



# Research Programs of the NSF Division of Mathematical Sciences

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Computational Mathematics, Mathematical Biology



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**Directorate**

ENG  
**MPS**  
GEO  
BIO  
CISE  
SBE  
EHR  
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**Division**

PHY  
CHE  
**DMS**  
AST  
DMR

**DMS Program**

Algebra / Number Theory /  
Combinatorics / Foundations  
Analysis  
Applied Math  
Computational Math  
Geometric Analysis / Topology  
Mathematical Biology  
Statistics & Probability  
Infrastructure  
Workforce

# What is new at NSF

[http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf0929](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf0929)

Updated PAPP manual.

New postdoctoral researchers mentoring plan requirement

Each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals.

The mentoring plan must not exceed one page.

Non-compliant proposals will be returned without review.



The screenshot displays the NSF website interface. At the top, the NSF logo and the text 'National Science Foundation WHERE DISCOVERIES BEGIN' are visible. A search bar is located in the top right corner. Below the header is a navigation menu with links for HOME, FUNDING, AWARDS, DISCOVERIES, NEWS, PUBLICATIONS, STATISTICS, ABOUT, and FastLane. The main content area features a 'Publications' sidebar on the left with links for 'Search/Browse Publications', 'Obtaining Publications', and 'Use of NSF Logos'. The main content area displays the title 'Proposal and Award Policies and Procedures Guide, April 2009' and provides details such as 'Available Formats: HTML | PDF', 'Document Type: Policies and Procedures', and 'Document Number: nsf0929'. It also includes a 'Public Comment' section stating the guide is effective for proposals submitted on or after April 6, 2009, and a 'Document History' section indicating it was posted on February 17, 2009, replacing document nsf091. A 'Print this page' button is located below the document information. The footer contains the NSF logo, contact information for the National Science Foundation (4201 Wilson Boulevard, Arlington, Virginia 22230, USA), and a 'Last Updated' date of April 29, 2009, with a link to the 'Text Only' version.

# What is new at NSF

- ▶ \$3B ARRA (stimulus) funding for NSF
  - *\$2.0B for Research & Related Activities account*
  - *\$0.5B for Education and Human Resources*
  - *\$0.5B for facilities and infrastructure*
  - *Context: ~\$100M for DMS, pro-rated basis*
- ▶ FY 2009 omnibus bill
  - *6.9% R&RA*

## **How will ARRA funds be spent?**

**Majority of the \$2 billion Research and Related Activities funds for proposals that are already in house and will be reviewed and/or awarded prior to Sept. 30, 2009.**

**Will result in a higher funding rate in FY09-FY11**

**All ARRA awards will be standard grants up to five years**

**Funding of new PIs and high-risk, high-return research: a top priority.**

# How will ARRA funds be spent?

**ARRA funds to increase the number of CAREER and IGERT awards**

## **Integrative Graduate Education and Research Traineeship Program (IGERT)**

Grants support interdisciplinary research and training of graduate students.

