



**Innovative & Quality Research Methods for the 21<sup>st</sup> Century Workshop**  
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**Research Funding Proposal Writing**

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**Research Funders for Africa**

**Agriculture, Fisheries, Forestry**

1. Common Fund for Commodities
2. Consultative Group on International Agricultural Research
3. European Commission — Maritime Affairs and Fisheries
4. Food and Agriculture Organization of the United Nations
5. International Center for Genetic Engineering and Biotechnology
6. International Fund for Agricultural Development
7. International Treaty on Plant Genetic Resources for Food and Agriculture
8. International Tropical Timber Organization
9. Regional Fund for Agricultural Technology
10. Southeast Asia Regional Center for Graduate Study and Research in Agriculture

**Biodiversity, Conservation, Wildlife**

- African-Eurasian Waterbird Agreement
- Convention on Biological Diversity
- Convention on Migratory Species
- Ramsar Convention on Wetlands
- United Nations Educational, Scientific, and Cultural Organization



**Energy, Climate Change**

- Asia-Pacific Network for Global Change Research
- Climate for Development in Africa
- Green Climate Fund
- Nordic Climate Facility
- United Nations Framework Convention on Climate Change
- United Nations Industrial Development Organization
- World Meteorological Organization

## Cross-Cutting Funders

- African Development Bank
- African Union
- Arab Fund for Economic and Social Development
- Caribbean Development Bank
- Commission for Environmental Cooperation
- Commonwealth Foundation
- Development Bank of Latin America (CAF)
- European Commission — Development and Cooperation
- European Commission — Environment
- European Commission — Humanitarian Aid and Civil Protection
- European Commission — Research and Innovation
- Global Environment Facility
- Inter-American Development Bank
- North Atlantic Treaty Organization
- OPEC Fund for International Development
- Organization for Security and Cooperation in Europe
- Union for the Mediterranean
- United Nations Development Program
- United Nations Environment Program
- World Bank

## Writing

### I. Introduction

#### A. Main jobs

1. You have an exciting project
2. You know what it takes to carry it out successfully
3. You are the right person to carry it out

#### B. Have to team good idea and good writing

#### C. Parts of the Proposal Dealing with the Science

1. Title
  2. Abstract
  3. Narrative—may have to follow a specific format for each agency
    - a. Introduction
    - b. Significance in context of other work
    - c. Bibliographic information; prior work
    - d. Description of hypotheses to be tested and the methods
    - e. Intellectual and other impacts of the research
- Introduction  
 Research Design Methods  
 Anticipated Results

### II. Principles to keep in mind while writing

#### A. Address Three Audiences

1. The program officer
2. The expert technical reviewer
3. The panel of generalists

#### B. Anticipate Reader's Questions

1. Unanswered questions lead to doubt about your project
2. If a question occurs to you while writing, answer it
3. Don't omit non-science questions:
  - How many students are going to be supported?
  - Does the department have an NMR?

#### C. Use Persuasive Rhetoric

1. Exposition = clear and accurate idea of your project
2. Persuasion = problem and your ideas are valid and interesting
3. Credentialing = you and your institution are the right person/place

### III. The Title and Abstract

#### A. Carry a lot of weight

1. First impression
2. Reviewers have a lot of other things to do
3. They don't want to be "mystified" or "amused"
4. Inform simply and efficiently

#### B. The Title

1. Examples: too short, too long, too cute, and just right
  - a. "Social Behavior in Transgenic Planetesimals: A Radiochemical Study"
  - b. "Planetesimal Herds: Gone Fission"
  - c. "Blekingsop's Paradigm and the Sorting of Oblate Planetesimals Subject to Dismutation During the First Five Hours as Measured by N-Pumped Laser  $\gamma$ -Ray Spectroscopy and Post-Mortality Paradigmatic Binning"
  - d. "Transgenic Planetesimals"
2. Avoid "The Effect of Dismutation on Transgenic Planetesimals"

For each of the following proposals, supply a title that is (a) too short, (b) too long, (c) too cute, and (d) just right. See Exercise 3.1a for possible responses.

