National Science Foundation Ins and Outs
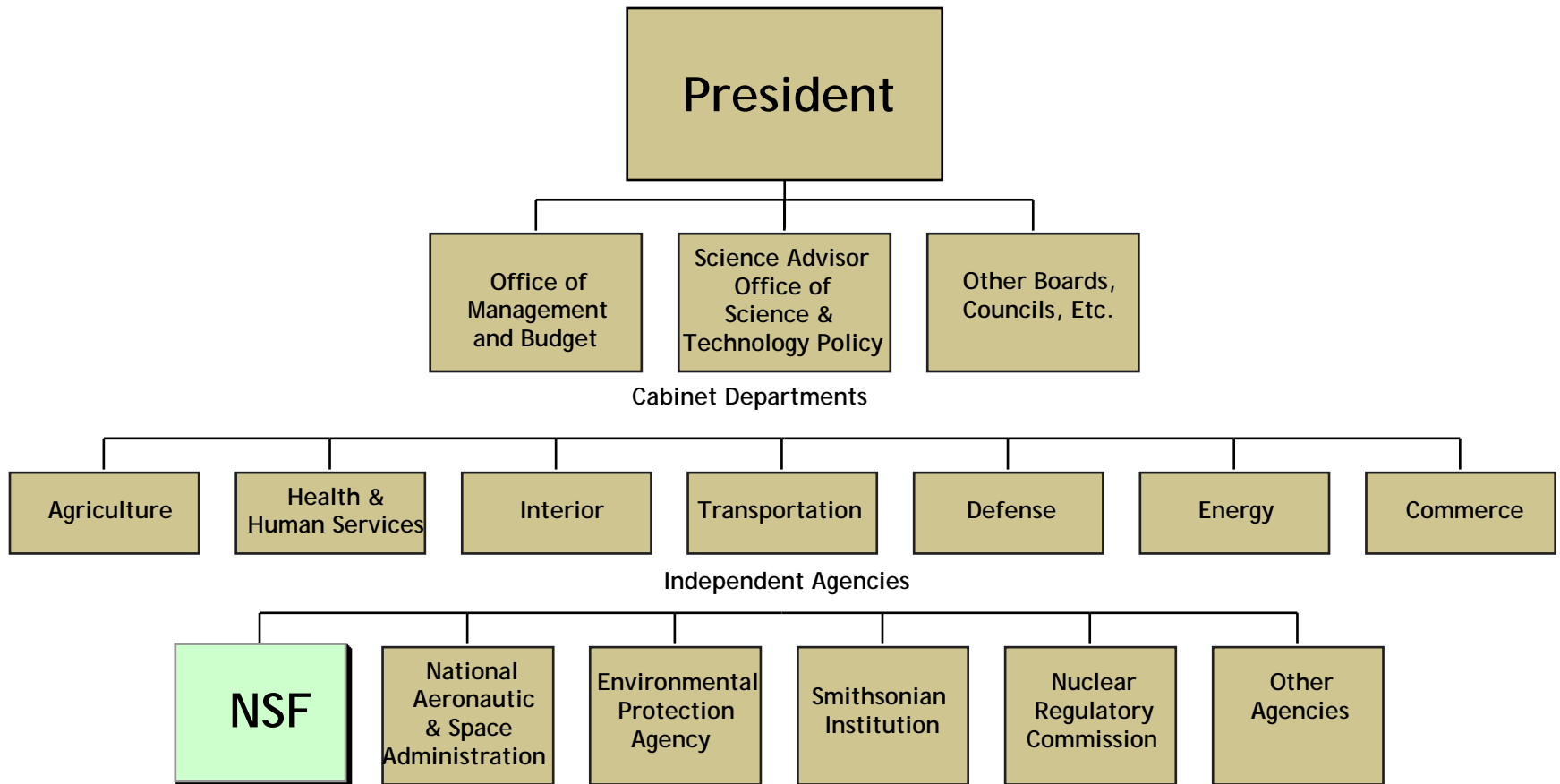

