

# Submitting a proposal to DMS (Division of Mathematical Sciences) at NSF

Presentation to UMass M&S Department

Eric Sommers

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# Two links with information about NSF funding and successful proposals

**Better known:** <http://www.nsf.gov/awardsearch/>

(search by Program Element Code to find awards in your field)

**Little known:** <http://dellweb.bfa.nsf.gov/starth.asp>

(get the overall picture and info about funding rates and average award sizes)

**Funding Rate by State and Organization  
from FY 2012 to 2013  
for MATHEMATICAL SCIENCES**

<b>Org (Drill to Next Level)</b>	<b>FY</b>	<b>Number of Proposals</b>	<b>Number of Awards</b>	<b>Funding Rate</b>	<b>Average Decision Time (months)</b>	<b>Mean Award Duration (years)</b>	<b>Median Annual Size</b>
<b>▲ <u>DMS</u></b>	<b>2013</b>	<b>2,806</b>	<b>847</b>	<b>30%</b>	<b>5.82</b>	<b>2.79</b>	<b>\$60,000</b>
	<b>2012</b>	<b>2,782</b>	<b>937</b>	<b>34%</b>	<b>5.62</b>	<b>2.80</b>	<b>\$63,029</b>
ALGEBRA,NUMBER THEORY,AND COM	2013	332	115	35%	5.94	2.55	\$52,837
	2012	329	122	37%	5.54	2.56	\$56,887
ANALYSIS PROGRAM	2013	299	117	39%	5.65	2.67	\$57,000
	2012	287	119	41%	5.37	2.71	\$62,065
APPLIED MATHEMATICS	2013	319	97	30%	6.22	2.77	\$66,957
	2012	328	107	33%	5.70	2.91	\$75,326
Big Data Science &Engineering	2013	2	2	100%	8.20	2.46	\$152,727
CDS&E-MSS	2013	80	15	19%	5.33	2.81	\$126,979
	2012	125	23	18%	4.89	2.84	\$161,139
CISE-MPS QIS Faculty Program	2013	5	1	20%	5.33	1.99	\$50,587
COFFES	2013	25	8	32%	5.54	2.99	\$200,873
	2012	47	20	43%	6.12	2.86	\$150,507
Combinatorics	2013	78	27	35%	6.31	2.84	\$56,583
	2012	81	29	36%	5.55	2.63	\$50,370
COMPUTATIONAL MATHEMATICS	2013	257	79	31%	5.97	2.77	\$76,610
	2012	292	91	31%	6.06	2.76	\$80,073
CR, Earth System Models	2013	3	3	100%	12.60	5.00	\$273,557
FOUNDATIONS	2013	50	20	40%	5.69	2.30	\$31,246
	2012	39	16	41%	5.45	2.48	\$45,242
GEOMETRIC ANALYSIS	2013	174	63	36%	6.11	2.64	\$56,827
	2012	138	55	40%	6.35	2.65	\$55,763
INFRASTRUCTURE PROGRAM	2013	30	16	53%	6.72	2.77	\$83,000
	2012	31	22	71%	4.97	2.50	\$66,728
MAJOR RESEARCH INSTRUMENTATION	2013	2	1	50%	5.72	3.00	\$121,193
	2012	5	1	20%	6.14	2.99	\$218,667
MATHEMATICAL BIOLOGY	2013	161	33	20%	6.42	2.71	\$74,643
	2012	263	52	20%	6.21	2.92	\$101,113
MATHEMATICAL SCIENCES RES INST	2012	3	3	100%	16.05	5.32	\$2,607,650
NIGMS	2013	117	11	9%	6.30	3.76	\$350,245
PROBABILITY	2013	88	27	31%	6.11	2.57	\$84,231
	2012	88	31	35%	5.73	2.54	\$80,009
SEES Hazards	2013	1	1	100%	6.05	3.96	\$711,669
STATISTICS	2013	267	80	30%	5.81	2.74	\$50,000
	2012	256	97	38%	5.48	2.72	\$57,454
TOPOLOGY	2013	158	64	41%	5.74	2.60	\$49,318
	2012	169	76	45%	5.96	2.52	\$51,918
WORKFORCE IN THE MATHEMAT SCI	2013	353	67	19%	4.69	3.87	\$37,500
	2012	301	73	24%	4.69	3.91	\$37,500

# Funding opportunities

- Subscribe to Dear Colleague Letters:  
<http://www.nsf.gov/mps/dms/about.jsp>
- Look on Grants.gov or NSF webpages. Start at DMS webpage; check out MPS (Math & Physical Sciences Directorate) and CISE (CS Directorate) webpages.
- Generally math folks apply once each year in the relevant program (e.g. Analysis or Applied Math).
- But some folks in a given year submit to more than one program (mostly in applied fields). You can even submit two proposals (on different topics) to the same program. This is very common in CISE, Engineering, etc.