- You are proposing research on the role of mutations in the development of the nematode *Caenorhabditis elegans*. You plan to correlate phenotype and genetic makeup using detailed molecular analysis of the worm's genetic material.
- You are proposing research on the rate and modes of speech modification in young women during adolescent socialization (the "Valley girl" speech syndrome). You plan to study and rationalize the roles of ethnicity, family income, diet, and laryngeal development using widely accepted statistical tools.
- You are proposing to use molecular dynamics simulations and Lennard-Jones potentials to predict changes in the band gap of semiconductors that have been doped with a variety of transition metals. Then you are going to carry out some experiments using infrared spectroscopy to examine the results of your predictions.
- Research is proposed on the azimuthal distribution of subsurface water on Mars. Your analysis will combine orbital spectroscopy with Hubble, Viking, and Mars Explorer imagery, radar reflectivity, and planet surface morphology.
- The proposed research is on biogenic organic compounds in Antarctic ice cores. You plan to correlate compound-specific  $^{13}\text{C}$  anomalies in the cores with global sea-level variations and paleogeography to examine the onset of Patagonian forestation.

### C. Abstracts

- Job: "...everything scientifically important about your project is revealed...in clear technical language."**
  - 200-400 words
  - Context and significance
  - Hypotheses and how you will test them
  - Impact
  - "Road Map of the Proposal"
- Tentative decisions are made just from the abstract**
  - Does the project address the agency goals
  - Who should the program officer send it to for review
  - Is the proposal focused and organized
- Does the abstract match the proposal?**
  - If you write the abstract first, things can change as you write proposal
  - Use abstract as a guide—then revise abstract when done
  - Disagreement with "Research Proposal Guidelines"—abstract last
    - Easier to cut down from the proposal than to build up abstract
    - Freedom to be creative in proposal; not restricted in thinking

#### 4. Your abstract should answer these questions:

- What's the problem?
- Why hasn't it been done before?
- Why can we do it now?
- The purpose of this research is...

#### 5. Practice Writing Abstracts

- Use the questions above
- Cover up the abstract on a journal article and write your own
- Go to the agency website and look at successful proposals

### IV. The Narrative

#### A. Introduction: Engaging Readers

- Should not be identical to abstract
- Explain theoretical framework; make your experiments meaningful
- OK to show your enthusiasm; Aesthetic Appeal
  - Why is this problem so interesting to you?
  - "Here...are the weird fish, the cool patterns, the distant worlds that I plan to investigate."

#### B. Prior Work and Bibliography

- Get them to understand problem as you see it
  - Vibrant and worthwhile
  - Show them you've done your homework
- Citing Literature
  - "Standing on the shoulders of giants"
  - Literature should be up to date
  - Can cite your own past work
- Tips
  - Don't cite every last article you could—50-100 is usually good
    - Too little: not an important field; leaving someone out
    - Too much: can't tell what's important; you haven't ready it all
  - Read everything you cite; it may say something else
  - Get the facts and formatting right; wrong reference is really annoying

#### C. Research Impact and Significance

- How does the interesting problem help other interesting problems?
- Example:
  - Solubility product of PbS
  - Molecular-level factors govern PbS solubility; how do ores form?

## 3. Agencies fund research that leads to new questions

## 4. Don't forget intangible impacts

- a. Training students
- b. Instrument will also be used in undergraduate labs

Review Criteria for and Rating of  
Unsolicited Research Grant and Other Applications

1. **Significance:** Does this study address an important problem? If the aims of the application are achieved, how will scientific knowledge be advanced? What will be the effect of these studies on the concepts or methods that drive this field?
2. **Approach:** 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 alternative tactics?
3. **Innovation:** Does the project employ novel concepts, approaches or methods? Are the aims original and innovative? Does the project challenge existing paradigms or develop new methodologies or technologies?
4. **Investigator:** Is the investigator 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 (if any)?
5. **Environment:** 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?

## D. Hypotheses and Methods

1. What you're going to prove and how you're going to prove it
2. Largest part of most proposals
3. Most technical part of all proposals
4. Testable Hypotheses vs. Fishing Expedition
  - a. "I want to synthesize and characterize this interesting material"
  - b. "Will woven polymers increase polymer strength and/or flexibility?"
  - c. Yes or no questions that your experiments can answer
  - d. Narrower questions are often easier to answer than broad ones.
5. What you're looking for, how, where, and how long?
  - a. Details about instruments and their limits
  - b. Details about synthetic steps
  - c. References to known techniques or reactions
  - d. Point out any modifications you will make
  - e. Establish your expertise if you are one of a few world-wide experts
6. Every technique must be adequate to answer that question
7. Don't forget safety and environmental hazards: Ex. 3.2 in handout

## E. Anticipated further work—you've thought it through

## V. Budgets and Supporting Information

## A. Budgets

1. Most agencies won't give you money unless you tell them how you are going to spend it
2. Each agency has its own rules

