proposal clear? Especially **summary & introduction**
  - Did you explain how it is a significant advantage over state of art broadly defined, **not just in your specialized area**
  - **Hint: Make Proposal Summary look like an ideal review**
- Did you address all the review criteria? Read announcement carefully
  - **Broader Impacts** – Mention Dept & School Outreach. Make it easy for others to build upon your work, education and research
  - **Research Plan- What will you do in year 3? Evaluation Plan?**
- Multi-investigator: **Integrate research topics** rather than append them. Be critical of each other.
- All the reviewers that it was pretty good, but none thought it was excellent → Are you sure the topic is important and innovative? Is this going to be the most cited work in 5-10 years?
- Is it Innovative, but achievable

# NSF: Small Grants for Exploratory Research (similar to NIH R03)

- Max: \$200K for 2 years
- Typical: \$75-100K for 1 year
- Exciting and innovative work but too preliminary. Expected High Payoff
- Not (usually) peer reviewed
- Ask before submitting
- Also used as consolation prize. Ask if you are turned down with a really promising proposal but “too preliminary”
- Don't ask too often.

# Supplements

- Add extra money to award. Not Peer Reviewed
- Now is good time to ask in budget cycle
- NSF
  - Research Experience for Undergraduates
  - International (add a collaborator) additional travel funds
  - Occasionally Equipment (ask to restore what was cut from your budget one year later)
- NIH
  - Research Supplements to Promote Diversity in Health-Related Research (**PA-05-015**)

# NSF REU Supplement

## REU Supplement ¶

1. ER - Feasibility and Funding: Suspension for the Active Control of Heat Transfer in  
Microtubes (27N-RECS #0404181) ¶

## Project Description ¶

Miniaturization of computer chips has led to an increasing demand for better thermal management techniques. The reduced size of microprocessors requires a more efficient way of removing heat from hot spots. Recently, microfluidic coating of hybrid suspensions of  $\text{nanotubes}$ , particles or tubes have shown considerable promise as enhanced heat transfer fluids for thermal management applications. For a volume fraction of 1%,  $\text{nanofluids}$  containing carbon  $\text{nanotubes}$  have been reported to have 2.5 times greater thermal conductivity compared to the fluid without  $\text{nanotubes}$ . This very counterintuitive finding must be explored to a greater extent. Carbon  $\text{nanotubes}$  are also unique in that their thermal conductivity is possibly orientation dependent. This property leads us to believe that aligning the  $\text{nanotubes}$  in the suspension will further increase the thermal conductivity of the  $\text{nanofluid}$ . Moreover, such an increase in the thermal conductivity would be actively controllable, since the orientation of the  $\text{nanotubes}$  can be controlled by an external electric field. The goal is then to develop a  $\text{nanofluid}$  having actively controllable thermal conductivity, so that heat transfer can be selectively enhanced, when and where needed. In our laboratory, we have demonstrated that external AC fields can align single-walled carbon  $\text{nanotubes}$  in hybrid suspensions. Furthermore, we can non-invasively detect the orientation of the  $\text{nanotubes}$  using optical diagnostics which depend on the alignment-induced polarization effect on a laser beam transmitted through the fluid sample ¶

This project extends and complements the ongoing research by introducing a new measurement technique for thermal conductivity. In particular, the undergraduate student will ¶

- 1) Construct a transient hot wire apparatus to measure the thermal conductivity of fluid samples ¶
- 2) Measure and compare the thermal conductivity for randomly dispersed and electric field aligned  $\text{nanotubes}$  solutions ¶

Currently, measurements of  $\text{nanofluid}$  thermal conductivity are being made in our laboratory by a parallel plate method. As an independent measurement technique, the transient hot wire method will provide additional data for comparison and help confirm the parallel plate measurement. Moreover, the hot wire apparatus has the potential to be a faster, easier-to-use method for determining the conductivity of small samples than the parallel plate technique. The work proposed under the REU Supplement will ideally complement ongoing research supported under the main grant ¶

## Justification ¶

### Form and Nature of Student Involvement ¶

The student will have the opportunity to conduct independent research on a portion of the overall project under the supervision of the PI and graduate students. He will design and construct the transient hot wire apparatus, collect data, and help analyzing the result. He will also meet regularly with the PI to discuss progress, and will participate in the weekly group meetings. Upon successful completion of the project, the student will co-author papers and conference presentations. The student will be expected to travel to the American Physical Society, Division of Fluid Dynamics, Annual Meeting to present results from his research ¶

### Experience of PI in Undergraduate Research ¶

The PI has had successful experience with undergraduate research in his laboratory. With support from Rutgers University under an Undergraduate Research Fellowships program, undergraduate students developed optical diagnostics for detecting  $\text{nanotubes}$ , oriented in the summer of 2004. Based upon successful completion of the project, the student co-authored an abstract presented at the American Physical Society, Division of Fluid Dynamics, Annual Meeting (Shan, J. W., Ezzamel, M., & Lim, C. 2004 Carbon nanotubes in hybrid suspensions: Electric field-induced alignment and optical anisotropy. *Bull. Am. Phys. Soc.*, 49, Proc. of APS DFD Ann. Mtg., Seattle, WA, Nov. 21-23). It is expected that the student supported by the REU Supplement will also co-author papers and conference presentations as a result of the research ¶

The PI also is currently mentoring two undergraduate women under Project SUPER, an excellent program for undergraduate women that provides undergraduate research experience in the sciences, math, and engineering. The students are gaining hands-on experience in the PI's laboratory, and are being encouraged to continue their studies in science and engineering. The Alfred P. Sloan Foundation provided the initial funds for this program which is now supported by Rutgers University ¶

### Personnel Justification ¶

Mr. Benjamin Reynolds is an undergraduate pursuing a dual major in Mechanical Engineering and Chemical Engineering. He has experience with the synthesis of  $\text{nanoporous silica particles}$  in a batch reactor, surface functionalization, scanning electron microscopy, and rapid prototyping. Mr. Reynolds was recruited for this project because of his unique background and abilities in both Mechanical and Chemical Engineering. His previous experience will be of immediate use to the preparation and characterization of carbon  $\text{nanotubes}$  suspensions in various fluids. The PI will further train Mr. Reynolds in the theory and application of the new measurement, and expose him to various fluid flow diagnostic techniques. Through this research opportunity, Mr. Reynolds will be encouraged to continue his academic/career development with graduate studies in science and engineering. Mr. Reynolds is a US citizen ¶

# Conclusion

- Increase Chance of Funding
  - Visit Agency before submitting and talk with program directors
  - Address all issues in solicitation
  - Make sure abstract covers all major points without being too dense
  - Submit one day early. (Allow ORSP time too)
- Once Funded
  - Ask for supplements
- Consider SGER and R03