Preparing a Successful NSF Proposal

Dr. Thomas Sanger
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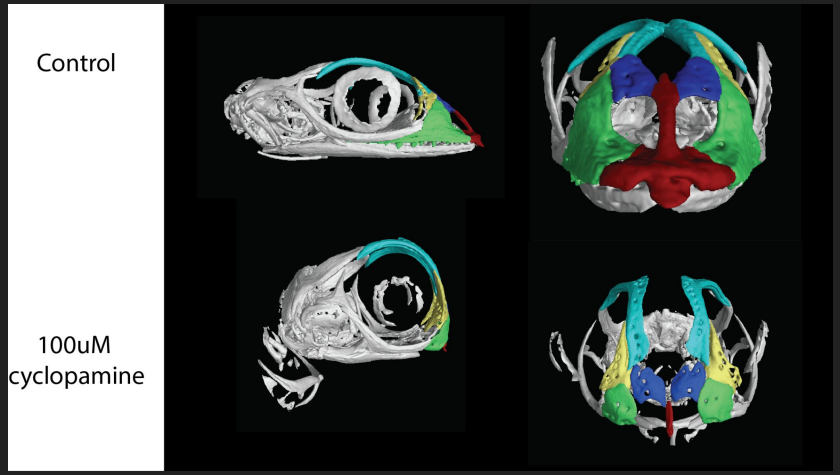
Who am I?

Thomas Sanger
Associate Professor
Department of Biology
CAREER award March 2020
Co-PI on two NSF MRI awards



The developmental bases of the Reptilian face

How environmental stress Disrupts embryonic development

Outline for today’s workshop

- Overview of NSF awards
- Solicitation-specific criteria
- General approaches to writing successful proposals
- Sales! Identify and state the knowledge gap

Upcoming Participation

What is your single most pressing question about funding from NSF?

To date, what is the single most transformative piece of advice you've been given about acquiring funding from NSF?

Why are we here?

To learn about NSF with a special focus on CAREER

PROGRAM SOLICITATION: NSF 22-586

The Faculty Early Career Development (CAREER) Program is a Foundation-wide activity that offers the National Science Foundation's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization. Activities pursued by early-career faculty should build a firm foundation for a lifetime of leadership in integrating education and research.

Funding rates are range from 14% to 24% depending on the directorate

Why are we here?

I have one CAREER award

Therefore, I have a sample size of 1.

Why are we here?

I have one CAREER award
Therefore, I have a sample size of 1.