	Aug. 1, 1988	Sept. 1, 1989
	to Aug. 31, 1989	to Aug. 31, 1990
1. Summer Salary: Principal Investigator (Maximum: \$4,000 per year including benefits)	\$ 4,000	\$ 4,000
2. Stipends: Undergraduate Student(s)	1,000*	1,000*
3. Expendable Supplies and/or Services	700	500
4. Capital Equipment (Specify item and any match in narrative)	7,500	-0-
5. Travel (Maximum: \$2,000 per year)	-0-	-0-
6. Field Work	-0-	-0-
7. Departmental Allocation (U.S. only; not to exceed \$500/yr)	500	500
<b>ANNUAL TOTALS</b>	<b>\$ 13,700</b>	<b>\$ 6,000</b>
<b>TOTAL REQUESTED</b>	<b>\$ 19,700</b>	<b>\$ 19,700</b>

\*To be supplemented from institutional funds. See budget explanation.

## 3. Commonsense guidelines

- a. Don't exceed any budget category limit
- b. Don't ask for something not allowed
- c. Don't ask for more (or less) than you actually need: they'll know
4. Budgets are just estimates
  - a. Impossible to know how much everything will cost or what you will need
  - b. You have to put something down
  - c. Often, you are allowed to move money between lines if funded
5. Look at previously funded proposals to the same agency
6. Keep in mind that you might get grant, but for less than asked for

## B. Ethical Considerations

1. Recommending Reviewers
  - a. Avoid conflict of interest
  - b. Graduate advisor or current colleagues are not acceptable
  - c. Can ask that certain people not be used as reviewers
2. Pending Proposals elsewhere
  - a. List current grants and pending proposals—don't like to double-dip
  - b. Honesty is best policy

### C. Strategic Considerations

1. Add-ons and Appendices: DON'T DO IT
  - a. Following the rules is important; may send back proposal unread
  - b. Reviewers don't need any more to read
2. Length Limits
  - a. Read the rules: do figures count, do references count
  - b. Don't cheat on margins or font size
  - c. Most proposals are improved by shortening
3. Deadlines
  - a. Some are hard and fast (NSF): miss it and they send proposal back
  - b. Some are rolling (NIH): miss it and proposal goes into next batch
  - c. Why you should aim to beat the deadline by at least a week
    - i. You'll find a mistake just as you are ready to submit
    - ii. Your institution will take longer to process than you think
    - iii. You should check office work yourself before allowing to be sent
    - iv. Servers will go down under the deadline crush
    - v. The reviewer you want will already be swamped

### Title of Research Project


- Good
  - Concise title that gives reviewer a general sense of what you are investigating.
  - For example:
    - Understanding the role anti-cell death protein BNIP3 plays in brain cancers.

### Title of Research Project

- Reject
  - Too long and technical of a title will not gain the reviewer's attention or interest.
  - Too short and broad a title will make the reviewer too critical of grant.
  - Example:
    - Determining the mechanism of action of Bcl-2 family members in regulating apoptotic signaling complexes within the mitochondria leading to a cure in cancers.


### Referees:

- Good
  - Choose referees in your field of research
  - Choose a scientist/colleague that will be objective but not too critical of the science.
- Reject
  - Do not choose close collaborators
  - Do not choose competitors in your field with divergent views.
  - Do not choose the top scientists in your field since they will not respond and will be too critical in general.




### Co-applicants

- Good
  - This could be strength if you are a junior investigator with a limited track record.
  - If the investigator lack specific skills, a co-applicant can bring these skills to the research project.
- Reject
  - It is a weakness to add a co-applicant if they just give you a reagent
  - Co-applicant will do most of the project in their laboratories.




### Budget:

- Good
  - Give a detailed account of where you will be spending the money.
  - Approximately one third of the budget should go to supplies.
- Reject
  - Graduate students should not be used in budget support since it is an easy target for reduction due to alternative funding sources.
  - Do not justify spending all the budget on personnel.




### All other Operating Grants

- Good
  - Declare all operating grants.
  - Declare 0% or 100% overlap.
  - In this granting environment it is reasonable to apply from multiple sources to get funding.
- Reject
  - Do not state 25-50% overlap with CCMB operating grant.
    - The review committee going to treat this grant as 100% overlap.



### Non-Scientific Summary

- Good
  - This is used for press releases.
  - Avoid acronyms
  - Clearly state why this project is important.
  - Declare the impact this research will have on cancer or other diseases.
  - Give it to a non-research friend to read.
- Reject
  - Using technical language is a negative.
  - Do not use acronyms even if you define them.