## **Faculty Early Career Development (CAREER) Program**

Grants support the research and education activities of junior faculty

## **New solicitations for**

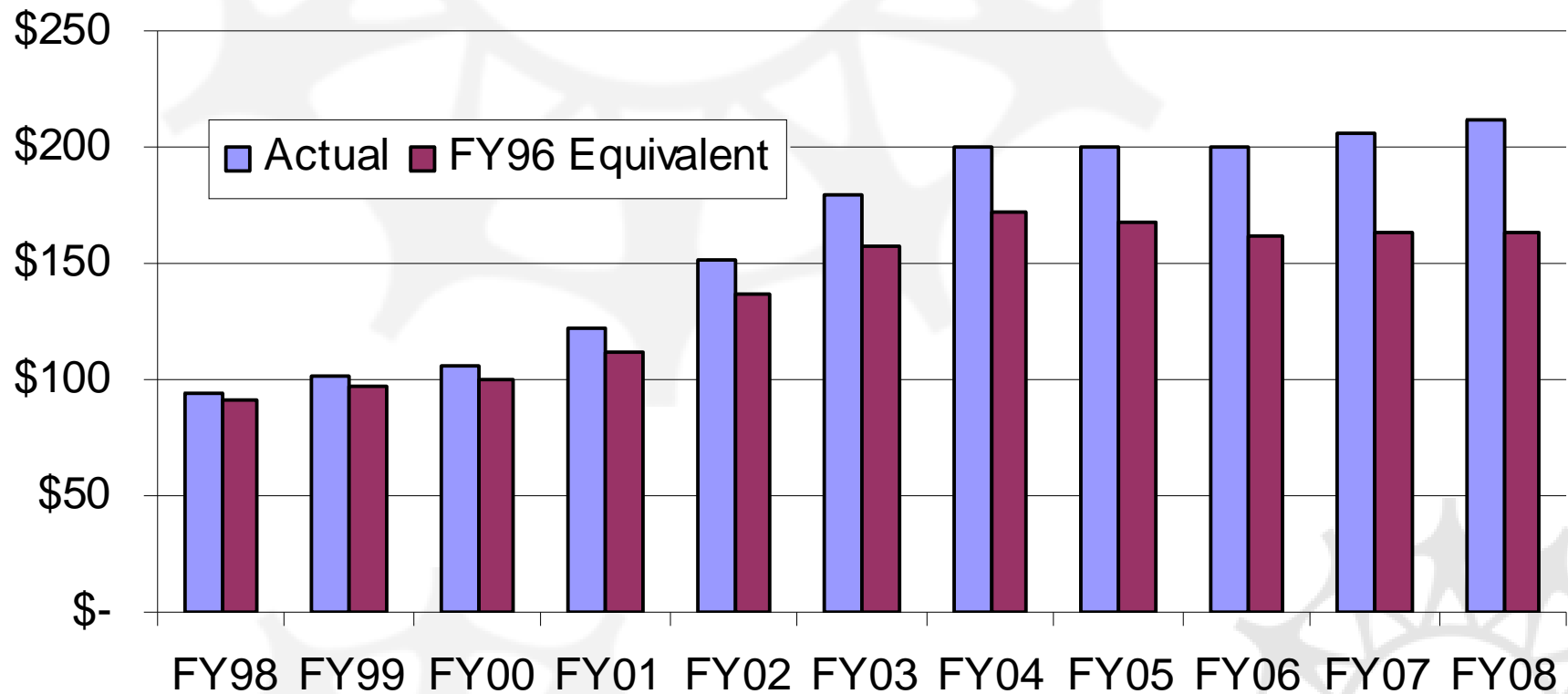
**Major Research Instrumentation (MRI) program**