I have regular discussions with NSF Program Officers

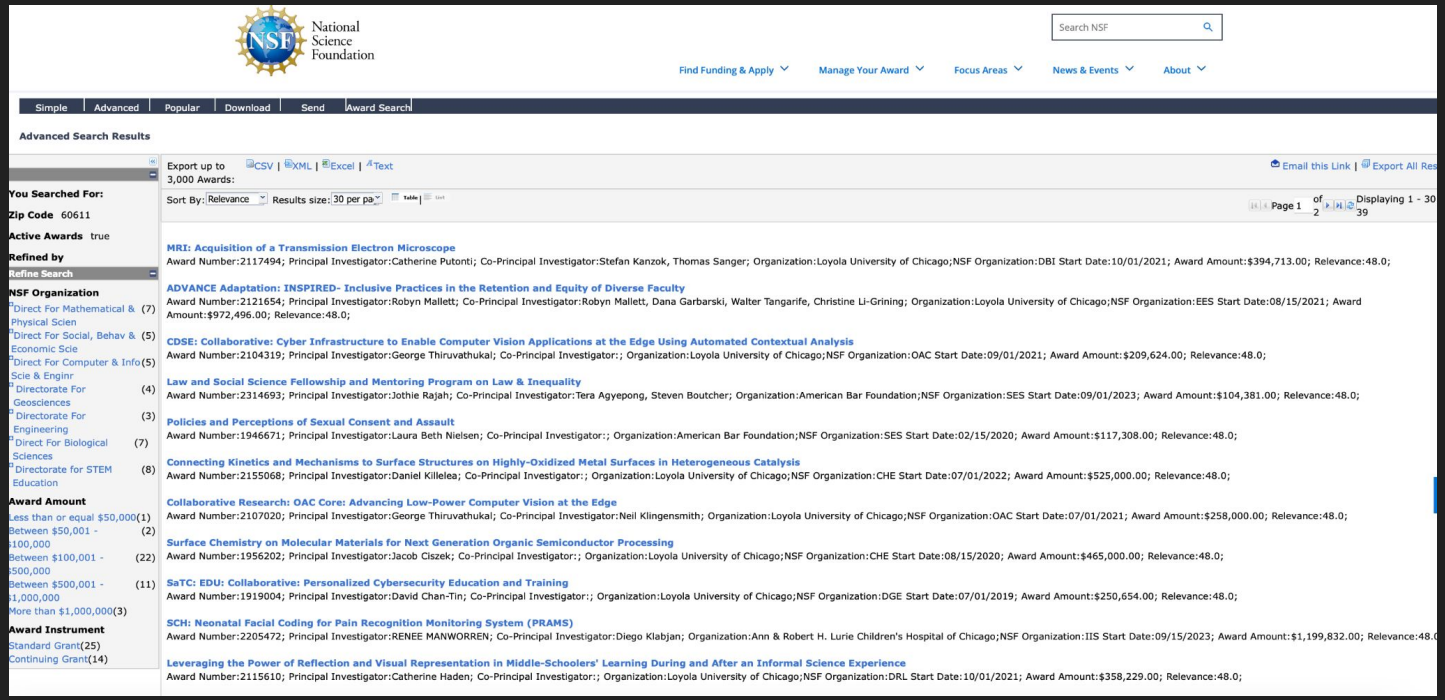
I've sat on NSF panels

I advise ECRs about grant writing for my professional society

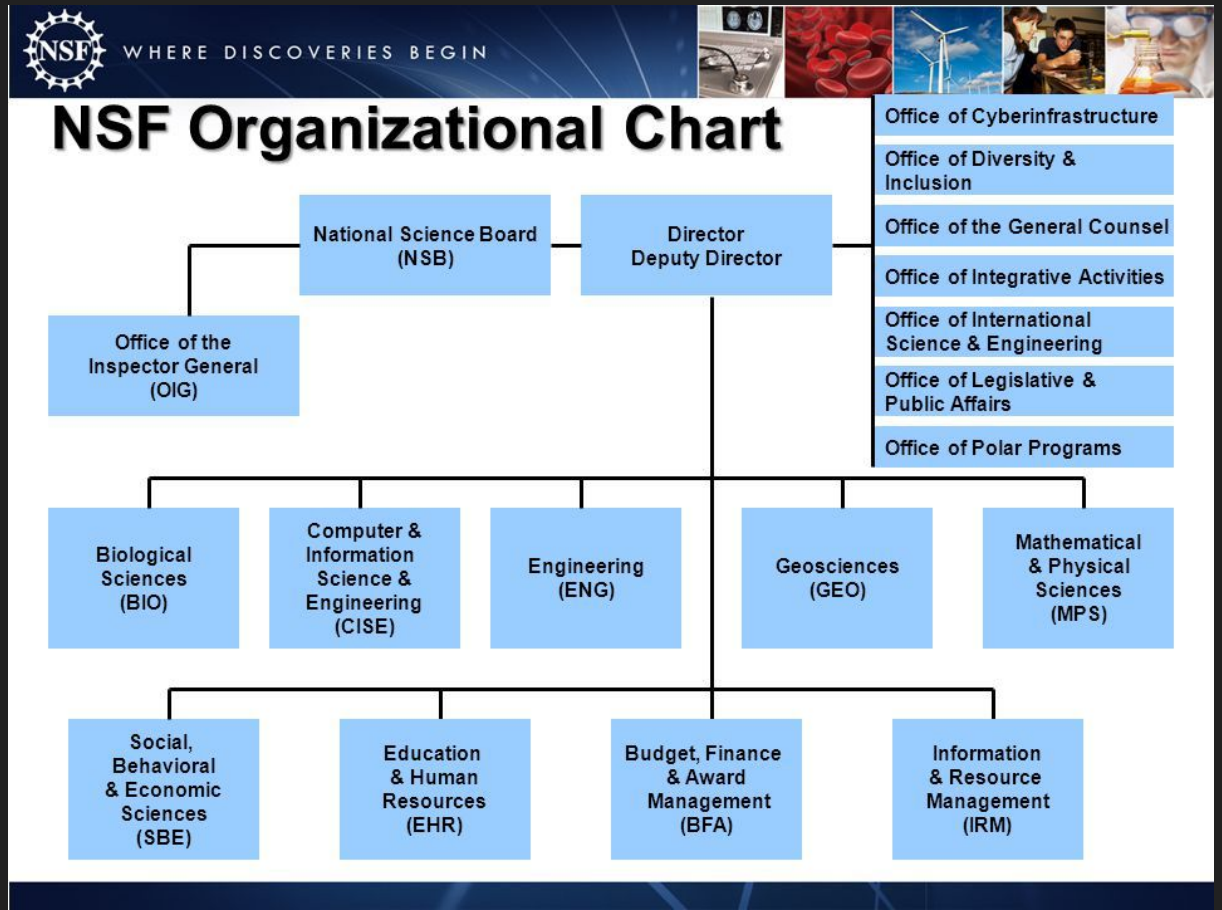
I've sat through grant-writing seminars

Expectations vary by discipline