# Other funding opportunities

- Besides the programs, consider other competitions with DMS participation:
  - **CDS&E** = computation and data science in the physical sciences; more about the methods and how they can be applied in different fields and less about implementation  
([http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=504813&org=DMS&from=home](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504813&org=DMS&from=home))
  - **SaTC** = cybersecurity
  - **DMREF** = materials
  - **Big Data**
- **Advanced Cyber Infrastructure (ACI)**: lots of support for computational infrastructure. For example, SAGE or individual groups writing packages for SAGE.

# Different ways to apply

- Apply as a single-investigator (by far most common)
- Apply with a colleague at same institution
- Collaborative: join forces with someone at another institution (two identical proposals, with separate budgets)
- **FRG (Focused Research Group)**. Work with 3 or more PI's at 2 or more institutions on a specific set of timely problems. This is a separate competition in DMS.

# Highlight two opportunities

- **Conference/Workshop Grants:** different format, usually 5-6 pages; very high success rates; less than 50K budget is internally reviewed (no written reviews). **Target dates vary by program, but tend to be flexible.**

([www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=11701&org=DMS&from=home](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=11701&org=DMS&from=home); and [www.nsf.gov/pubs/policydocs/pappguide/nsf14001/gpg\\_2.jsp#IID8](http://www.nsf.gov/pubs/policydocs/pappguide/nsf14001/gpg_2.jsp#IID8))

- **Math Sciences Innovation Incubator:** **New** interactions between math sciences & discipline subjects. Submit proposal with other scientists or apply for supplement to an award by discipline scientists. Then notify DMS and they will look at it.

(<http://www.nsf.gov/pubs/2014/nsf14063/nsf14063.jsp>)

# Workforce

- **REU site**
- **RTG** (Research Training Group)
- **EDT** (Enriching Doctoral Training): Should we try for this? Preparing students for careers beyond academia. Deadline is November 12.
- **MSPRF**: postdoctoral fellowship in math sciences



# Preparing the proposal

- Apply through FastLane or Grants.gov. Talk to Phil.
- Refer to Grant Proposal Guide, section II:  
[http://www.nsf.gov/pubs/policydocs/pappguide/nsf14001/gpg\\_index.jsp](http://www.nsf.gov/pubs/policydocs/pappguide/nsf14001/gpg_index.jsp)
- Key parts:
  - Project Summary (1 page)
  - Project Description (15 pages)
  - Biographical Sketch (2 pages)
  - Budget + Budget Justification

# Project Summary (1 page)

- Three parts, forced by FastLane:
  - **Overview:** what will you work on?
  - **Intellectual Merit:** why is it important/interesting? how does it relate to others' work in the area? how does it relate to other parts of math? to other disciplines?
  - **Broader Impact:** training (mentoring postdocs, grad students, REUs); outreach (public lecture; run a Math Circle; talk at a high school summer program); service to discipline (AMS committee; editorial work); educational infrastructure (new courses, textbooks, research books, expository notes for grad students); broadening participation (engaging underrepresented groups; give talk at Smith's Postbac program; give talk at HCC); research infrastructure (write code and post it on website; organize seminar; organize conference; joint seminar with physicists); international (talks; collaborate; exchange visits); real concrete uses in society or for national security
- You may submit a PDF! It looks nicer and you can use symbols.

