GRANT WRITING FOR SUCCESS

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NINR/NIH

National Institutes of Health

Office of Extramural Programs

OVERVIEW

- Start planning early
- Apply for the right opportunities
- Contact appropriate program staff early
- Talk with potential mentors, collaborators, & peers – seek advice from colleagues
- Present your ideas clearly and pay attention to review criteria
- What to do after review

The Grant Life-cycle
Start planning your application early

Idea and planning

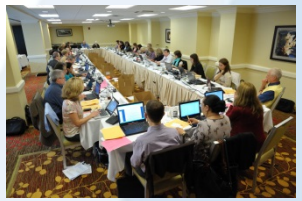
Find opportunity

Apply to NIH

NIH Center for Scientific Review

Assigns to IC/review group

Study Section

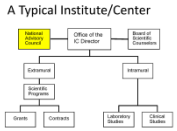


Reviews scientific merit

Institute

Evaluates program relevance

Advisory Council



Recommends action

Institute Director

Makes award

Funds

Manage grant award

Use NIH resources for help

http://gran

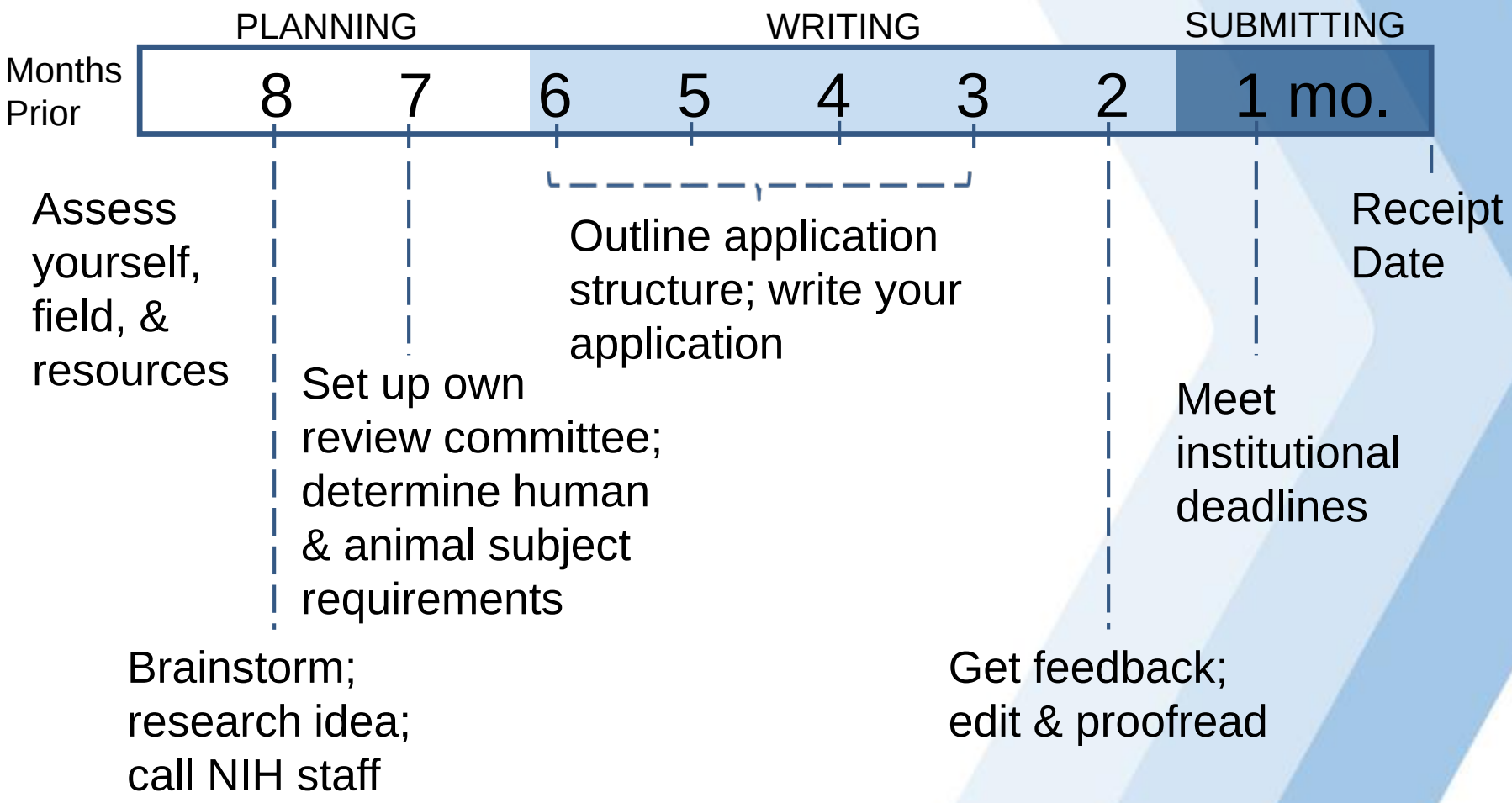
About Grants

Navigate the NIH grants process from finding a funding opportunity to monitoring your award.