1. Your NSF Program Officer
2. Colleagues with NSF experience
3. Use NSF award search and talk to people!



The NSF Org Chart



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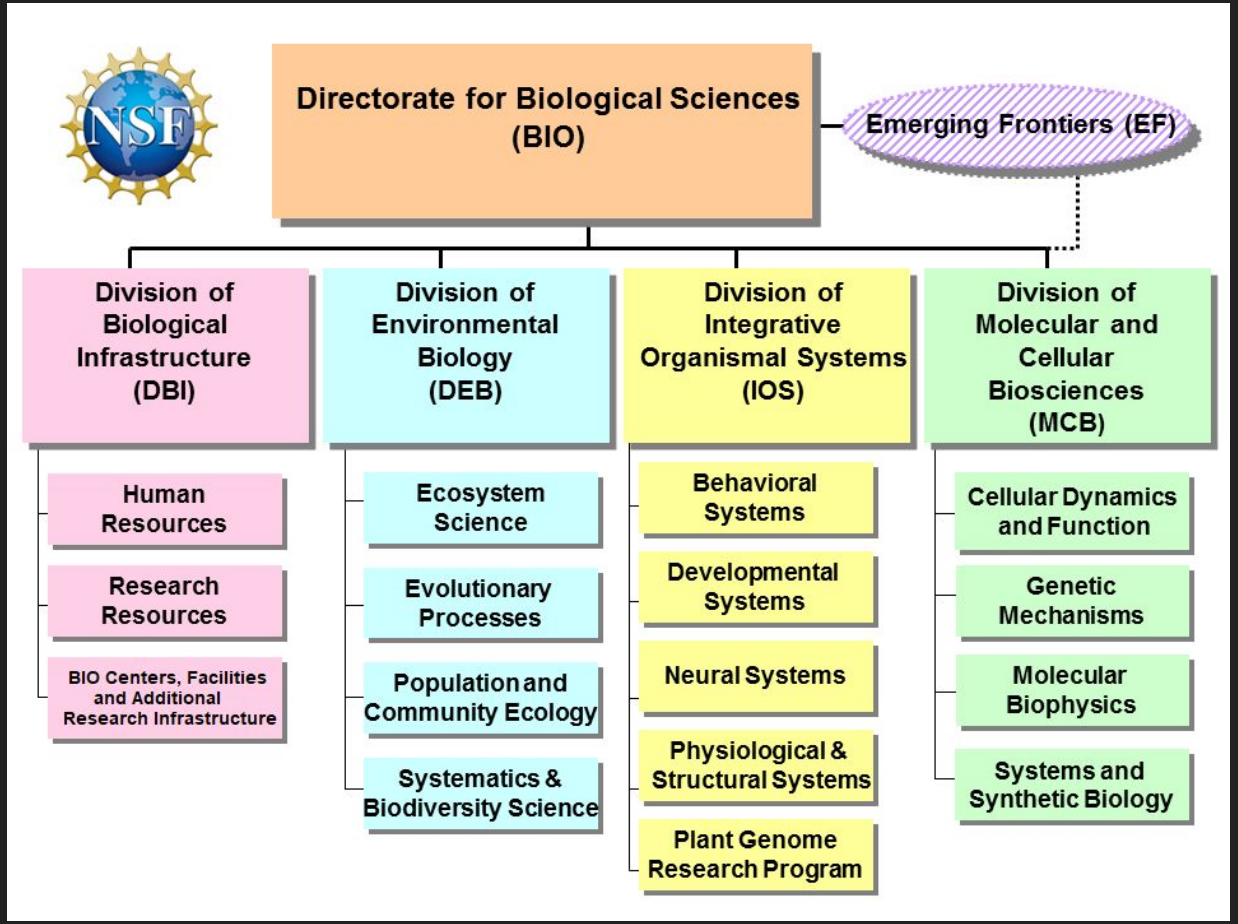
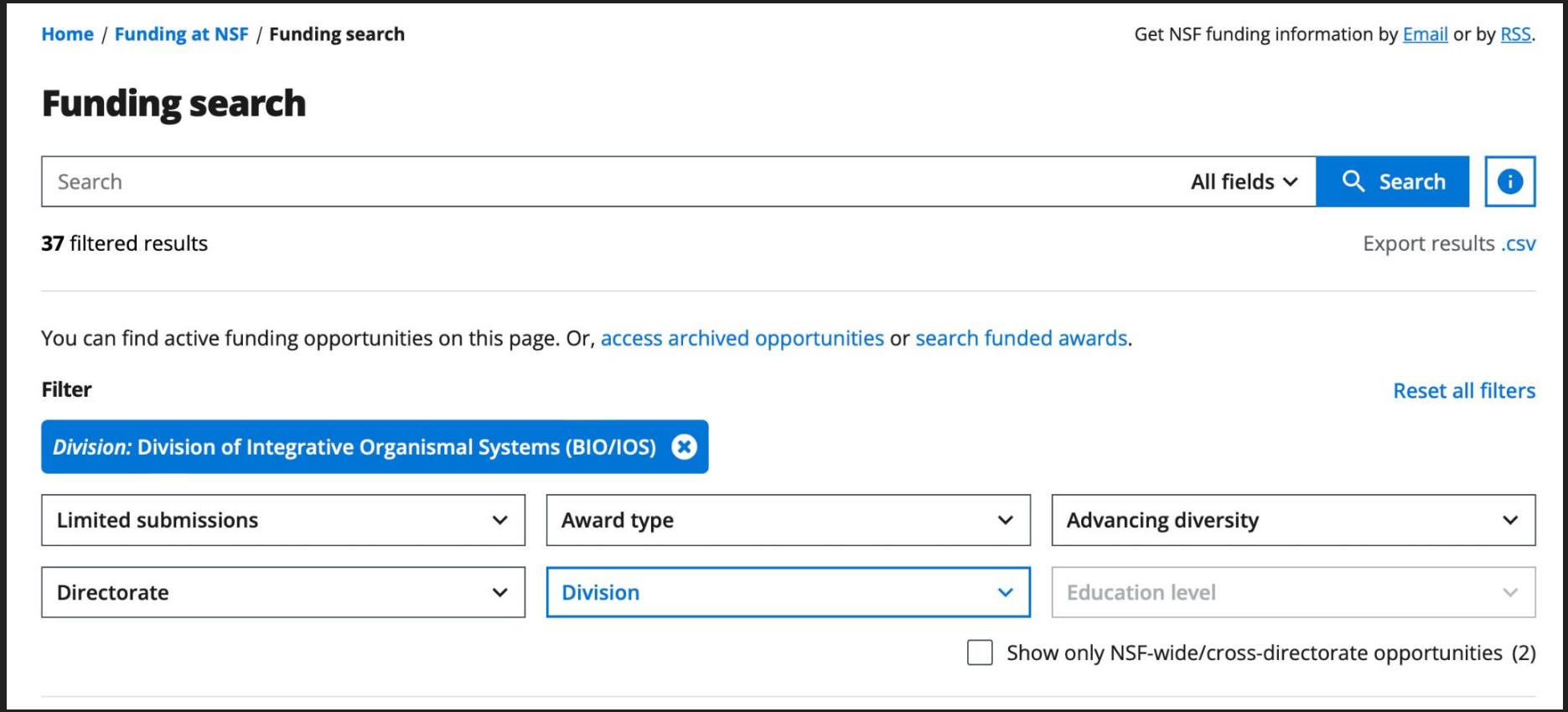