# Quiz: B.I. or I.M.? Include or not?

- 'I am the department chair'
- 'I collaborate with a physicist.'
- 'Representation theory has applications in physics'
- 'I have started a reading group for math and CS PhD students on applications of representation theory to machine learning'
- 'Number theory has applications in cryptography'
- 'My work has implications for factoring large composite numbers'
- 'My work is cited by the famous mathematician X'
- 'Of my 4 grad students, 3 have been female'
- 'I am interested in attracting community college students to research mathematics'
- 'My department had a VIGRE grant and I ran the REU component'
- 'I often teach my department's intro grad course in Topology'

# Project Description

- Separate section on **Prior NSF support** if you have had any kind of NSF research support in past 5 yrs. 5 page limit. Explain your achievements and list your publications/preprints from the supported period.
- Must address I.M. and B.I. (do not need to be labeled, but you might as well). These will be your past achievements.
- In remaining 10 pp describe your proposed projects and goals.
- Include evidence for achieving the goals (examples, computational). Give description of the approach and methods you will use. Try to show that you are not just making incremental progress. At same time don't exaggerate what you can achieve. Have a list of problems (some that are clearly achievable, others more difficult, a few more speculative).
- Include a **separate section on B.I.** These are your future broader impacts: e.g, you will direct an REU; you will continue to work with grad student X; you plan to organize a conference; your work will have impact on signals processing; you will design a new graduate course.
- Use all 15 pages (maybe less if you're a newer PhD)

# Budget

- Amount should not affect funding, but may turn off reviewers if too outlandish.
- Keep it realistic:
  - 2 months summer salary per year
  - 8K for all travel per year (including visitors)
  - No money for equipment, books.
  - Grad student money: summer money or academic year money commensurate with your experience. Mention your students in the proposal!
  - REU money. Can also ask for a supplement.
  - Postdoc money only in Applied Math or Comp Math (maybe some other programs, e.g. Math Bio, check with program officers). Postdoc mentoring plan.
  - Justify these add-ons (visitors, REUs, grad students, postdocs) both in the project description and in the budget justification.
- Expect budget to be cut. E.g., salary may be capped at 25K or 30K per year; or overall budget may be capped at 180K for 3 years.

# Some other advice

- Ask colleagues or collaborators for sample successful proposals. Many are willing to share.
- Search web for folks who have posted theirs (see Ben Webster's page for 5 PI's proposals, some with reviews: <http://people.virginia.edu/~btw4e/grant.html>)
- Accept invitations to review and/or volunteer to become a DMS reviewer:  
[https://www.surveymonkey.com/s/nsf\\_dms\\_reviewers\\_info](https://www.surveymonkey.com/s/nsf_dms_reviewers_info)
- Strength of competition varies from year to year, so you've got to keep trying.
- I'm happy to talk and to read stuff over.

# Review Process I

- FastLane sends proposal to chosen program and then it is assigned to a program officer. (Note you may also ask for co-review by a second program, even in another division).
- Panels are created and proposal is placed in a panel, or sometimes two.
- Panels in DMS tend to be the same from year to year: low-dimensional topology; inverse problems; dynamical systems.
- Statistics does not separate by topic.
- In some cases, proposal may be mail reviewed or partially mail reviewed.
- Depending on your proposed research, your proposal may go to different panels in different years.

# Review Process II

- Panelists are invited for each panel, almost always after the proposals are placed in the panel.
- Panelists are asked for their preferences for reviewing; then they are assigned proposals to write reviews for.
- Each proposal must have 3 reviews. Normally each panelist writes a review for 8-12 proposals in the panel.
- Panel sizes range from 5 or 6 panelists to 15 or 16 panelists. May have 20, 30, or 60 proposals in a panel.
- The reviews and letter grades are given **before** the panel starts. But they can be updated during the panel.



# Review Process III

- At the panel: an order is pre-selected and proposals are discussed one at a time, for 10-20 minutes.
- One panelist, who is not one of the reviewers, writes a summary of the discussion. The summary will be approved later by the whole panel.
- Typically, panel will place each proposal in one of 3 categories: Top 10%; Next 30%; Bottom 60%.
- Usually Top proposals are funded (and with higher budgets).
- Usually Bottom proposals are declined.

# Review Process IV

- Proposals in the middle category are ranked by the panel (usually). They are held until later.
- Some programs pre-divide the budget and assign funds to each program officer. The program officer can then proceed through the middle proposals and fund what they like.
- Other programs are collaborative. They decide as a team what to fund by comparing the remaining proposals across all panels in that program. B.I.'s may play a bigger role here.
- Co-funding by other programs may happen.

# Review Process V

- Many proposals in the middle category will be declined. Programs do not need to follow the ranking, but an argument must be given for each decision and the ranking, reviews, and panel discussions are central factors.
- At the end of the process, you will receive all reviews, the panel summary, and a justification for the decision written by the program officer (other Divisions may not give the latter).