**Academic Research Infrastructure (ARI) program**

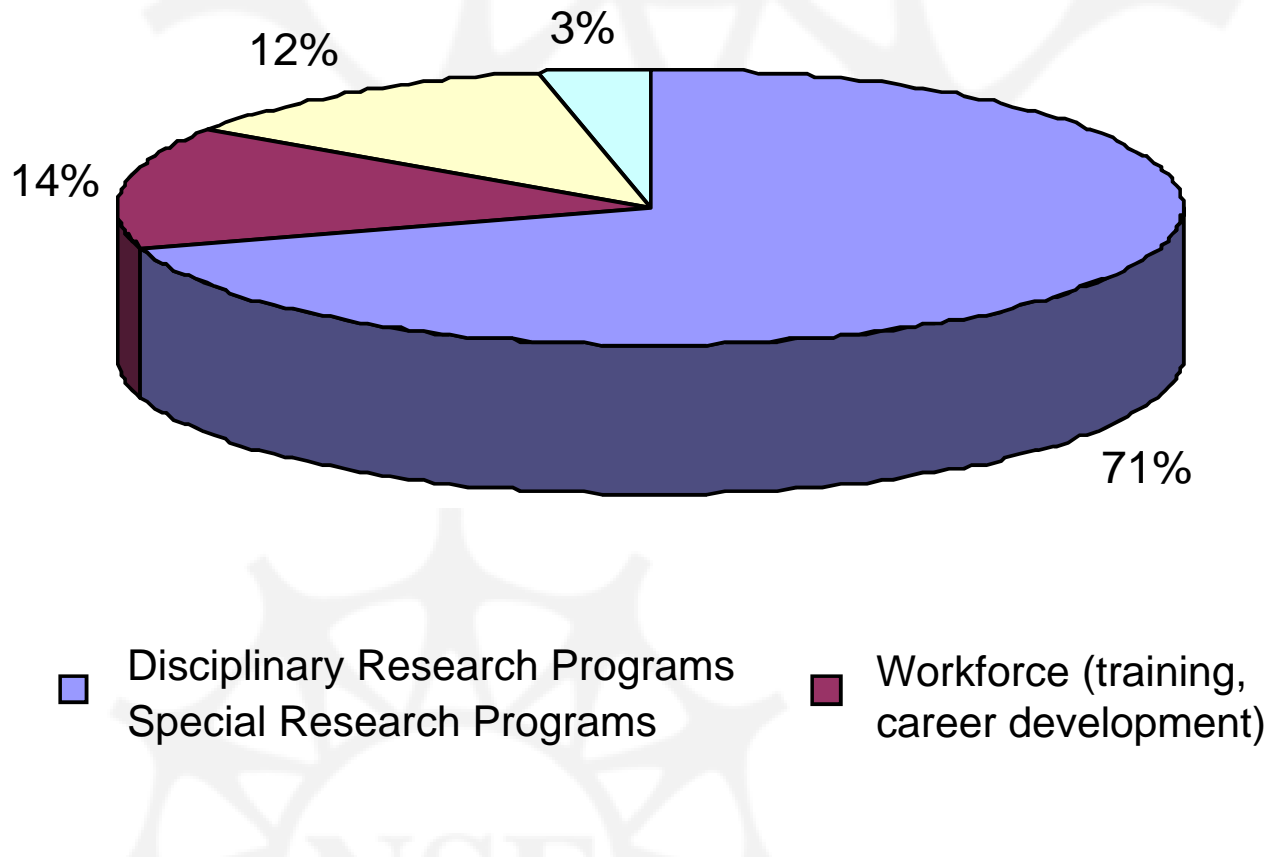
**Science Masters Program – call expected**