Larry Gottlob
Program Director, SBE/BCS/PAC
Associate Professor, Dept. of Psychology
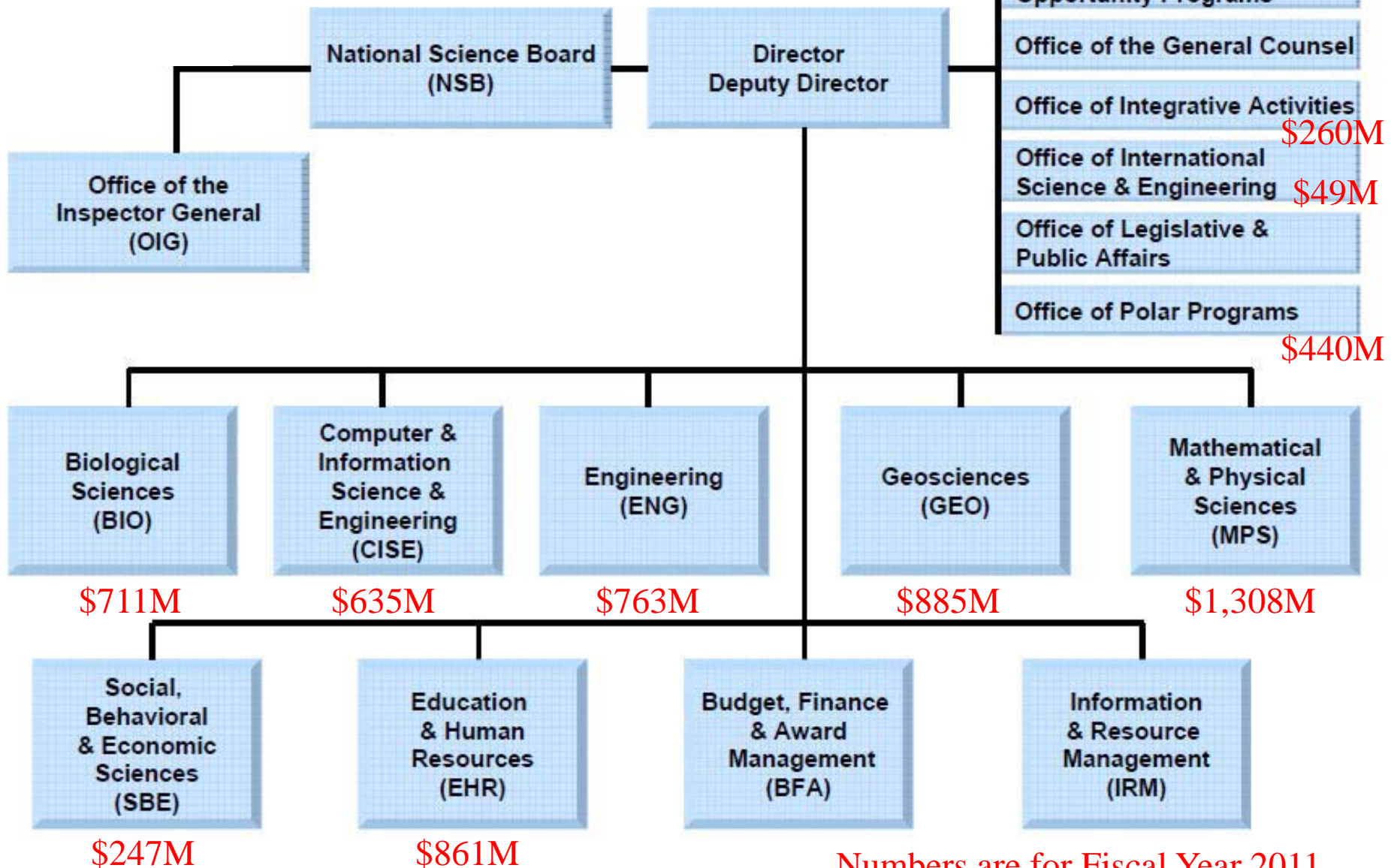
Overview of my talk

- What is NSF?
- What type of research does NSF fund?
- How do I prepare a proposal for NSF?
- What makes a good proposal?
- How are funding decisions made?