- Grants Basics
- Grants Process Overview
- How to Apply
- Pre-Award Process
- Post Award Monitoring and Reporting
- Forms Library

Learn More

Pre-submission planning timeline



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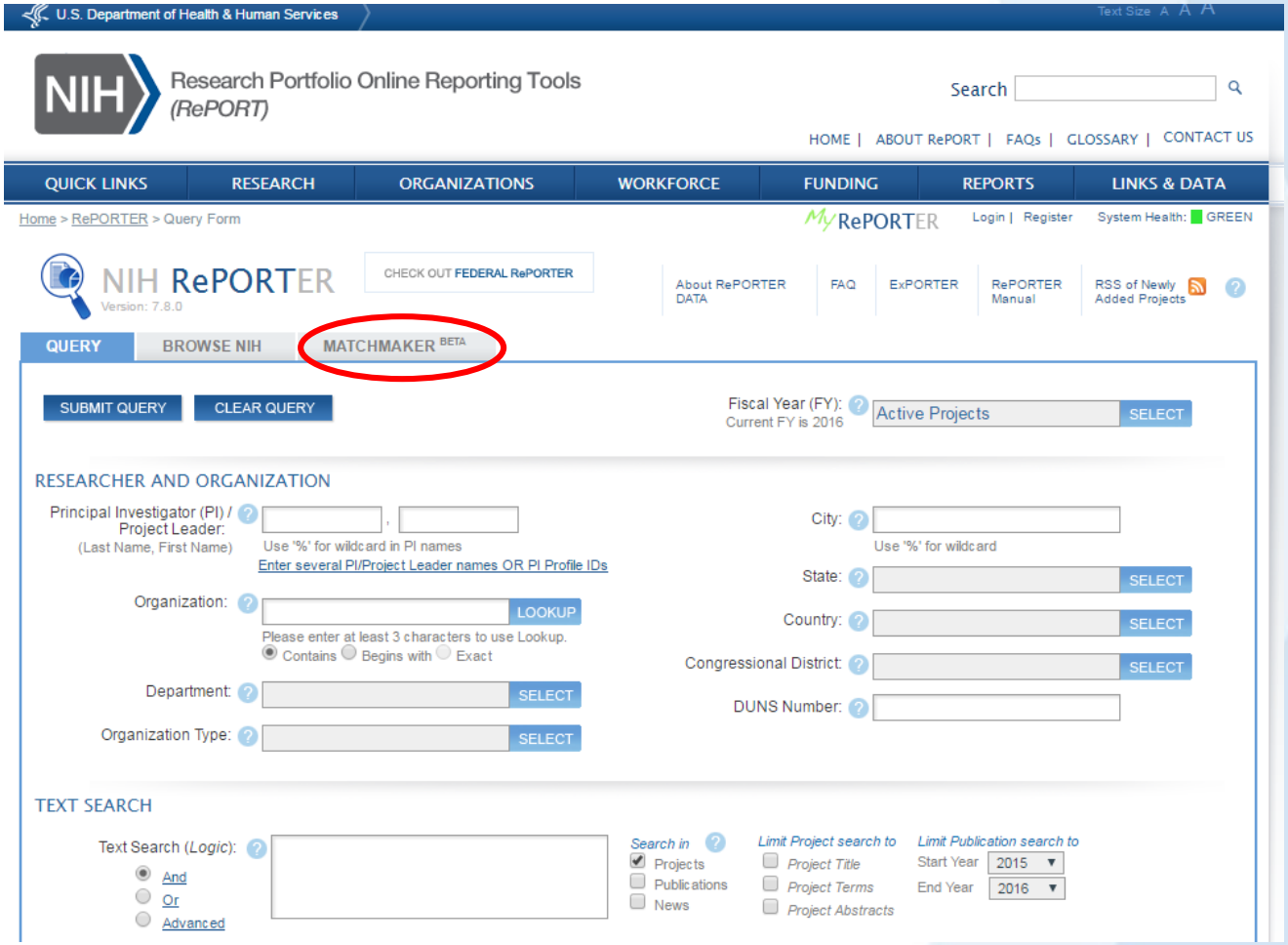
Let NIH Reporter help you find similar work, appropriate IC and study section

http://projereporter.nih.gov



It is important to find the right study section

- Once you have identified some potential study sections, go to CSR website (https://public.csr.nih.gov/studysections/pages/default.aspx)
- Talk to your PO
- Send your Specific Aims to relevant SROs
- Include an Assignment Request Form with the application (no more cover letters); suggest:
  - An institute for potential funding
  - A study section for review
  - Specific areas of scientific expertise (but no names!)
  - Reviewers that should not be involved in the review

Use the NIH Guide to find funding opportunities

Grants (NIH Guide to Grants and Contracts)

The NIH Guide for Grants and Contracts is our official publication for NIH grant policies, guidelines and funding opportunities. We publish daily, and issue a table of contents weekly. Learn more about the NIH Guide and subscribe today!

