# Writing a NSF Statistics Proposal

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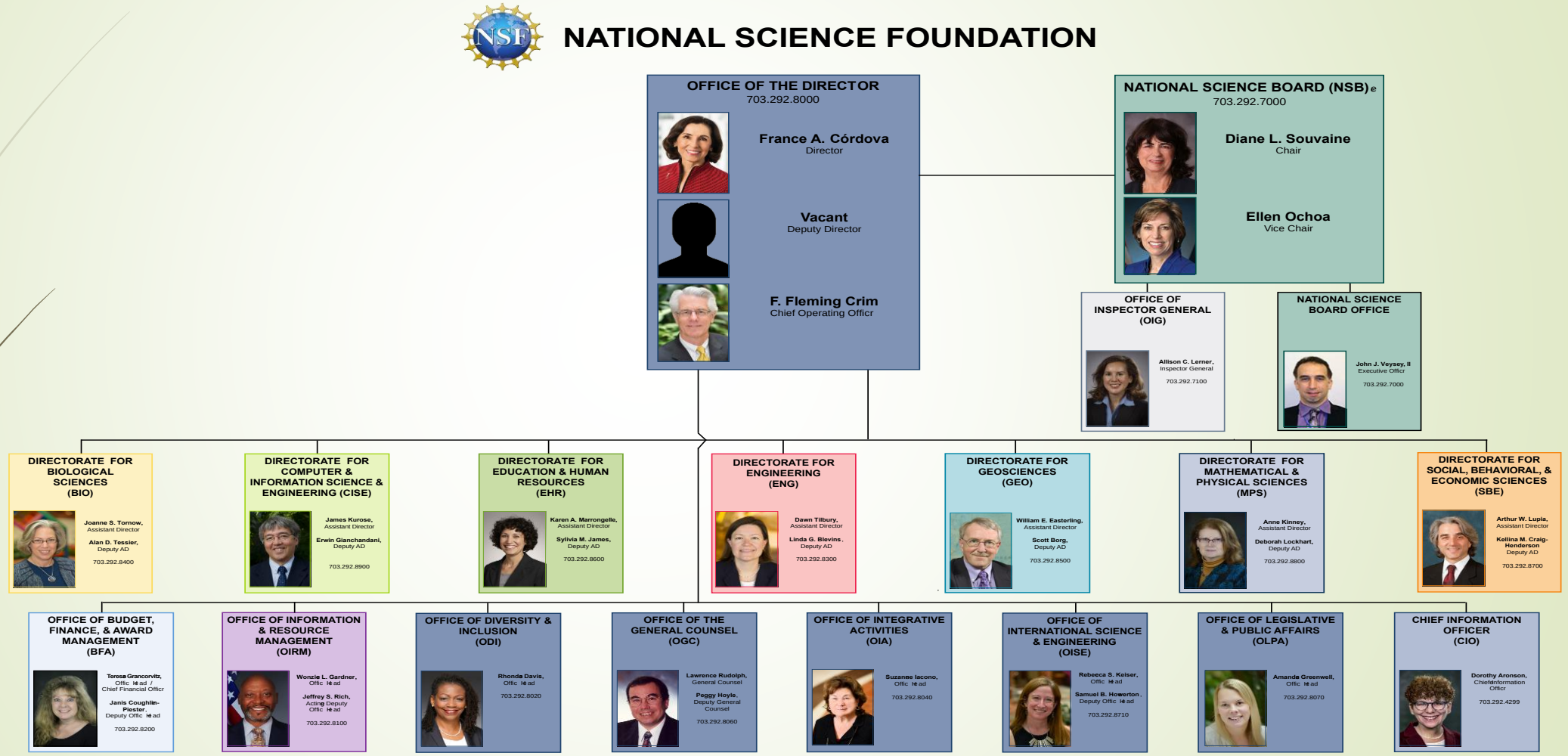
# About myself

- Ph.D. in 2006
- Wrote a bunch of proposals so far, limited successes
  - 3 funded grants from NSF, including a CAREER award,
  - PI of a NIH R21 grant, co-PI of an R01 grant
- Served on both NSF and NIH panels before
- Disclaimer: I am not an NSF official, the materials of this talk are either from public information or personal experiences.

# Why write a NSF proposal

- The statistics program at NSF and the BMRD study section at NIH are the two biggest agencies that fund statistical methodology research.
- There are other agencies and programs that support statistics research, but you will need to compete with computer scientists, mathematicians, and researchers from other disciplines.
- Some agencies and industrial funds take years of networking.
- NIH grants require real biological and medical applications. The goal is to advance medical science and improve health. Your research aims need to be aligned with this goal. Sometimes you need a research team that include doctors.
- For fundamental statistics research, especially theoretical research, NSF provides the biggest opportunity.