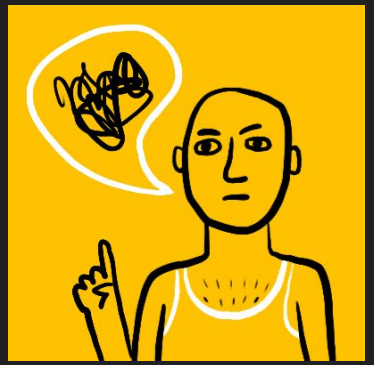
Funding opportunities



Your turn

Answer in the chat:

What is your single most pressing question about funding from NSF?



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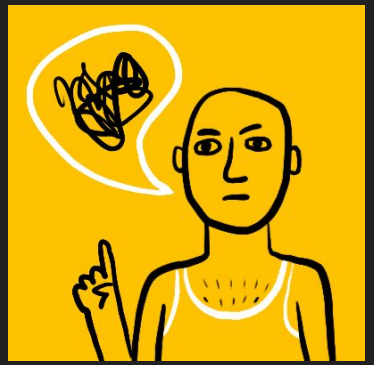

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- Solicitation-specific criteria
- General approaches to writing successful proposals
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Solicitation-specific Criteria

May be about the people, the science, or the broader impacts (e.g., training plan or the people being trained)

Additional Solicitation Specific Review Criteria

In addition to the two NSB-approved merit review criteria, reviewers will be asked to evaluate the following solicitation-specific criteria:

1. Does the proposal describe an overarching question that is addressed through hypothesis-driven research aimed at expanding knowledge and understanding of the **mechanisms of response of organisms to climate change**?
2. Does the proposal **integrate mechanistic insights at the organismal level with eco-evolutionary approaches** to produce **synergistic** research outcomes that may lead to novel, unexpected, or major advances in understanding and/or prediction of biological responses to climate change?
3. Do the broader impacts describe a **plan or a predictive framework** for how the foundational research can be **used for use-inspired insights that address societal challenges** caused by climate change?