**Expecting NSF operating plans to be approved by Congress**

# DMS Budget (\$M)

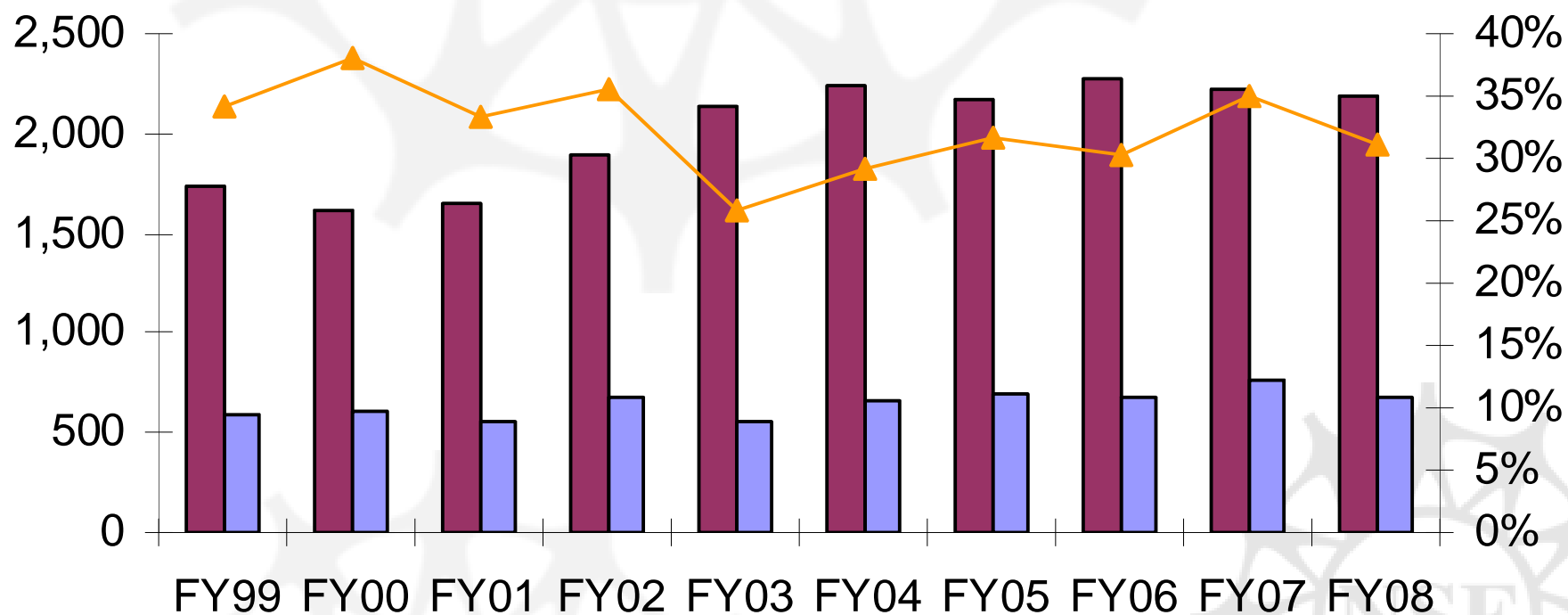


# FY 2008 Budget (~ \$212M)



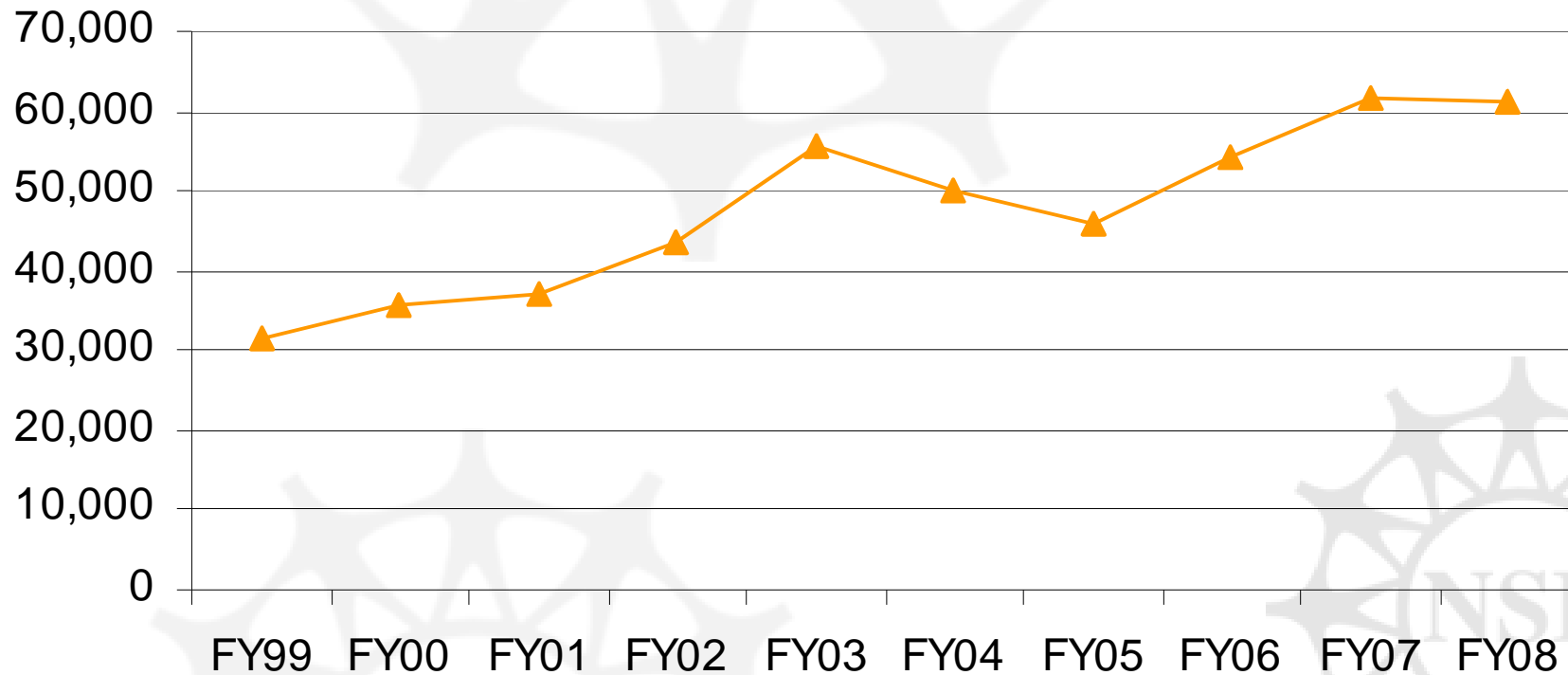


# Funding Rate



■ Actions ■ Awards —▲ Rate

# Annualized Median Award



# General Guidelines on DMS Unsolicited Proposals

Dates:

**Applied math:** Nov 1-15

**Computational Math:** December 1-15

**Probability & Statistics:** October 23-November 7

**Math Bio:** December 18- January 13

**DMS/NIGMS:** October 1

<http://www.nsf.gov/div/index.jsp?div=DMS>

# Standard NSF Evaluation Criteria

## ➤ INTELLECTUAL MERIT

- How important is the proposed activity to advancing knowledge and understanding within its own field or across fields?
- To what extent does the proposal suggest and explore *creative, original, or potentially transformative* concepts?
- What will be the significant contribution of the project to the research and knowledge base of the field?
- How well conceived and organized is the proposed activity?
- Is there sufficient access to resources (equipment, facilities, etc.)?
- How well qualified is the team (the PI, co-PIs, sub-contracts, etc.) to conduct the proposed activity?

# Standard NSF Evaluation Criteria

## ➤ **BROADER IMPACTS**

- How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
- How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?
- Will the results be disseminated broadly to enhance scientific and technological understanding?
- What may be the benefits of the proposed activity to society?

## How to learn about new solicitations?

DMS announces new funding opportunities via two automated e-mail lists.

To subscribe, send a blank e-mail message to [join-mathdept@lists.nsf.gov](mailto:join-mathdept@lists.nsf.gov) for the MATHDEPT list or to

[join-statdept@lists.nsf.gov](mailto:join-statdept@lists.nsf.gov) for the STATDEPT list.

(Information on how to cancel a subscription is included in each mailing.)

# Some new and continuing DMS research solicitations

<http://www.nsf.gov/div/index.jsp?div=DMS>

- CHE-DMR-DMS Solar Energy Initiative (SOLAR)
- Cyber-Enabled Discovery & Innovation (CDI)
- DTRA-DMS Initiative on Next Generation Algorithms for the Detection of Chemical and Biological Materials
- Joint DMS/NIGMS Initiative to Support Research in the Area of Mathematical Biology
- Collaboration in the Mathematical Geosciences (CMG)

# Solar Energy Initiative (SOLAR)

**Supports interdisciplinary efforts by groups of researchers to address the scientific challenges of highly efficient harvesting, conversion, and storage of solar energy**