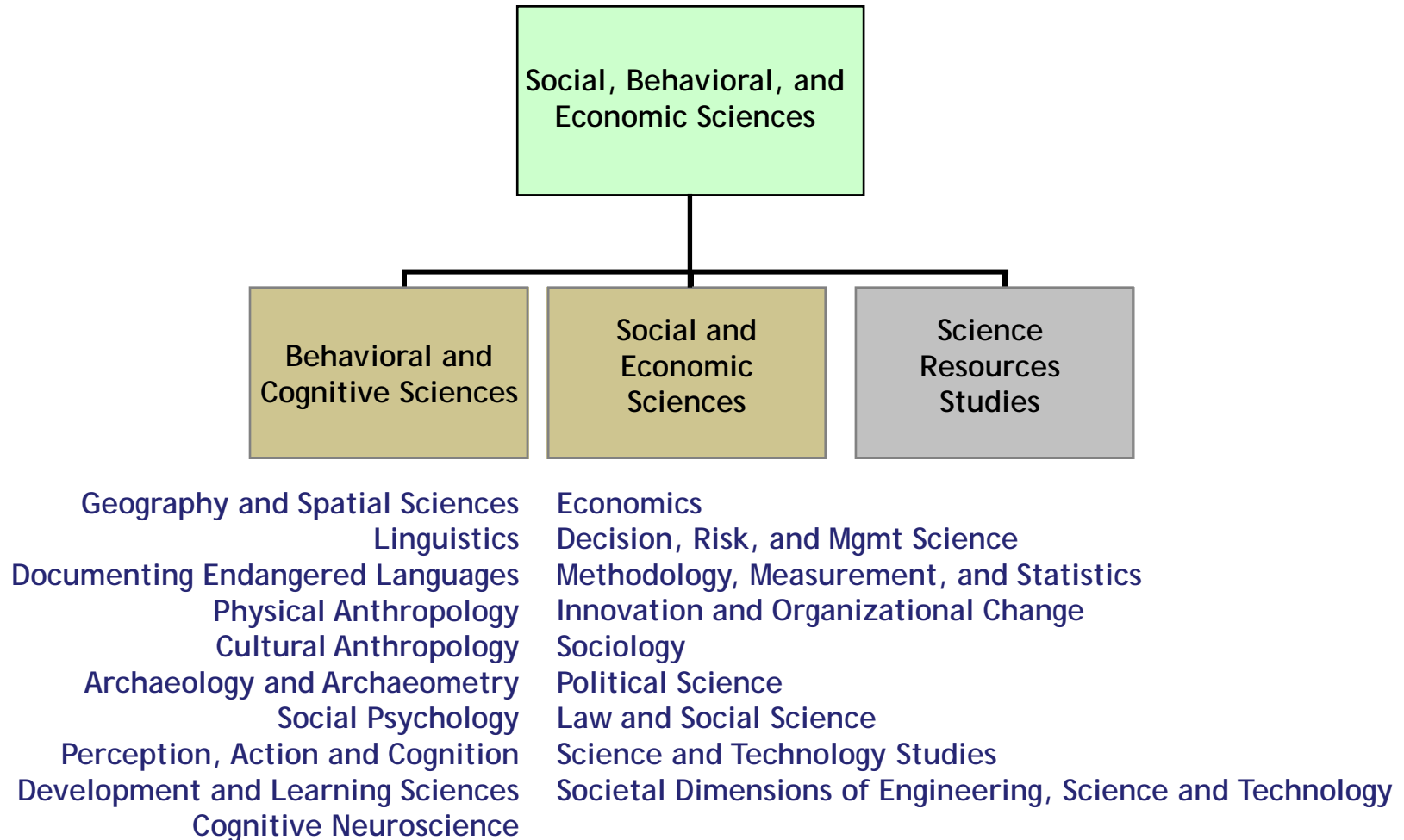# NSF Is an Independent Agency of the Executive Branch of the U.S. Government
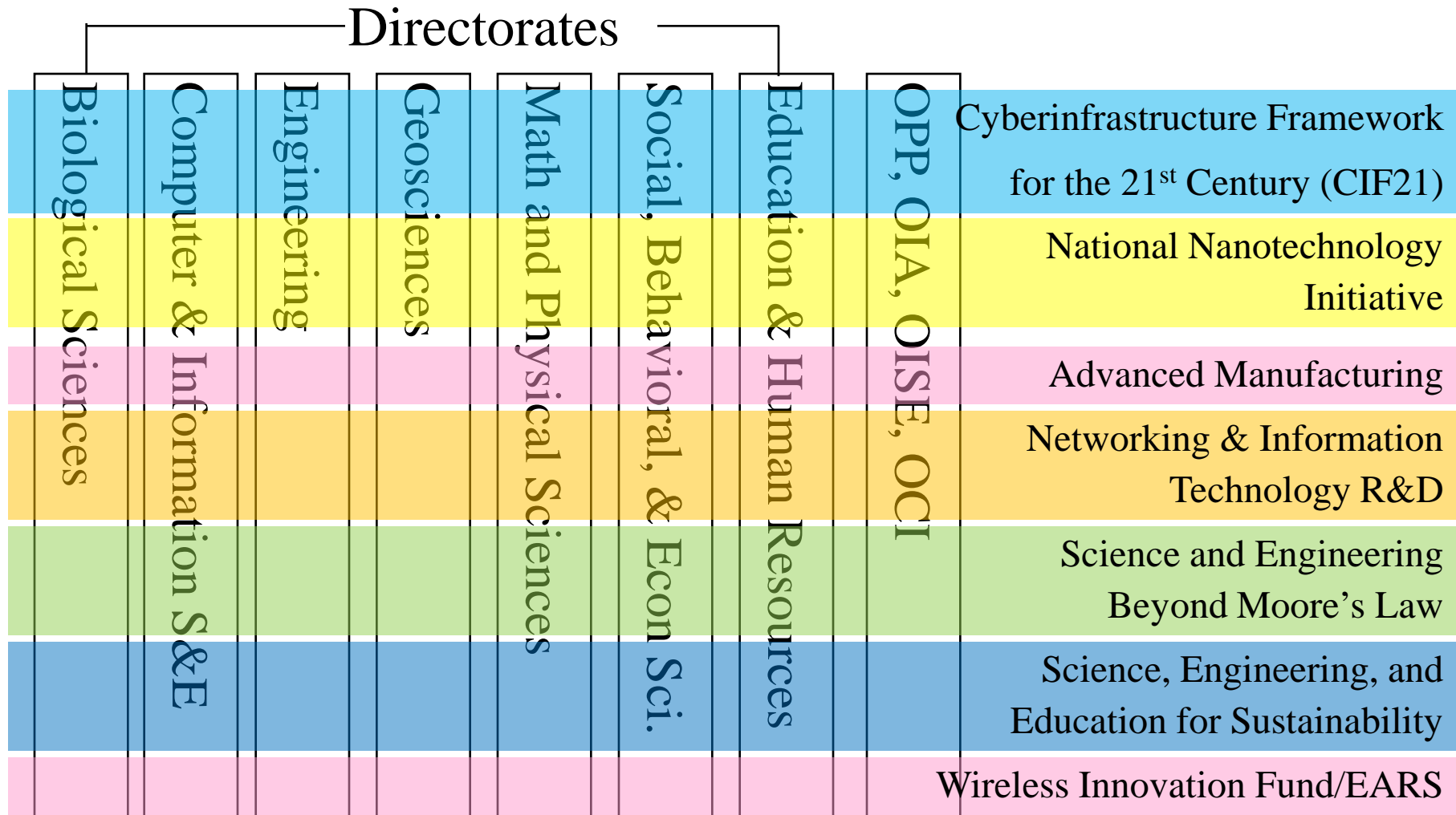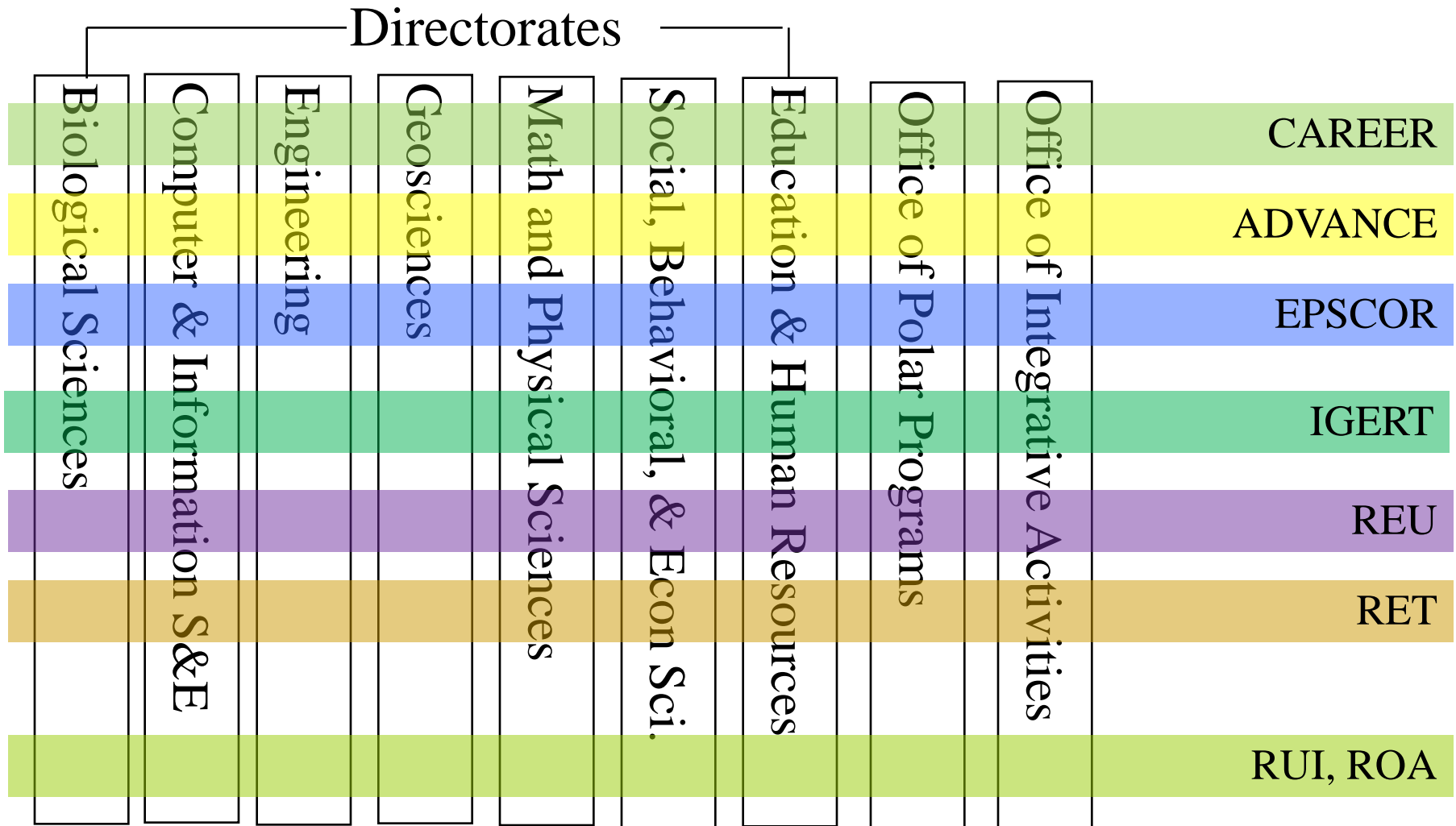
NSF Organizational Chart