View all Parent Announcements
(for unsolicited applications)

Search for funding opportunities and notices

Learn our jargon:

- Request for Applications (RFA) – set aside funds, one submission date, special review panel
- Program Announcements (PA, PAR, PAS)
- "Parent" announcements—investigator-initiated; mechanism specific
  - R01, R03, R15, R21

Or use our tool to find opportunities for your career stage

https://grants.nih.gov/grants/funding/funding_program.htm

Are you a new investigator (NI), an early stage investigator (ESI)?

- Pertains to R01 applications
- NI - never has been awarded a R01
- ESI – never been awarded a R01 and is within 10 years of terminal degree
- Does it make a difference? *YES!*
  - In a study section, NI and ESI R01 applications are clustered and reviewed together
  - At the institute level, new investigator applications have a preferential ‘payline’ (either all NI’s or just ESI’s, depending on the institute)

R21 and R03 applications

Not every IC accepts these funding mechanisms!!!!

- R21 – 2 years for a total of $275,000
  - ‘High-risk, high-reward’
  - Paradigm shifting
  - Create a new tool/model for the community
  - Not a ‘mini’ R01

- R03 – 2 years for $50,000/year

These can be used obtain preliminary data and then write a R01

Finding the right opportunity - summary

- Use NIH Websites and tools, like NIH Reporter, to understand the mission of NIH Institutes and Centers and find those that might be relevant to your research

- Use the NIH Guide or the career stage-specific Websites to identify appropriate Funding Opportunity Announcements (FOA)

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Know your PO, SRO, and GS

- **Program Officer (PO)**
  - Works in a particular institute
  - Manages a scientific research portfolio of grants, contracts, and cooperative agreements
- **Scientific Review Officer (SRO)**
  - Typically works in CSR but also within institutes
  - Helps ensure that the scientific review group (study section) identifies the most meritorious science for potential funding
- **Grants Management Specialist/Officer (GS/GMO)**
  - Works in a particular institute; Evaluates applications for administrative content and compliance with policy

What does a Program Official do?

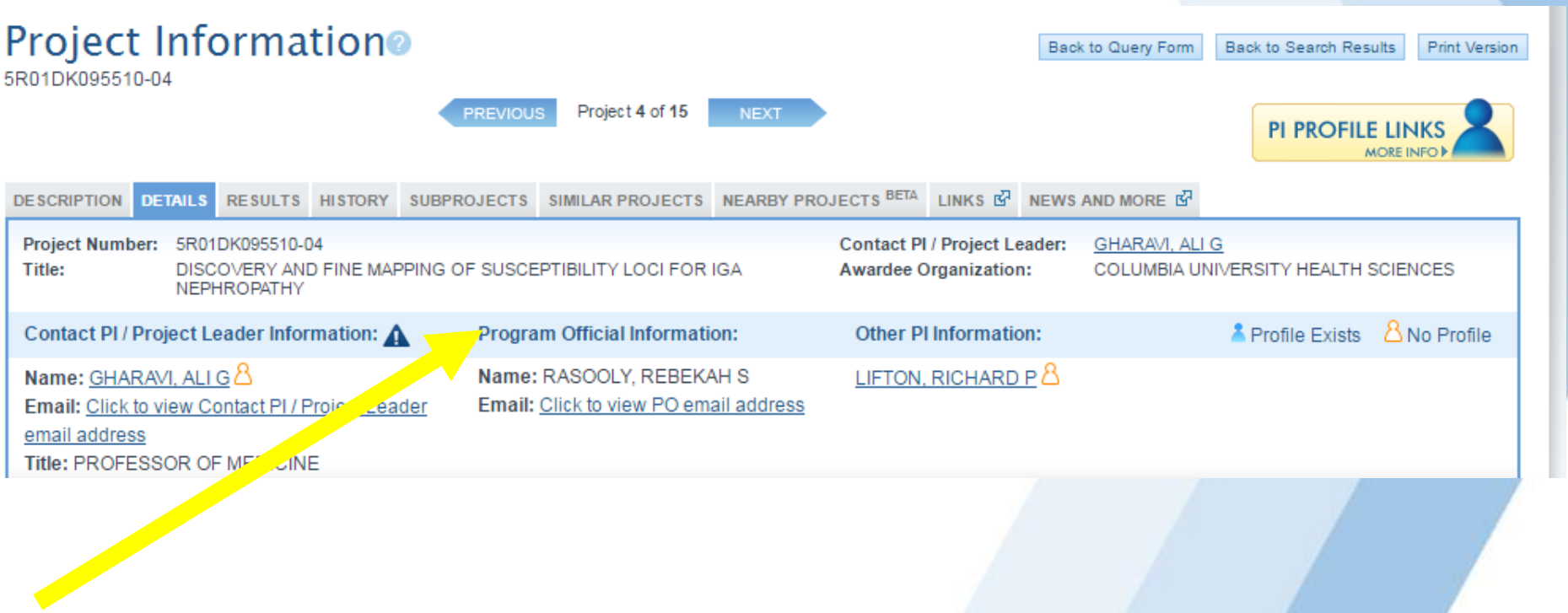
- Scientist and administrator
- Manages grants, contracts, & cooperative agreements
- Identifies needs in scientific areas
- Identifies areas of special interest & communicates program priorities
- Reports on scientific progress and program accomplishments
- Government's technical representative for funded projects
- a.k.a. Program Director/Chief, Health Scientist Administrator