Solicitation-specific Criteria

May be about the people, the science, or the broader impacts (e.g., training plan or the people being trained)

Who May Serve as PI:

PIs must be a) at the Associate Professor rank (or equivalent; see Additional Eligibility Information) and b) at that rank for at least 3 years by the proposal submission date. PIs must have current or proposed research that falls within the purview of a participating disciplinary program.

Pilot PUI Track in Directorates for Biological Sciences and Geosciences only, extends PI eligibility: Researchers at the Full Professor rank (or equivalent; see Additional Eligibility Information) at PUI institutions *only* and with proposed research that falls within the purview of a participating program within the Directorate for Biological Sciences or the Directorate for Geosciences may also apply.

The collaborative partner(s) may not be listed as co-principal investigator(s) on the cover page. Instead the partner(s) should be designated as senior personnel or consultants.

Solicitation-specific Criteria

Mid-Career Advancement (MCA)

1) The title of an MCA proposal must begin with "MCA:", followed by the substantive title.

If submitting under the Pilot PUI Track (see Additional Eligibility Info), the title must begin with "MCA Pilot PUI:", followed by the substantive title.

2) In addition to requirements in the PAPPG, including the separate section labeled "Broader Impacts," the Project Description of MCA proposals must also include the following three sections within a 12-page limit. Please note that if submitting via Research.gov, the section header for Broader Impacts must be on its own line with no other text on that line.

Section 1. Candidate's Past Research: All MCA proposals must describe the past (and current) research efforts and accomplishments of the candidate to their field of science or engineering. In this section, the candidate should include a list of no more than 6 publications. Each should be followed by a brief explanation of its significance, the candidate's role in the research, and funding source(s). This discussion should be incorporated into the section on Results of Prior NSF Support, when appropriate. It is not necessary to list the full citation of these articles in the Project Description; full citations of the articles discussed should be listed as a separate group in the References Cited section (see below).

Section 2. Candidate's Proposed Research Advancement and Training Plan: All proposals must describe the scientific research and training enhancement experiences to be undertaken, and how the collaboration between the candidate and partner(s) is likely to be mutually beneficial and create "added value" beyond that which would occur through a typical collaboration (for example, by opening new avenues of inquiry). The candidate and partner(s) should be engaged in a research project that addresses fundamental questions and challenges in the scientific discipline to which the proposal is submitted (see participating programs) and is likely to result in publications and a foundation for future competitive proposals. The candidate should include enough information to permit an evaluation of the intellectual merit of the research advancement and training plans, including their novelty, creativity, and significance.

Section 3: Candidate's Long-Term Career Plans: This forward-looking section should describe how the proposed work builds upon past (and current) research and related accomplishments of the candidate to enable a productive long-term scientific career extending well beyond the award period. This section should also include a timeline for present and future career enhancement activities and associated products, including expected outcomes from the MCA-funded activities that will serve as a foundation for future research endeavors.

Solicitation-specific Criteria

Not all NSF solicitations are for research

Solicitations may also be calls for personnel, training, or education

Solicitation-specific Criteria

Not all NSF solicitations are for research

In addition, reviewers will be asked to evaluate proposals for:

- A coherent network structure that is designed to leverage a range of expertise and institutions to achieve the goals of this program and optimize the networking opportunities for all participants and that is well integrated with the science theme and cohort-structure of the mentees to create a cohesive training environment.
- A well-developed participant recruitment, selection, and retention plans with effective strategies for broadening participation.
- An effective, evidence-based inclusive and culturally-aware program for mentor-training that is well integrated into the entire project.
- An effective, evidence-based plan for mentoring of trainees that includes such factors as individualized components; clear expectations; training in critical thinking and interpersonal interactions; authentic research experiences; a sense of identifying and belonging to the cohort; culturally appropriate practices; fair assignment of research credit; and professional development.
- The effectiveness of the plans to evaluate and assess project progress and outcomes and for project dissemination.

CAREER-specific Criteria

- No rolling deadlines.
  The deadline is the 4th Wednesday of July at 5:00pm local time.

- No Co-PIs.
  Relevant to assessing feasibility
  Senior personnel are allowed

- Maximum of three proposals.
  Don’t submit too early.
  Establish your independent research program first!