$210M

Office of Cyberinfrastructure

Office of Equal Employment Opportunity Programs

Office of the General Counsel

Office of Integrative Activities

$260M

Office of International Science & Engineering $49M

Office of Legislative & Public Affairs

Office of Polar Programs

$440M

National Science Board (NSB)

Director Deputy Director

Office of the Inspector General (OIG)

Biological Sciences (BIO)

Computer & Information Science & Engineering (CISE)

Engineering (ENG)

Geosciences (GEO)

Mathematical & Physical Sciences (MPS)

$711M $635M $763M $885M $1,308M

Social, Behavioral & Economic Sciences (SBE)

Education & Human Resources (EHR)

Budget, Finance & Award Management (BFA)

Information & Resource Management (IRM)

$247M $861M

Numbers are for Fiscal Year 2011

Directorates Are Divided into Divisions, and Divisions Are Divided into Programs

Social, Behavioral, and Economic Sciences

Behavioral and Cognitive Sciences	Social and Economic Sciences	Science Resources Studies

Geography and Spatial Sciences	Economics
Linguistics	Decision, Risk, and Mgmt Science
Documenting Endangered Languages	Methodology, Measurement, and Statistics
Physical Anthropology	Innovation and Organizational Change
Cultural Anthropology	Sociology
Archaeology and Archaeometry	Political Science
Social Psychology	Law and Social Science
Perception, Action and Cognition	Science and Technology Studies
Development and Learning Sciences	Societal Dimensions of Engineering, Science and Technology
Cognitive Neuroscience	