What should I talk about with a Program Official?

- Provide a thumbnail sketch of what you have in mind
- Ask whether the idea fits the Institute's interests
- Get information from on FOAs
- Find out what kinds of grant mechanisms can be used and whether there any priorities for those mechanisms
- Ask if the PO is willing to read an very brief outline of the proposed project or draft specific aims
- Email to set up a time to discuss, but remember that this is advice, not a review, and you have no obligation to follow the advice given

Identify appropriate NIH program directors

- Start with NIH Reporter and see what research projects the NIH or any Institute has funded that are similar to yours
- Then find the Program Official in the “Details” tab



Contacting NIH program staff - summary

- Use Reporter or other NIH Websites to identify program directors relevant to your research

- Contact the program director early in the planning process to get advice about your application and funding opportunities

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Collaborate with others

- Collaborate with others
  - In your department
  - In other departments
- Network at meetings
- Stay connected to past colleagues and mentors
- Cultivate a strong network that understands the funding process

Find collaborators for your application

- Determine the expertise needed to strengthen your research study team and fill gaps in your own expertise
- Begin to assemble the research study team early and obtain letters of commitment from them
- Consider a multiple project director/principal investigator model if a team science approach would be more effective for your work (but this is a complex decision that you should discuss with a Program Director first!)

Ask colleagues to read your application

- Show your draft application to:
  - Your collaborators
  - A colleague that does not know what you intend to do
  - Someone who is not your best friend

- Draft “reviewers” must understand:
  - What you intend to do
  - Why you believe it is important to do
  - Exactly how you’re going to do it.

  If they don’t get it, you must revise your application!

Seek advice from colleagues - summary

Appropriate collaborators can strengthen your proposal

Colleagues can read your application before you submit it

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General grant-writing tips

- Read instructions for application form
- Be realistic … not overly ambitious
- Discuss potential problem areas and possible solutions
- Be explicit
  - Reviewers cannot read your mind!
  - Don’t expect reviewers to read between the lines
  - Don’t assume they know what you intend!

What reviewers look for in an application?

- A clean, well-written, easy to follow application
  - Significance and impact
  - A strong premise leading to exciting ideas
  - Clarity of the project's rationales and goals
  - Realistic aims and timelines
  - Rigorous experimental approaches
  - Discussion of limitations of the study
  - Reasonable alternatives

Develop a Strong Research Plan

Your hypothesis (or hypotheses) is the basis of a strong application

- Make sure that the hypothesis thematically unifies the abstract, specific aims, and the research plan
- It must be solidly based on current information.
- It must convey the significance of the project
- It should be clear
  - Not so good: "we hypothesize that Chronic Kidney Disease causes cardiovascular disease and early mortality"
  - Better: "we predict that individuals with CKD are more susceptible to the development of atherosclerosis due to uremic solutes directly activating macrophages and promoting inflammation-induced plaque deposition"

Will you be in trouble if the study:

- Is discovery-driven (hypothesis generating)? No, but you need to:
  - Describe the rationale for the aim and how it will provide the foundation to follow up with more mechanistic questions
  - Have a defined plan for prioritizing large amounts of data
- Uses a model system? No, but you need to:
  - Place the work in context as to how it will propel the field forward
  - Emphasize its significance
- Not immediately translational? No,
  - But if you discuss the potential translatability of a study it becomes fair game for reviewers to disagree