- **Deadline March 09 2009, just passed**  
**Solicitation planned for 3 years - to 2011 and renewable another 3 years**
- **Competition funding in FY 2009: \$5 M**  
**(planned) FY 2010: \$10M**
- **Expected typical award size:**  
**\$500,000 per year**
- **Research groups must include three or more co-Principal Investigators:**
  - **one in Chemistry**
  - **another in Materials Research**
  - **another in Mathematics or Statistics**



# Solar Energy Initiative (SOLAR)

## Two-Stage Review Process

### I. Preliminary Proposals

- Three pages
- Internal review by NSF program directors
- Internal review criteria
  - Potential for transformative breakthrough
  - Extent of group synergy between all three disciplines
- “Encourage / Discourage” feedback

### II. Full Proposals

For more information:

<http://www.nsf.gov/pubs/2008/nsf08598/nsf08598.pdf>

**DMS PO: Mark F. Feshbach [mfeshbac@nsf.gov](mailto:mfeshbac@nsf.gov)**

**Henry A. Warchall [hwarchal@nsf.gov](mailto:hwarchal@nsf.gov)**

# Cyber-Enabled Discovery & Innovation (CDI)

- Five-year initiative (FY2008-12)
- All directorates, programmatic offices involved
- To create *revolutionary* science and engineering research outcomes
- Emphasis on bold, multidisciplinary activities
- Radical, paradigm-changing science and engineering outcomes through computational thinking

# Cyber-Enabled Discovery & Innovation (CDI)

- “Business as usual” need not apply
  - *“Projects that make straightforward use of existing computational concepts, methods, models, algorithms and tools to significantly advance only one discipline should be submitted to an appropriate program in that field instead of to CDI.”*
- No place for incremental research
- Untraditional approaches and collaborations welcome
- Potential for extraordinary outcomes, such as revolutionizing entire disciplines, creating entirely new fields, or disrupting accepted theories and perspectives
- ... as a result of taking a fresh, multi-disciplinary approach.

## Three CDI Themes:

- 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;*
- Building Virtual Organizations: *enhancing discovery and innovation by bringing people and resources together across institutional, geographical and cultural boundaries*

# CDI: Application Process

No letters of intent

Preliminary proposals up to 6 pages reviewed by panels  
invite, non-invite decisions

Full proposals by invitation



## CDI FY09

- Second year of NSF-wide five-year initiative
- Preliminary Proposals due: Dec. 8, 2008
- Full proposals by invitation only
- Full proposals due: May 20, 2008
- 30-40 awards – not later than October 2009

CDI FY10 Solicitation some time in **September 2009**

## Contacts

- CDI Co-chairs **Mary Lou Maher** (CISE), **Tom Russell** (OIA), **Eduardo Misawa** (ENG) or members of the team listed in the solicitation

[cdi@nsf.gov](mailto:cdi@nsf.gov) ; (703) 292-8080

<http://www.nsf.gov/crssprgm/cdi/>

# DTRA-DMS Initiative on Next Generation Algorithms for Detection of Chem & Bio Materials

Dear Colleague letter

<http://www.nsf.gov/pubs/2009/nsf09010/nsf09010.pdf>

Next generation of mathematical and statistical algorithms and methodologies in sensor systems for the detection of chemical and biological materials within the Computational Mathematics program

A number of good proposals received by the deadline  
December 2009

**FY 2010: Stay tuned!**

CONTACT: Dr. Leland Jameson, [ljameson@nsf.gov](mailto:ljameson@nsf.gov)

# Joint DMS/NIGMS Initiative to Support Research in the Area of Mathematical Biology

Has been active for several years

~15 awards expected in FY 2009

Next deadline for submissions: **October 01, 2009**

Innovative mathematics or statistics to solve an important biological problem.