NSF-Wide Scientific Investments

Directorates

Biological Sciences	Computer & Information S&E	Engineering	Geosciences	Math and Physical Sciences	Social, Behavioral, & Econ Sci.	Education & Human Resources	OPP, OIA, OISE, OCI	
								Cyberinfrastructure Framework for the 21st Century (CIF21)
								National Nanotechnology Initiative
								Advanced Manufacturing
								Networking & Information Technology R&D
								Science and Engineering Beyond Moore's Law
								Science, Engineering, and Education for Sustainability
								Wireless Innovation Fund/EARS

NSF-Wide Programs

Directorates

Biological Sciences	Computer & Information S&E	Engineering	Geosciences	Math and Physical Sciences	Social, Behavioral, & Econ Sci.	Education & Human Resources	Office of Polar Programs	Office of Integrative Activities	CAREER
									ADVANCE
									EPSCOR
									IGERT
									REU
									RET
									RUI, ROA

Interdisciplinary Research Portal

http://www.nsf.gov/od/oia/additional_resources/interdisciplinary_research/index.jsp

Go to www.nsf.gov, select "Integrative Activities" from the "Program Areas" pull-down menu on the left, then select "Interdisciplinary Research" from the list on the right under Additional OIA Resources.

A New Interdisciplinary Initiative

- Will be announced shortly
- Extra funds spread across all directorates

CAREER Program

- NSF's most prestigious awards for junior faculty.

- Awardees are selected based on their plan of outstanding research, excellent education, and the integration of research and education within the context of the mission of their organizations, building a firm foundation for a lifetime of leadership.

- Increased participation of those traditionally under-represented in science and engineering is encouraged.
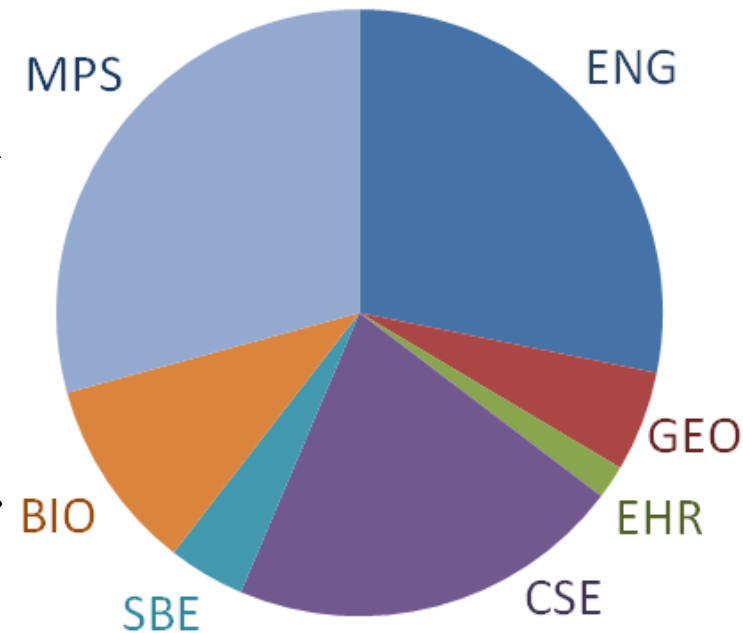
The NSF Vision

Advancing discovery, innovation, and education beyond the frontiers of current knowledge, and empowering future generations in science and engineering.

The NSF Mission

- To promote the progress of science.

- To advance the national health, prosperity, and welfare.

- To secure the national defense.

(from the NSF Act of 1950)

NSF is a Science Management Agency

Scientists and institutions
responding to broad civilian
scientific needs of the nation

45,000 Annual Competitive Proposals

| 60 advisory groups (6,000 members) | 1,500 full-time employees | 250,000 reviews (50,000 reviewers) |

About 10,000 new competitive awards plus another
roughly 10,000 continuing award actions that obligate about $7 billion
annually for academic, industrial, non-profit, governmental recipients.

NSF Investment Priorities

- Promote transformational, multidisciplinary research.
- Investigate the human and social dimensions of new knowledge and technology.
- Further U.S. economic competitiveness.
- Foster research that improves our ability to live sustainably on Earth.
- Advance fundamental research in computational science and engineering and in fundamental, applied, and interdisciplinary mathematics and statistics.

What is Basic Research?

- It is grounded in a broader theoretical framework.

- It focuses on one or a few questions grounded in that broader framework.

- It uses scientifically sound approaches to assess the viability of answers to those questions.

- Its focused results also contribute to enhancement of broader theoretical knowledge.

Therefore, Basic Research is…

- …research that contributes to general understanding.
- …research that is well grounded in a general theoretical framework or that generates development of new frameworks.
- …research that is valuable even if we do not care about its specific findings or applications.
- …research that often increases our knowledge of how we expand our knowledge.

Basic vs. Applied Research

- It's not "either/or."
- Basic research results often have great direct and indirect utility and applicability.
- But at its core, basic research is first and foremost about broader theoretical development, not the focused application of specific research results.
- Analysis and synthesis are favored over prescription.

Finding Funding

How Do You Gain Access to Some of NSF's Funds?