Specific Aims

Develop a Strong Research Plan

- This one page grabs the reader immediately, and also gives you a roadmap for your application
- Begin with an overall section
  - State general purpose
  - Include some key supporting data
  - State the hypothesis
  - State long-term objectives and expected ***impact***
- Organize the aims in a sequential, numeric format
- *Tell reviewers what the results will mean!*

Building a specific aim

- Introductory paragraph
  - What is the research area?
  - What is known?
  - What is the gap in knowledge?
  - What is the critical need?
- Second paragraph
  - What is the solution?
  - What is the long-term goal and potential impact?
- Aims
  - What will you do to test the hypothesis?
  - What are the expected outcomes?
- Final paragraph
  - Return to impact/payoff

Building a specific aim
Introductory Paragraph

Mammalian oocytes are stored in the ovary and are arrested at meiotic prophase, for decades in women. Then in response to luteinizing hormone signaling in the surrounding follicle, meiosis resumes, and the oocyte progresses to the stage at which it can be fertilized. Meiotic arrest in antral follicles of mice is maintained by cyclic GMP that is produced by the granulosa cells and that diffuses into the oocyte through gap junctions; LH signaling decreases gap junction permeability and cGMP production by the granulosa cells, thus lowering cGMP in the oocyte. Since cGMP competes with cAMP at the catalytic site of the phosphodiesterase (PDE3A), the reduction of cGMP decreases cAMP in the oocyte, which ultimately leads to activation of the CDK1 kinase and release of inhibition of the meiotic cell cycle.

Color Key: What is the research area?

What is known about the area?

Building a specific aim
Second paragraph

Despite knowledge of this cascade, much of it elucidated by our studies, many questions remain. This proposal focuses on the key event of the reduction in cGMP by investigating how LH signaling reduces the guanylyl cyclase activity of natriuretic peptide receptor 2 (NPR2) (aims 1 and 2), and how LH signaling lowers cGMP through the activity of cGMP phosphodiesterases (aim 3). These experiments will contribute to our understanding of how hormonal signaling triggers resumption of meiosis, and may have implications for reproductive medicine as well as understanding of regulation of guanylyl cyclases and cGMP in other tissues.

Color Key: What is the gap in knowledge?

What is the critical need/potential impact?

Develop a Strong Research Plan

Significance

- Why is this research important?
- Shows your understanding of the overall field
- Demonstrates that your questions are novel and important and represent a logical next step in research
- Do not write a review article; instead highlight critical gaps that will be addressed by the proposed research
- Graphics can be helpful

Develop a Strong Research Plan

Innovation

- Show that proposed research is new and unique
- Either:
  - Show how the proposed research would refine, improve, or propose a new application of an existing concept or method.
  - Or show how the research would shift a current paradigm.
    - Make a very strong case for challenging the existing paradigm.
    - Have data to support the innovative approach

Develop a Strong Research Plan

Approach:

Preliminary Studies

- If you are applying for a new application, include preliminary studies
- Your preliminary studies show availability of key resources, familiarity with the proposed methods and approach to interpreting results
- If the data are pertinent to only one Aim, include it in this Aim. If the data are generally relevant, include a section at the beginning of Approach before describing individual aims
- Include a progress report if you are applying for a renewal or a revision (competitive supplement)

Develop a Strong Research Plan

Approach

- Does your plan flow logically from the literature review and prior studies?
- How will each hypothesis be tested?
- Do your measures capture the variables needed to test hypotheses?
- Why did you choose those measures?
- Methods and analyses must match
- Consider organizing each aim the same way, including the:
  - Rationale
  - Experimental approach
  - Anticipated results
  - Alternative approaches/pitfalls

Develop a Strong Research Plan

Approach-
Clinical Studies

- For clinical studies, be explicit and thorough in discussing
  - intervention or system to be studied
  - target population
  - inclusion and exclusion criteria
  - independent and dependent variables
  - all measures and instruments
  - power analyses

Align your application with the Review Criteria

- Overall Impact
- Core Review Criteria
  - Significance
  - Investigator
  - Innovation
  - Approach
  - Environment

What is the overall impact of an application?

- Two questions drive reviewer determination about the likelihood that the proposed studies will have a strong and sustained impact on the scientific field
  - Should they do it?
  - Can they do it?
- The overall impact is NOT mathematically related to individual criteria scores.

Core Review Criterion #1

SIGNIFICANCE (*Should they do it?)*

- Does this study address an important problem?
- If the aims are achieved, how will scientific knowledge be advanced?
- What will be the effect on concepts or methods that drive this field?

Core Review Criterion #1 (cont.)