Standard mathematics or statistics to solve biological problems is not appropriate

Proposals designed to create new software tools based on existing models and methods not accepted



# Joint DMS/NIGMS Initiative to Support Research in the Area of Mathematical Biology

## A broad variety of topics:

Evolutionary theory and practice arising from genomic advances;

Statistical and other approaches to the discovery of genes contributing to complex behavior, and their environmental interactions;

Explanatory and predictive models of the cellular state;

Growth, motility, cell division, membrane trafficking, and other cellular behavior

Metabolic circuitry and dynamics;

Population dynamics;

Signal transduction;

Development of new algorithms for phylogenetic analysis;

Design principles and dynamics of pattern formation in development and differentiation;

New approaches to the prediction of molecular structure;

Improved algorithms for structure determination by x-ray crystallography, NMR and electron microscopy;

Simulations of the human systemic responses to burn, trauma and other injury;

New approaches to understanding system-wide effects of pharmacological agents and anesthetics, and their genetic and environmental modifiers

# Joint DMS/NIGMS Initiative to Support Research in the Area of Mathematical Biology

Strong mathematics/statistics coupled with a strong bio application that lies within the interests of NIGMS are the key

Successful proposals are usually truly collaborative

DMS contacts:

Mary Ann Horn, [mhorn@nsf.gov](mailto:mhorn@nsf.gov)  
David Stoffer, [dstoffer@nsf.gov](mailto:dstoffer@nsf.gov)  
Junping Wang, [jwang@nsf.gov](mailto:jwang@nsf.gov)  
Yazhen Wang, [yawang@nsf.gov](mailto:yawang@nsf.gov)  
Tanya Vassilevska, [tvassile@nsf.gov](mailto:tvassile@nsf.gov)

NIGMS contact:

John Whitmarsh,  
[whitmarj@nigms.nih.edu](mailto:whitmarj@nigms.nih.edu)

# Mathematical Biology Program

Similar requirements to DMS/NIGMS solicitation

However: Stronger focus on contribution to the mathematical sciences: this is a DMS program!

Collaboration with a biologist is strongly encouraged but not required for a successful proposal

**Computational biology** proposals can be submitted to either Math Bio or Comp Math or both programs

# Mathematical Biology Program

**IMPORTANT:** Let us know if your proposal may be of interest to any of the Biology programs:

<http://www.nsf.gov/dir/index.jsp?org=BIO>

Biological Infrastructure (DBI)

Environmental Biology (DEB)

Emerging Frontiers (EF)

Integrative Organismal Systems (IOS)

Molecular and Cellular Biosciences (MCB)

Contact the BIO program officers and let them know you submitted to Math Bio. And vice versa!

## Collaboration in the Mathematical Geosciences (CMG)

Enable collaborative research at the intersection of mathematical sciences and geosciences

Encourage cross-disciplinary education.

Three themes:

- (1) mathematical and statistical modeling of complex geosystems,
- (2) understanding and quantifying uncertainty in geosystems,
- (3) analyzing large/complex geoscience data sets.

## Collaboration in the Mathematical Geosciences (CMG)

Next submission window:

January 08, 2010 - January 22, 2010

DMS contacts:

Junping Wang, [jwang@nsf.gov](mailto:jwang@nsf.gov)

Thomas F Russell, [trussell@nsf.gov](mailto:trussell@nsf.gov)

Gabor Szekely, [gszekely@nsf.gov](mailto:gszekely@nsf.gov)

# New Training Activities in FY 2009

## Proactive Recruitment in Introductory Science and Mathematics (PRISM)

- Partnerships to attract freshmen & sophomores to STEM disciplines
- Support projects in education through research involvement that aim to improve the freshman and sophomore experience in mathematics and science.

Deadline: **February 16, 2009; will continue in 2010**

### CONTACTS:

Jane Gilmann, [jgilman@nsf.gov](mailto:jgilman@nsf.gov)

Bruce Sagan, [bsagan@nsf.gov](mailto:bsagan@nsf.gov)

Bruce Palka, [bpalka@nsf.gov](mailto:bpalka@nsf.gov)

Dean M. Evasius, [devasius@nsf.gov](mailto:devasius@nsf.gov)



Questions?