- Submit a proposal to compete in one of the standing program competitions for 'unsolicited proposals'

- Submit a proposal for a special program competition such as the CAREER program

- Submit a proposal for a special program competition such as the Doctoral Dissertation Research Improvement (DDRI) Award competition

In addition to its standing programs, NSF has many special funding opportunities

HSD

IGERT

EGB

ADVANCE

CAREER

RAPID

EAGER

CCLI

PECASE

TCW

Minority RPGs/CAAs

CI-TEAM

ITR

SciSIP

SBIR

RUI/ROA

EPSCoR

REU

GOALI

GK-12

NANO

CDI

CNH
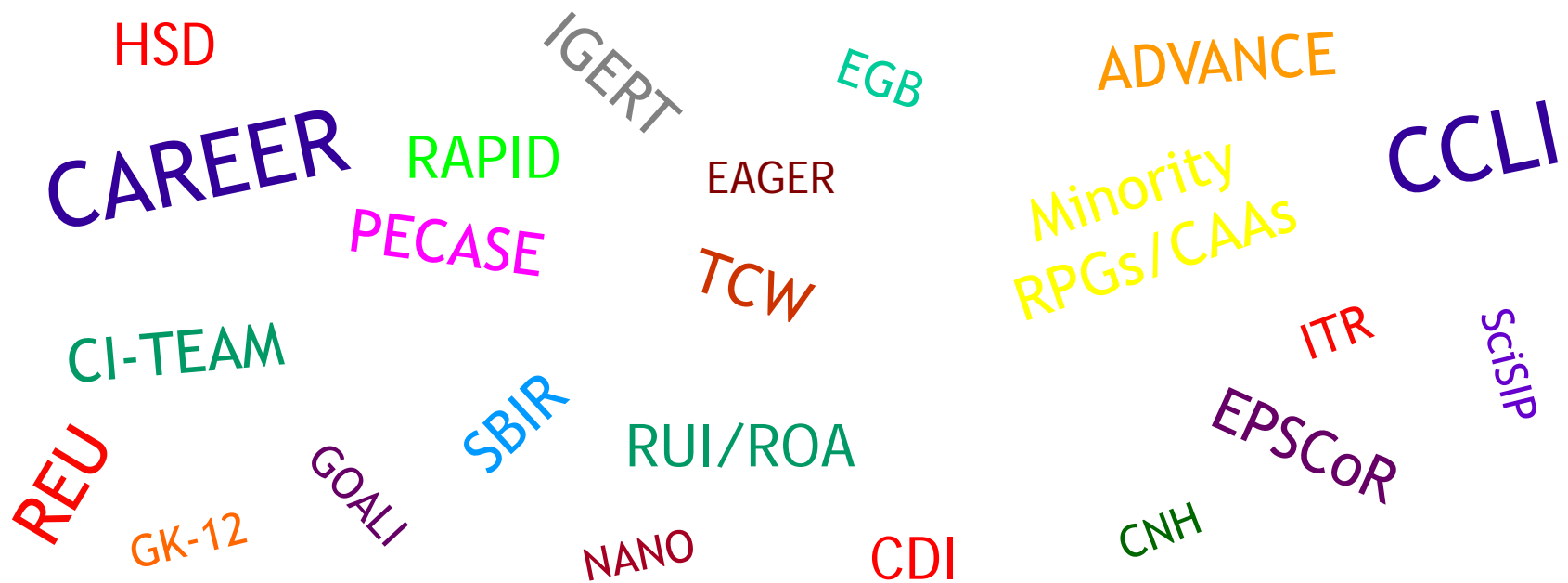
Check the NSF Web site for more information
or contact relevant program officers

Identifying the Best Program(s) or Competitions(s) for Your Research

- Focus on theory
  - In which communities is your theoretical framework drawn?
  - To which communities will it contribute?
- Consider where you will publish results
  - Which journals will disseminate your findings?
  - Who are the researchers who read those journals?
- 'Map' communities and readers onto NSF programs/competitions to identify the best fit.
- NSF programs can jointly review proposals.

Critical Dates for Submitting Proposals

- Regular proposal submission <u>target dates</u>:

   Usually January 15 and August 15

   (Note a maximum of two weeks beyond target date.)

- Doctoral Dissertation Research Improvement (DDRI) proposal submission <u>deadlines</u>:

   February 15 and October 15

   (There is no leeway for a deadline.)

- CAREER proposal submission <u>deadline</u>:

   Late July *(see CAREER solicitation)*

Proposal Process

NSF Proposal Generating Document

Organization submits via FastLane

Research & Education Communities

Proposal Processing Unit

NSF Program Officer

Returned as Inappropriate/Withdrawn

Minimum of 3 Reviews Required

Ad hoc

Panel

Both

Program Officer Analysis & Recommendation

Division Director Concur

Award via DGA

Decline

Organization

Proposal received by NSF

Div. Dir. Concur

Award

4 months

30 days

Proposal Preparation Time   Review of Proposal   P.O. Recommend   DGA Review & Processing of Award

Some Advice on Obtaining Funding from NSF (and Other Sources)

Your chances of success are best if you:

- Learn the rules.
- Learn which entries receive high ratings.
- Learn how the competition is organized.
- Hone your skills, correct weaknesses.
- Realize that how you place depends also on how well others do.

Sections of an NSF Proposal

- Cover sheet
- Project Summary (one page) with IM and BI explicitly!
- Table of Contents
- Project Description (15 pages max regular proposal, 10 pages max DDRI)

  [For DDRIs only - up to two pages beyond the 10 max for graphics *only*]

- References cited
- Biographical Sketch(es) (compliance any issue...)
- Budget
- Budget Justification
- Data Management
- Current & Pending Support (even if you have none)
- Facilities, Equipment, & Other Resources
- Special Information & Supplementary Documentation

How Do You Learn the Rules of NSF Competitions?