# NSF Structure

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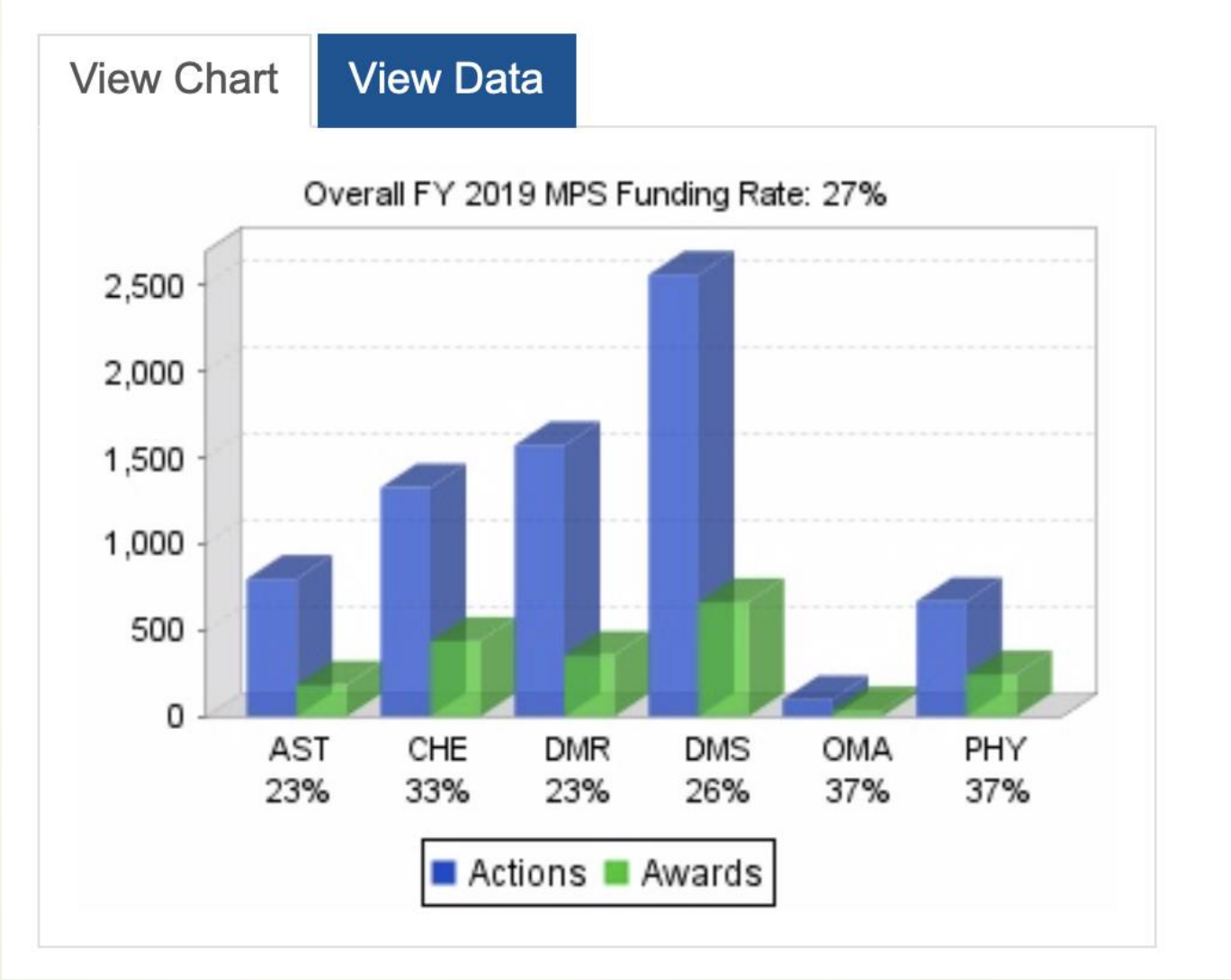
# Directorate of Mathematical & Physical Sciences

- Division of Astronomical Sciences
- Division of Chemistry
- Division of Material Research
- Division of Mathematical Sciences
  - Algebra and number theory
  - Analysis
  - ….
  - **Statistics**
- Division of Physics

# Funding rate of MPS



# What does NSF fund

- NSF has a budget of 7.8 billion dollar in 2018, and provides 24% of all federal funds for scientific research.
- A NSF statistics grant normally means two months of summer salary for junior faculty or 1 month summer salary for senior faculty
- There would be some travel money and budget for computation.
- A standard award is a 3-year grant, and the dollar amount depends on your salary level.
- Junior faculty rarely get support for graduate students or postdocs.
- Your proposal is judged by its merit -- proposing a small budget won't increase your chance.

# What does a NSF grant mean for junior faculty

- Summer salary.
- The prestige of a NSF grant means national recognition.
- It is the proof that your research program has not only intellectual merits but also broader impacts on science and society.
- There is a strong correlation between grant and promotion and tenure.
- Good news: NSF takes new researcher into consideration.