## Summary of Research Proposal

- Good
  - give a short but informative background to justify the research hypothesis and objectives.
  - Clearly state the hypothesis.
  - State the objectives and/or aims of this proposal.
  - State the impact, significance and innovation in this proposal.
  - Define acronyms as much as possible.
- **Reject**
  - **Technical and condensed phrasing of the project.**
  - **No clear statement of what is the purpose of this study.**




## Details of Research Proposal

- Order of Proposal:
  - Goals or objectives of proposal
  - Background
  - Rationale and hypothesis.
  - Specific Aims
    - Rationale
    - Hypothesis (optional)
    - Approach
    - Expected Results
    - Pitfalls or Alternative approaches.
  - Significance and/or Impact of this proposal.




## Details of Research Proposal

- Goals and/or Objectives of Research
  - Good
    - This is usually one paragraph telling the reviewer everything they need to know about this research proposal.
    - This provides the opportunity to gain the reviewers interest and excitement about this proposal.
    - It should contain the background on why this research is important, hypothesis, and objectives.
    - Should state the innovation of this proposal.
    - Finally it should in a clear statement demonstrate why this project is significant and what impact it will have.




## Details of Research Proposal

- **Reject**
  - **No goal or objective statement at the start of the proposal.**
  - **Too technical and condensed will make it hard to read and understand.**
  - **Too short will not give the reviewer the needed information to understand the proposal.**
  - **Too long will make the reviewer skip to the background and makes the reviewer search for what is important.**




## Details of Research Proposal

- Background:
  - Good
    - Give the reviewer the needed information to understand the objectives and approaches in this proposal.
    - Structure the background to go from broad information such as cancer kills Canadians to specific information such as my protein is increased in solid tumors.
    - Build up the background towards answering a specific question that is unknown.




## Details of Research Proposal

- Background:
  - Good
    - There should be section within the background to discuss preliminary data.
    - Connect preliminary data to background.
    - If limited preliminary data, spend time on the innovation such as using unique resources at CCMB for this proposal.



## Details of Research Proposal


- Background
  - Reject
    - Do not expand background to unnecessary information that does not support the hypothesis.
    - Background should not exceed one third to one half of proposal.
    - No preliminary data generally negatively impacts the proposal in two ways.
      - No indication that the proposal will be feasible.
      - No indication the applicant can do the proposed work.



## Details of Research Proposal


- Rationale and Hypothesis.
  - Good
    - Clearly state the hypothesis or number of hypotheses that will be addressed in the proposal.
    - Give a rationale why this hypothesis is important to investigate.
  - Reject
    - Avoid combining the two together. It could be confusing to the reviewer.
    - Too long of a hypothesis makes it hard to understand the aim of the research.






## Details of Research Proposal

- Specific Aims
  - Good
    - Limit specific aims to 2-3.
    - Make sure controls are added to approaches taken.
    - Always give what your expected results will be.
    - Always give alternative approaches since pitfalls happen.
    - Address feasibility if you have not demonstrated that you can do the experiments proposed.




## Details of Research Proposal

- Specific Aims:
  - Address innovation wherever possible.
  - Justify the use of specific reagents or animal models.
    - For example:
      - If you use a cell line why that cell line
      - If you use an animal model why that animal model.
  - Confirm results with multiple approaches.
  - Make aim 1 less risky compared to other aims.




## Details of Research Proposal

- Specific Aims
  - Reject
    - Many specific aims is bad. This is a two year proposal and if it is too ambitious, will negatively impact on reviewers.
    - Avoid to many specifics on experiments.
    - Structure aims so that aim 2 is not dependent on aim 1.
    - Do not avoid issues within the field of research
      - Using cell lines for genetic studies is not the same as primary cancer cells and might yield misleading information. Tell the review you understand the limitations and how to address it.




## Details of Research Proposal

- Significance and Impact:
  - Good
    - Last chance to impress the reviewer on the importance of what you are proposing.
    - Give a sense of future directions for this research.
    - Why is this proposal innovative?
    - Impact on the field and/or on the disease being studied should be stated.
  - Reject
    - No significance statement.
    - Superficial such as this will cure cancer.



**Applicant's CV details:**

- **Good**
  - List all awards especially awards directly related to your research.
  - List all publications in the last five years.
    - Abstracts are an easy way to show productivity.
    - Give impact factors for publications and citations if any.
    - Give ranking of journal in your field of research if possible.
- **Reject**
  - No evidence of research activity or track record.
  - All middle authors for publications.



**General Thoughts**

- Reviewers will not be experts in your field of research. Make the proposal accessible to them.

**Get your proposal read by a colleague or someone in your area of research. They might find problems that reviewers will find.**

**End of Presentation**

**Thank You for  
Listening**