- Read and follow instructions in the NSF *Grant Proposal Guide.*
  - Publication is available online at http://www.nsf.gov

- Follow instructions in any special announcements or solicitations

- Contact the relevant program officers
  - Phone numbers and e-mail addresses on web http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5410

How to Develop a Proposal

- Determine the best possible funding sources.
- Give yourself plenty of **TIME**.
- Understand the ground rules.
  - Read announcements and instructions carefully.
  - Read the NSF *Grant Proposal Guide*.
  - Make sure your project really fits the program scope.
  - Look over prior award abstracts.
  - Talk with NSF program officer about specific questions.
- Coordinate with your sponsored programs office; Doctoral students coordinate with your advisor/chair.
- Ask successful PIs for copies of their winning proposals (there are some examples of successful DDRIs on the NSF GSS Web page).

Speaking of Time... A Suggested Timeline for Developing NSF Proposals

3 months before	Develop prospectus for proposal (doctoral students should share with advisor) and run your idea past relevant agency program officers.
1 month before	Complete what you think is a very solid first draft of the entire proposal. Share it with colleagues (for DDRIs, with advisor and doctoral committee) and ask for honest, constructive advice.
2 weeks before	Use comments to revise the proposal one or two more times.
1 week before	Forward the proposal to your sponsored projects office so that they can complete their work and submit the proposal a day or two before the deadline.
5 months after	You should by this time have heard from your program officer about the status of your proposal.

What Makes a Proposal Competitive?

- The theoretical framework within which the research question is set.

- Specification of the methods to be used.

- Elaboration of how expected results will enhance the theoretical framework and make broader contributions.

- Sufficient attention to analysis of data.

- Biographical information about investigator(s).

- A budget with justifications.
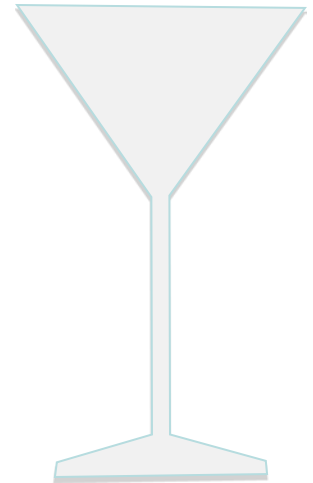
Some Tips on Writing a Competitive Research Proposal

- Try to answer any reasonable questions that reviewers might ask about your plans.

  Reread your drafts from a reviewer's perspective.

- Make sure your proposal is technically correct.

  Careless writing and math imply careless scholarship.

- Convey enthusiasm in your writing.

- Check that is passes the 'grand-mother test'

- **Comply completely with the guidelines**.

When You Prepare a Proposal, Think Like Those Who Will Evaluate It

- Advisory panel members
  - Consists of specialists and generalists; so relevant theory and technical details matter as well as broader significance.
- External reviewers (for regular proposals only)
  - Consist of specialists
- Program officers
  - We're the investors, seeking "bang for our bucks."

Decisions Will Be Based on NSF Merit Review Criteria

NSF asks reviewers to comment on two major criteria:

Intellectual merit & Broader impacts

The First Criterion:

What is the **intellectual merit** of the proposed activity?

- How important is the proposed activity to advancing knowledge and understanding within its own field and across different fields?

- How well qualified is the proposer (individual or team) to conduct the project?

- To what extent does the proposed activity suggest and explore creative, original and *potentially transformative* concepts?

- How well conceived and organized is the proposed activity?

- Is there sufficient access to resources?

Transformative Research

The National Science Foundation must support the most innovative and potentially transformative research—research that has the capacity to revolutionize existing fields, create new subfields, cause paradigm shifts, support discovery, and lead to radically new technologies…. The Foundation must create an environment that is more open to and encourages transformative research proposals from the research community.

The Second Criterion:

What are the **broader impacts** of the proposed activity?

•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, geographic, etc.)?

•Will the results be disseminated broadly to enhance scientific and technological understanding?

•What may be the benefits of the proposed activity to society?

Learn Which Entries Receive the Highest Marks

Try to think like a program officer!

Investment Broker

Bang for the Buck

What We Look For

What Reviewers and Program Officers look for

- Engaging & focused from the beginning
- Important and original topic
- Doesn't short either context or methods
- Explains methods, not a laundry list
- Methods match question
- Includes data analysis plan
- Well-prepared researcher (language skills, experience, background)
- Proposal reads easily, no typos, no jargon
- Inclusive & up-to-date references cited

The 'Investment Broker' Analogy

- We have funds to invest.

- We're selecting from a range of options.

- We're looking to invest in a portfolio that will maximize returns.