- Requires a departmental letter of support

CAREER-specific Criteria

- Five years of funding
  - Take this into account with research and education planning

- $400K minimum
  - LUC CAREER budgets have ranged from ~$400,000 - $960,000

- Integrated Education Plan
  - Research and education are integrated with each other
  - This is more than a typical NSF Broader Impacts statement

Solicitation-specific Criteria
CAREER-specific Criteria

- Five years of funding
- $400K minimum
- Integrated Education Plan
- No rolling deadlines.
- No Co-PIs.
- Maximum of three proposals.
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Questions?

Writing successful NSF proposals

- Broad/shallow versus Focused/deep
- Identity and clearly state the knowledge gap
- Avoid the fishing expeditions. NSF wants hypotheses.
- Plug your work into broader NSF initiatives
- Think like a reviewer.
- Sell you ideas!

Broad/shallow versus Focused/deep

Too many routes - you can’t explore them all

Lots of space in-between those paths

Unclear which path you will take

Could be considered an incremental advance (superficial)

Mississippi River Delta

Broad/shallow versus Focused/deep

You have a tangible/achievable goal
You are filing a clear knowledge gap
Your route is direct

You acknowledge the surroundings

Molinere Underwater
Sculpture Park, Grenada

What is the knowledge gap?

Identify the gaps in knowledge or understanding of a subject and how your research will fill those gaps.

Molinere Underwater Sculpture Park, Grenada

Literature review

Avoid “novelty” clichés

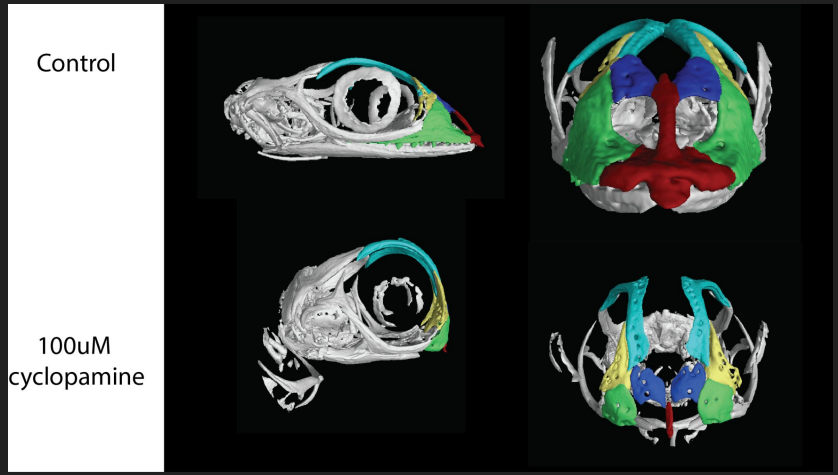
- Prove to the reviewer that there is a knowledge gap and that you are the right person to fill it!

What is the knowledge gap?

Ranging from humans, to snakes, to birds to crocodiles, there is incredible diversity in the shape of the amniote skull.

Skull development has been studied extensively in only two model species.

Skull development has not yet been studied in lizards or snakes, a group of nearly 8,000 species.



The developmental bases of the Reptilian face

Your turn

On your own, try to write three to four sentences that identify a tractable knowledge gap that your research can address. (3 minutes)

Is anyone willing to share?

Writing successful NSF proposals

- Broad/shallow versus Focused/deep
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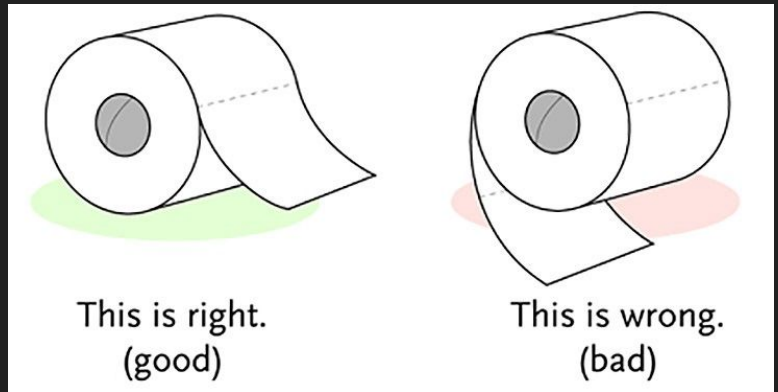
Controversial!