# What does a NSF proposal include

- Project description 15 pages long – use up the page limit!
- Project summary in 1 page that sum up the Intellectual Merits and Broader Impacts of the project – very important!
- Biosketch is limited to 2 pages.
- References are not counted in the 15 page limit.
- Other supporting documents: current and pending support, facility and equipment, mentoring plan, etc.

# Time Line

- The DMS statistics program is a regular annual solicitation.
- Submission window: Dec 1 -- 16, 2019; Dec 1 -- 15 annually thereafter.
- Do not wait till the last minute to submit your proposal – Fastlane might be busy.
- Start at least one month before the deadline. Give yourself 2 months if it is your first proposal.
- Write and re-write.
- Ask your mentor or colleagues to proofread and solicitate comments.
- At the mean time, work with the secretary (accountant, business manager) in your department on the budget and budget justification.
- Your college should have designated personnel help you put the proposal together on Fastlane.
- You can revise your proposal to the last minute, but the other supporting material should be uploaded beforehand.

# Content of your proposal

- Use the proposal as an opportunity to organize your thoughts and plans for your career.
- Write down the ideas that you come across in your everyday research.
- Recycle and organize your ideas into a common theme.
- Identify a few problems under a common theme that you want to investigate – keep in mind it needs to be worth 3 years of effort. For example:
  - I would identify 3 big problems as my objectives, and there might be numerous topics on statistical issues related to these problems;
  - Software development is usually an important object to achieve broader impacts;
  - There can be an education component in the proposal, since training future workforce is one of the missions of NSF.

# Think along the lines of NSF Merit Review Criteria

- Intellectual merit
  - How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields?
- Broader impact
  - promote teaching, training, and learning
  - broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)
  - enhance the infrastructure for research and education
  - benefits of the proposed activity to society

# Writing style

- Borrow funded proposals as examples from your colleagues, major professors and friends.
- Clearly defines the premises of the problems under investigation
  - Why are the problems worth investigating?
  - How existing methods fall short addressing the statistical issues?
  - What do you propose to solve the problem?
- Show your plans are reasonable and likely to succeed
  - Show you have thoroughly thought about all statistical issues;
  - Show preliminary results that show promises, yet there is plenty of work left to do for the next 3 years.
  - Provide a time table to carry out the plans.

# Be part of NSF review

- Volunteer to serve on NSF panel
- NSF welcome junior faculty be involved in the NSF review process
- Good opportunities to see what successful proposals look like
- Get familiar with the review process, how panel discussion is conducted
- See how reviewers evaluate Intellectual Merit and Broader Impacts of proposals
- Use the experience to improve your own proposal writing.

# NSF Early CAREER Grant

- The CAREER program offers the most prestigious awards for early career faculty.
- $400,000 for 5 years – high prestige, more money, longer supporting period.
- Only pre-tenure junior faculty are eligible – you are only competing with peers.
- Must be a single PI proposal, but you can include a couple of collaboration letters from your senior collaborators (optional).
  - The proposal needs to be your idea;
  - Your collaborator only confirms his/her intention to collaborate with you – it is not a recommendation letter;
  - It may add to your credibility.
- Need a good education plan – everyone is doing course development, student advising, you may want to be more creative and genuine.

- You can only submit 1 CAREER proposal in any given year, and you have 3 chances before tenure.
- You can start from your fourth year, and revise your proposal based on the feedback.
- Deadline July 19 this year-- check the next solicitation.
- Start early – you may submit a revised proposal to the regular statistics program. If funded in one program, withdraw from the other.
- NSF CAREER webinar https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214&org=DMS&from=home

# Don’t give up, try again…

- Most proposals have their merits, but the competition is fierce
- The top proposals are ranked ‘must fund’ – truly outstanding, try to learn from them if you serve on a panel
- Bottom ones are ranked ‘not fundable’ – flawed.
- Most proposals are ranked ‘fund if possible’ – there are some merits in the proposal, but NSF may not have enough money to support everyone.
- Read the comments carefully, address them and submit the next time
- Try a different data example, more convincing preliminary results
- Go to a different program

# Branch out

- Other NSF programs that support statistics research
  - DMS-NIGMS, joint program between DMS within NSF and National Institute of General Medical Sciences (NIGMS) at NIH, support fundamental research in mathematics and statistics necessary to answer questions in the biological and biomedical sciences.
  - Methodology, Measurement, and Statistics (MMS) Program, Directorate for Social, Behavioral, and Economic Sciences
  - Division of Biological Infrastructure (DBI) 'Rule of Life' program – if you work in bioinformatics.
- Seek out interdisciplinary collaborations

- Writing a proposal can be very stressful
- It can also be rewarding
- Even not funded, it is a good opportunity to plan your career.