SIGNIFICANCE (*Should they do it?)*

Scientific premise has been added to the stated review criteria

- **Premise** – defined as 'the research that is used to form the basis for the proposed research question(s)'
- Consideration of the strengths and weaknesses of published research or preliminary data crucial to the support of the application
- Distinct from hypothesis
- Assessed as part of the Significance criterion

Core Review Criterion #2

INVESTIGATOR (*Can they do it?)*

- Are the investigators appropriately trained and well suited to carry out this work?
- Is the work proposed appropriate to the experience level of the principal investigator and other researchers?
- Does the investigative team bring complementary and integrated expertise to the project (if applicable)?

Tip: use the Biosketch to explain your major contributions or any mitigating circumstances that ‘slowed’ your progress

Core Review Criterion #3

INNOVATION (*Should they do it?)*

- Does the application challenge and seek to shift current research or clinical practice paradigms?
- Are the concepts, approaches or methodologies, instrumentation, or interventions novel to one field of research or novel in a broad sense?
- Is a refinement, improvement, or new application of theoretical concepts, approaches or methodologies, instrumentation, or interventions proposed?

Core Review Criterion #4

APPROACH (*Can they do it?)*

- Are the conceptual framework, design, methods, and analyses adequately developed, well-integrated, and appropriate to the aims of the project?
- Does the applicant acknowledge potential problem areas and consider alternatives?
- 

Have the investigators presented adequate plans to address relevant biological variables for studies in vertebrate animals or human subject, e.g., sex?

Core Review Criterion #4

APPROACH (*Can they do it?)*

Rigor is now formalized in the stated review criteria

- **Rigor** is defined as ‘strict application of the scientific method to ensure robust and unbiased experimental design, methodology, analysis, interpretation and reporting of results.’
  - Provide confidence that the research can be reproduced
  - Consideration of confounding variables, e.g., sex as a biological variable

Core Review Criterion #5

ENVIRONMENT (*Can they do it?)*

- Does the scientific environment in which the work will be done contribute to the probability of success?
- Do the proposed experiments take advantage of unique features of the scientific environment or employ useful collaborative arrangements?
- Is there evidence of institutional support?

Other review considerations

These sections are also essential:

- Human subjects and inclusion of both genders/minorities/children
- Animal care and use – address all five points
- Select agents/biohazards
- Model organism sharing plan
- Data sharing plan
- 

Authentication of Key Biological Resources

The FOA will list any additional issues that reviewers will be asked to evaluate.

Hallmarks of an outstanding grant application

- Strong significance for an important problem in public health: IMPACT is high
- High degree of novelty and innovation
- Strong track record of a well qualified applicant with compelling publications
- Clear rationale
- Relevant and supportive preliminary data
- Clear and focused approach that provides unambiguous results
- Careful attention to details
    - Spelling, punctuation, grammar, fonts, clarity of data, error bars, spelling, etc.

Common reasons cited for a weak application

- Lack of or weak impact – avoid ‘descriptive’ or ‘incremental’ projects
- Too ambitious, lacking focus, too many unrelated aims
- Unclear or flawed hypothesis or rationale
- Applicant track record weak or lacking appropriate expertise
- Feasibility unsupported; do not assume that the reviewers are as familiar with the subject as you are
- Approach flawed; assuming that everything will work perfectly and leaving out discussion of pitfalls and alternative approaches
- Poor writing and lots of errors; small figures and densely packed text.

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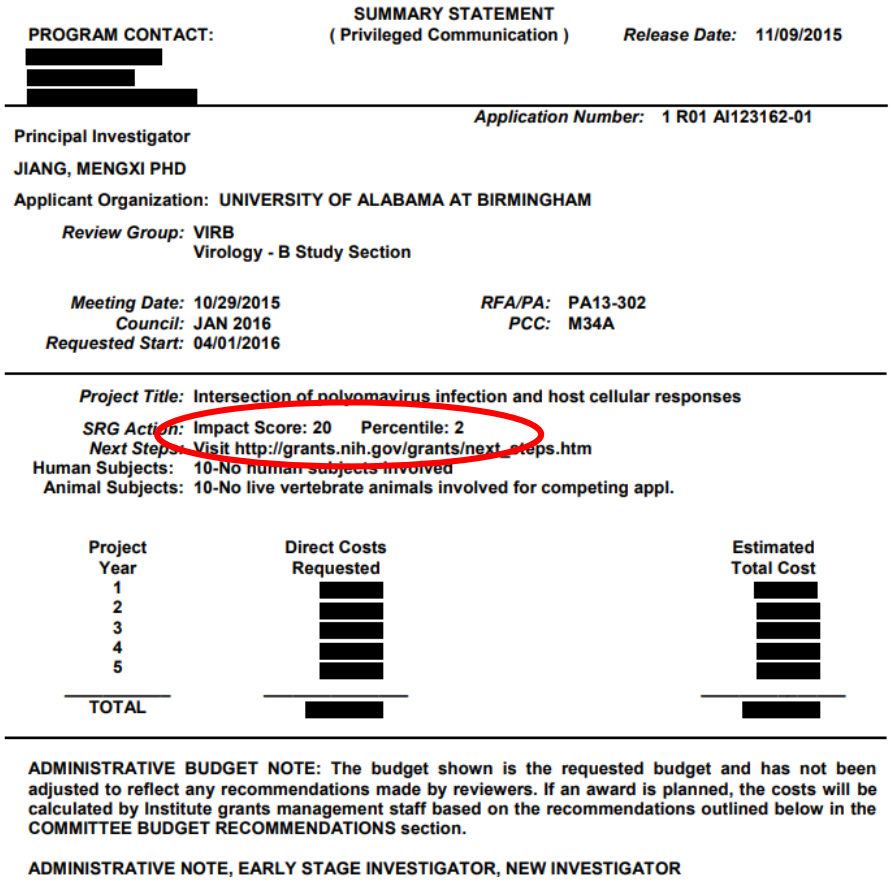
After the review – reading the summary statement