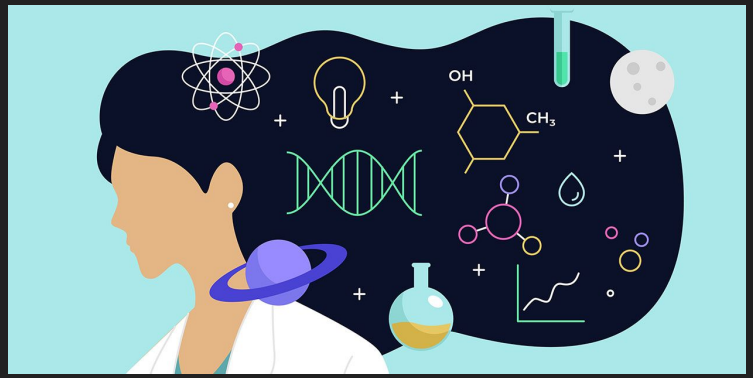
Fishing
Inductive research

You often don’t know what you are going to catch when you fish.
Sometimes you don’t catch anything at all.

To reviewers, this is viewed as risky.

Hypothesis-driven research

Deductive research



Prior observations provide you with predictions

This demonstrates that you have thought through all the steps

There may be multiple, alternative hypotheses

To reviewers, this is viewed as less risky and fundable.

Broader NSF initiatives

Where possible, explain how your work supports NSF-wide or Directorate-specific initiatives

“My efforts to in integrate across levels of biological organization–from molecules to morphology–my proposed research aligns well with the current NSF-wide initiative, Understanding the Rules of Life.”

Writing successful NSF proposals

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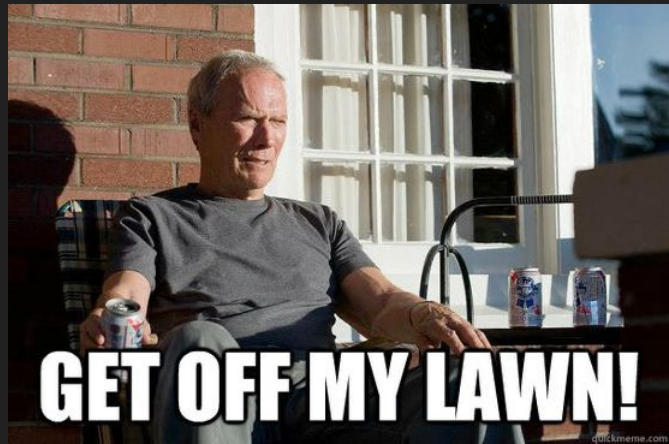


The NSF Review Process

- **Intellectual Merit:** The intellectual Merit criterion encompasses the potential to advance knowledge.

- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

- **Solicitation-specific criteria**

Strengths and Weaknesses

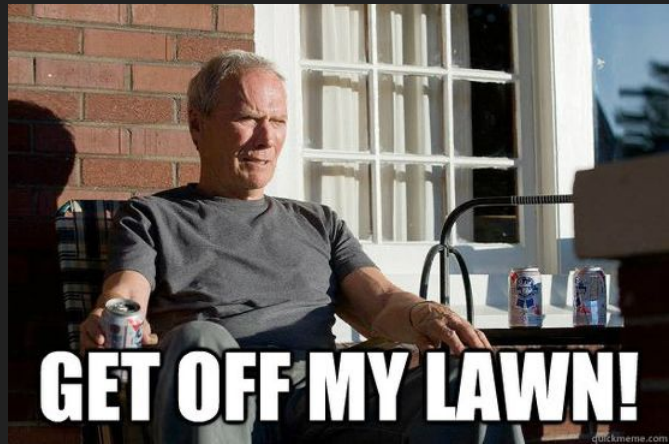
1a. What is the potential for the proposed activity to advance knowledge and understanding within its own field or across different fields?
1b. benefit society or advance desired societal outcomes
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the Principal Investigator (PI) either at the home organization?

Reality of proposal review

When writing the proposal, the reviewer is your target audience.

You are not writing to your collaborator.
You are not writing to another specialist in your narrow field.

You need to get out of your own head.



Reality of proposal review

When writing the proposal, the reviewer is your target audience.

Busy researchers have too many demands on their time.
They will compare your proposal with the several others that they have been asked to review
Will read it in 60 min or less
Will compose his/her review in less than 30 min

Reality of proposal review

In the chat, what are some ways that you can make the reviewer's Work easy for them? (How to we make them like us?)

Use subheadings to highlight sections

the pros will toss their golf ball to their caddie when they can and as often as they can. A clean golf ball is so important to the game. A dirty golf ball can cost you valuable strokes if not done properly. How to clean a golf ball is a simple thing to do, and most golf courses have the tools to help you do this.