# What Is the Crucial Ratio for a Program Officer?

/ $ = Bang for the Buck!
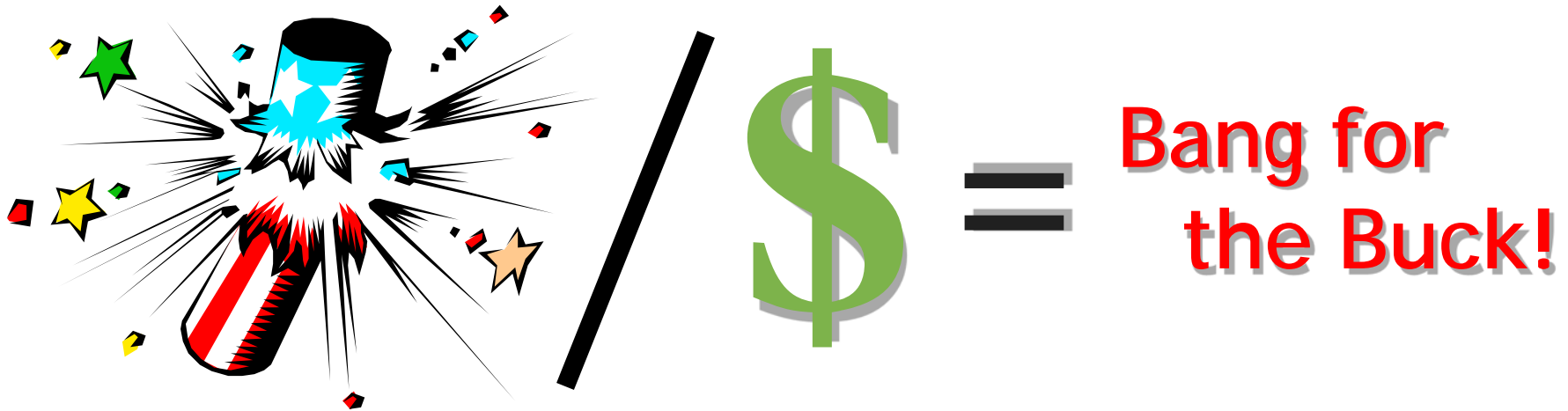
Likelihood of **Significant** Contributions to **General** Scientific Understanding and **Broader** Impacts

What is a Program Officer Looking For?

- Significant contributions to general scientific understandings.

- Enhancements of theoretical understandings in addition to any expansion of specific knowledge.

- Broader impacts, such as enhanced education, greater diversity, improved infrastructure or methods, and beneficial applications.

- Dissemination of results, especially in refereed, widely disseminated publications.

- For DDRI awards, we're looking to invest in very promising junior investigators for whom targeted funding can result in more valuable dissertations.
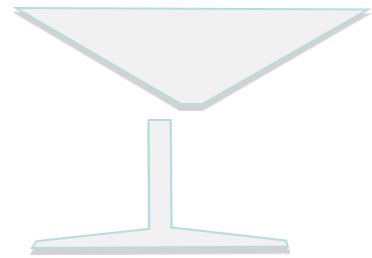
Major Reasons Proposals Are Declined
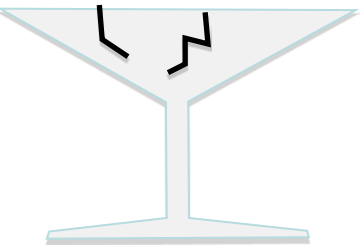
- Proposals fail to establish a sound theoretical framework and/or are poorly related to relevant literature.
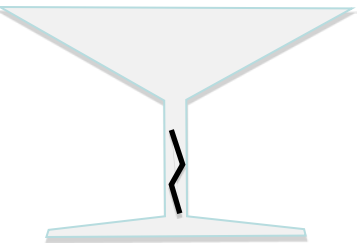
- Proposals fail to specify research methods in sufficient detail or have flawed research plans.

- Theoretical frameworks are sound and research plans are solid, but they don't match up with each other.

CAUTION: NSF is a Bureaucracy

- Do not violate the maximum page rule.
- Do not violate typeface, or other GPG strictures (some programs will NOT give you a second chance).
- Do not submit the same proposal to two programs (instead: ask for co-review by one or more programs).
- <u>Do not underestimate the negative impact of a poorly constructed proposal that fails to follow the guidelines!!</u>

What Expenses Should Be Listed in a Budget?

All expenses necessary to complete the project.

- For every possible expenditure, ask yourself:
  - Is this expenditure necessary? -- or --
  - Would the research be diminished substantially if this expenditure is not made?

  If you answer "Yes" to these questions...include the item in the budget.

  If you answer "No," leave the item out.

- NOTE: DDRI budgets should not include salaries for the student or the advisor, nor tuition for the student.

What If Your Proposal Is Funded?

- Work with the program officer(s) to ensure that the 'Bang for the Buck' is maintained during any pre-award negotiations.

- Check with NSF regarding any significant changes during the project.

- Conduct the research properly and disseminate the results promptly.

- Regularly report findings, products, and contributions (even after the funding has ended).

What If Your Proposal Is Declined?

- Evaluate the reviews.
  - If criticisms focus on correctable points, revise and resubmit the proposal.
  - If criticisms are more general, consider other funding sources or other lines of inquiry.
- If you have questions or want additional information, contact a program officer.

Some Related Advice
from Some Colleagues

A Good Proposal

A good proposal has a good idea, well expressed, with a clear indication of methods for pursuing the idea, evaluating the findings, and making them known to all who need to know.

A Final Reminder…

- If you have questions, contact:
Your sponsored research office
Your NSF program officer

- If you need additional information:
Surf into the NSF Website at

http://www.nsf.gov

WARNING!!!

Data Management Plan

- Starting in January 2011, all proposals must describe plans for data management and sharing
- Fastlane will not allow submission of a proposal missing a plan.
- Plan is reviewed as part of the intellectual merit or broader impacts

Postdoctoral Mentoring Plan

- If request money for a postdoc, must have plan as supplementary doc (1 page)