- Read the summary statement (don't take it personally!)



SUMMARY STATEMENT
(Privileged Communication)

PROGRAM CONTACT: [redacted]

Release Date: 11/09/2015

Application Number: 1 R01 AI123162-01

Principal Investigator

JIANG, MENGXI PHD

Applicant Organization: UNIVERSITY OF ALABAMA AT BIRMINGHAM

Review Group: VIRB
Virology - B Study Section

Meeting Date: 10/29/2015
Council: JAN 2016
Requested Start: 04/01/2016

RFA/PA: PA13-302
PCC: M34A

Project Title: Intersection of polyomavirus infection and host cellular responses

SRG Action: Impact Score: 20 Percentile: 2
Next Steps: Visit http://grants.nih.gov/grants/next_steps.htm
Human Subjects: 10-No human subjects involved
Animal Subjects: 10-No live vertebrate animals involved for competing appl.

Project Year	Direct Costs Requested	Estimated Total Cost
1	[redacted]	[redacted]
2	[redacted]	[redacted]
3	[redacted]	[redacted]
4	[redacted]	[redacted]
5	[redacted]	[redacted]
TOTAL	[redacted]	[redacted]

ADMINISTRATIVE BUDGET NOTE: The budget shown is the requested budget and has not been adjusted to reflect any recommendations made by reviewers. If an award is planned, the costs will be calculated by Institute grants management staff based on the recommendations outlined below in the COMMITTEE BUDGET RECOMMENDATIONS section.

ADMINISTRATIVE NOTE, EARLY STAGE INVESTIGATOR, NEW INVESTIGATOR

Applications in the bottom half of pre-discussion average scores are not discussed: ND (++)

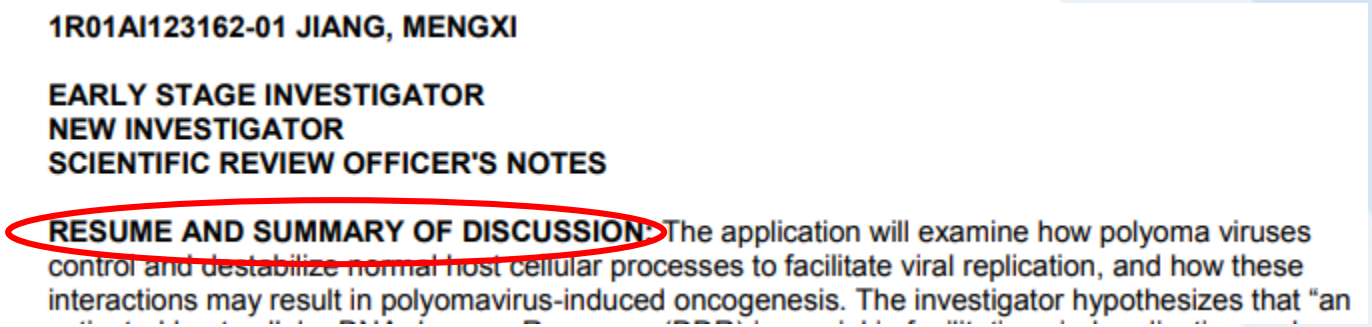
All discussed applications receive a priority/impact score (PS)

PS = the average of all final scores, multiplied by 10

Most priority/impact scores are ranked by converting them to a percentile

Reading the Summary Statement – find the general summary of the discussion

At the top:



1R01AI123162-01 JIANG, MENGXI

EARLY STAGE INVESTIGATOR
NEW INVESTIGATOR
SCIENTIFIC REVIEW OFFICER'S NOTES

RESUME AND SUMMARY OF DISCUSSION: The application will examine how polyoma viruses control and destabilize normal host cellular processes to facilitate viral replication, and how these interactions may result in polyomavirus-induced oncogenesis. The investigator hypothesizes that "an

RESUME AND SUMMARY OF DISCUSSION -

Written by the SRO based on the final outcome of the discussion, summarizes strengths & weaknesses mentioned by all reviewers, highlights areas of concurrence & disagreement between reviewers.