If you are a beginner to the game you may not know that most courses have a tool called a ball washer that will clean your ball. Located by most tees it is very easy to use. Mounted on a post is the most common one, with a small bucket and a handle on top. Lift the handle on the bucket and you will notice a hole in the middle for your golf ball. Place the ball in this hole and move the handle up and down through the brushes in the bucket, till your ball is clean.

Now, some courses do not have ball washers on every hole and you need an alternative to clean your ball. You should get into the habit of carrying a towel on your golf bag. As you get ready to play your round, wet one end of your towel and keep the other end dry. Carry two towels, one wet and one dry. This will make sure you are always ready to clean your ball.

One point I forgot to mention is that there are never ball washers around the green. Putting is the most important time to have a clean ball. Having a towel is the only way to clean your ball. There are times that you may clean your ball in the fairway and you won't find a ball washer in the middle of the fairway either.

There are a few rules in the game of golf that will allow you to lift and clean your ball. After a rain you may land in a puddle, they call this casual water and you get a free lift and may clean your ball. The imbedded ball rule also allows you to lift and clean. You can clean the ball if you have a unplayable lie or go into a hazard area, but in these cases it cost you one stroke.

VS

On Course features

The on course features of Golf GameBook are very similar to the types of things you can do on several other golf apps, but with an added focus on the social side of the game and it is this element which is driving many golfers towards this app. Features you can use on course include:

- Innovative scoring system that not only tracks the scores of you and your partners, but if you are in a competition, will collate all the scores received from players in the competition to produce a real-time leaderboard.
- A variety of different golf games and formats are supported so you can set up the app to automatically calculate your results based on your handicap and the scoring system selected.
- Fully Customizable tournaments, leagues and games which can be set up between friends.
- Photo sharing facility, so you can capture your moments on course and quickly share them to your chosen social media platform (such as Facebook).
- Chat facility available for messaging with other golfers and friends using Golf GameBook, whether they are on the course with you or not.

In our view...

Having looked at the app in detail, we think that this is certainly one of the top ten best apps available for iPhone, Android or Samsung devices and we are unsurprised that the app is quickly becoming the must have golf app on each of these devices.

What makes this app particularly useful is that using it is very much like using a social media tool, rather than a dedicated golf app. This makes navigating the

Outline for tomorrow

- Building your narrative
- Common pitfalls of NSF unsuccessful proposals
- Building your broader impacts

Dr. Thomas Sanger
tsanger@luc.edu

Come back for day 2 tomorrow!

CAREER-specific Criteria

Five years of funding

How could you demonstrate to a reviewer that your project is five years worth of work?

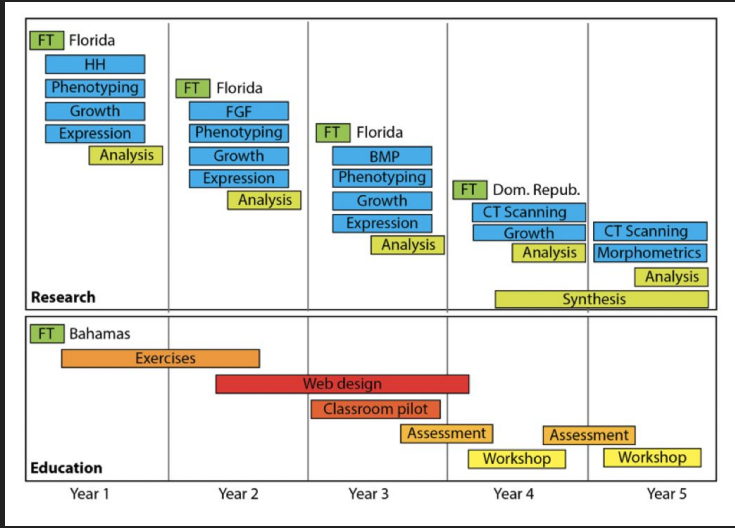
Provide ideas in the chat.

CAREER-specific Criteria

Five years of funding

How could you demonstrate to a reviewer that your project is five years worth of work?

Add a timeline



Tell reviewers why they should care!

An old quote from an NSF Program Officer:
“90% of the grant’s likelihood of success is based on how novel your questions are —ideally they are ones that have not been thought of or posed before”.

<u>The first page can make or break your proposal</u>

Tell reviewers why they should care!

Help the reviewers understand where they are going.
The first page should serve as a introduction to the entire proposal.

Identify the knowledge gap
State how you are going to fill it
(three aims)

If appropriate, state an overarching, testable hypothesis

Tell reviewers why they should care!

Earlier: On your own, try to write three to four sentences that identify a knowledge gap that your research can address.

Now: Name three potential aims that could potentially address that knowledge gap.

We will begin next time with feedback within our breakout rooms.