Reading the Summary Statement – read the individual reviewer comments

Individual critiques follow the "Resume and summary":

CRITIQUE 1:

Significance: 2
Investigator(s): 2
Innovation: 2
Approach: 2
Environment: 2

These scores are indices only. They have no mathematical relationship to the priority score

Overall Impact: The enthusiasm for this application is based on the significance, innovation, and approach. The research proposed in this application should fill gaps in knowledge about the connection

Critiques are written by the individual reviewers to summarize their opinions on the overall strengths and weaknesses of the application

Reading the summary statement - Consider the scores for individual review criteria carefully

- The written comments and summary of discussion tell a more complete story
- *However*, pay special attention to Significance and Approach
  - Low significance, no matter what the other scores are, might be hard to fix
  - High significance but weak approach may be fixable

Scoring

Overall Impact:
The likelihood that a project will have a sustained and powerful influence on science (and/or clinical practice and/or technological developments?)

Overall Impact	High	Medium	Low
Score	1 2 3	4 5 6	7 8 9

Evaluating Overall Impact:
Consider the 5 criteria: significance, investigator, innovation, approach, environment (weighted based on reviewer's judgment)

e.g. Applications are addressing a problem of high importance in the field. May have some or no technical weaknesses.

e.g. Applications may be addressing a problem of high importance in the field, but weaknesses in the criteria bring down the overall impact to medium.

e.g. Applications may be addressing a problem of moderate importance in the field, with some or no technical weaknesses

e.g. Applications may be addressing a problem of moderate/high importance in the field, but weaknesses in the criteria bring down the overall impact to low.

e.g. Applications may be addressing a problem of low or no importance in the field, with some or no technical weaknesses.

5 is a good medium-impact application, and the entire scale (1-9) should always be considered.

After the review

- Read the summary statement (don't take it personally!)
- Reread the summary statement
- Contact your program officer and be prepared to discuss:
  - what the reviewers said about your application (after you have summary statement)
  - Scores and percentiles
  - the likelihood of funding
  - the prospects of a revised application
- Wait for the AWARD, or
- Listen to advice from Program Officer about options

If not funded, try again!

- You are in good company
- Know your options
- Get advice, regroup
- Contact your Program Officer
  - If the application was discussed, they may have notes
- Decide whether you can respond appropriately
  - If not discussed, maybe consider an application that moves in a different direction
- Don’t resubmit too quickly
- Don’t assume you will get the same reviewers

Revising and resubmitting

- Write a clear introduction section
- Address all criticisms thoroughly
- Respond constructively
- Acknowledge and accept the help of reviewers
- Don't be argumentative!
- Don't be abrasive or sarcastic!
- Resubmission is an opportunity to improve the entire application

Gain review experience: Early Career Reviewer Program

- Train and educate qualified scientists to become critical and well-trained reviewers
- Expose investigators to the peer review experience to help make them more competitive as applicants
- www.csr.nih.gov/ECR

What determines which applications become grants?

- Funding Decisions are based on:
  - scientific merit and impact
  - program considerations
  - available funds
- Some ICs are strictly “payline,” i.e. pay in priority score order until the money runs out
- Other ICs do not use a strict payline, but instead follow IC-specific processes for considering applications for funding
- All ICs must justify all their funding decisions based on established criteria
- All grants paid must be approved by IC advisory council (second level review)

What not to do:

- Don't start writing less than two months prior to deadline.
- Don't ask a colleague to review a proposal due in 3 days
- Don't write a rambling background review
- Don't propose too much in too many areas
- Don't give up and stuff all your other ideas into Aim 3
- Don't propose experiments for which key reagents or cohorts have to be developed or are not yet in hand
- Try to avoid 'fishing expeditions' with aims built around "-omics" profiling with no hypothesis

Summary – tips for success

- Plan ahead. Outline aims and assemble preliminary data 8-9 months ahead of time. Identify and contact potential collaborators.
- At least 6 months prior to deadline, share your outline with a colleague
- Rework your specific aims to fit with your preliminary and published data.
- Invest time in assembling attractive, self-explanatory figures and diagrams, especially in color.

USE ALL YOUR NIH RESOURCES

...AND WE HOPE YOU FIND SUCCESS WITH NIH FUNDING!