



Istituto Zooprofilattico Sperimentale  
del Lazio e della Toscana *M. Aleandri*

Corso

PUBBLICARE UN ARTICOLO SCIENTIFICO

Roma, 29 Novembre 2021

# Dal progetto di ricerca alla pubblicazione: partire col piede giusto!

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# **Grant Writing**

## **How to write a Competitive Application to a Funding Agency**

**Roger A. Coulombe, Jr**  
**Graduate Program in Toxicology**  
**Utah State University**  
**Logan, UT USA**

**Corso IZSUM, 10-15 settembre 2017**



# Things they didn't tell me in school

Running a laboratory or research program is like running a small business



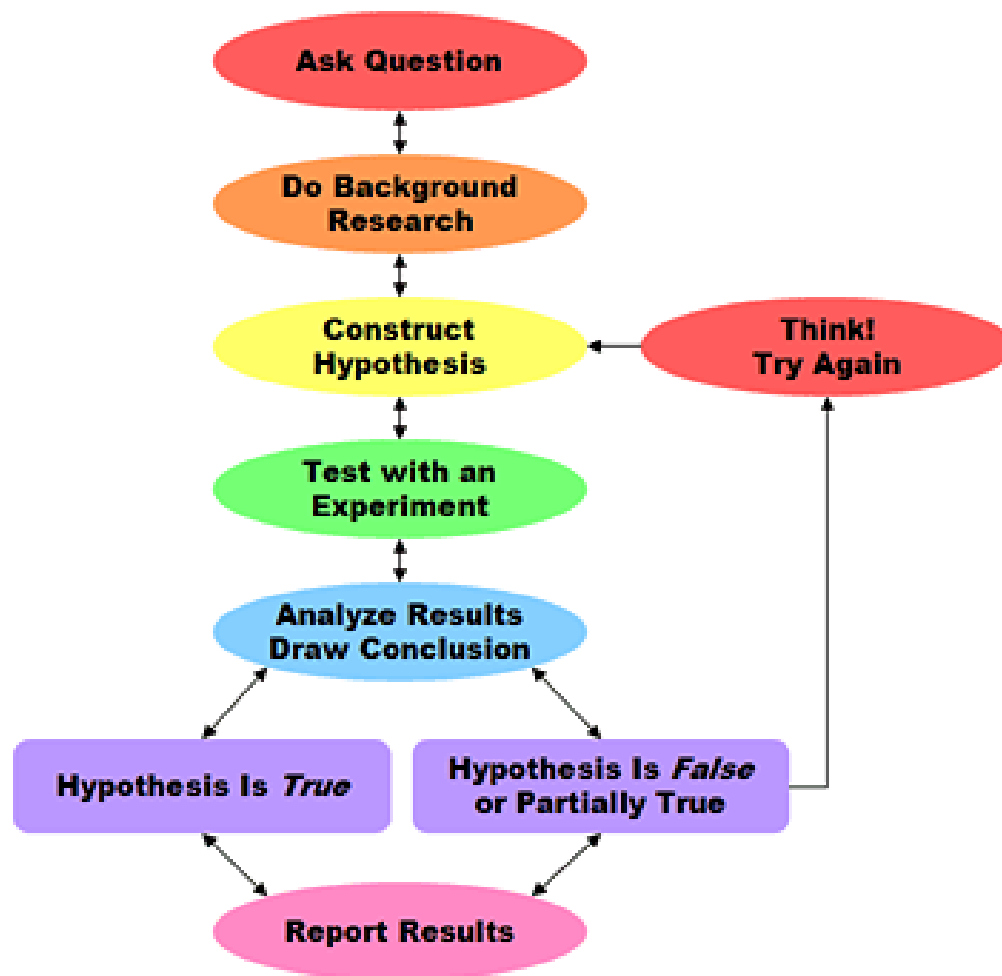


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# The Scientific Method



# The Scientific Method





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## Hypothesis: front-and-center of your application

- Have **clearly-defined**, **logical** and **well-written hypothesis**
- Project must be hypothesis-driven
- Hypothesis must logical reflect current knowledge and knowledge gaps







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## Hypothesis tips:

- **The question comes first:** before you make a hypothesis, clearly identify the question you are studying
- **Hypothesis is a statement, not a question**
- **Make it clear:** convey to reader **exactly what you think will happen** at project start
- **Keep variables in mind:** **define variables** in **easy to measure terms**
- **Make sure hypothesis is **testable**:** practical experiments required to **prove** or **disprove** hypothesis
- **Has it been done before?**
- **Not overly ambitious**



## Hypothesis – good, not so good

Good hypothesis	Poor hypothesis
<p><b>“Diets rich in fruits and vegetables result in a lower incidence of lower GI tract cancer”</b></p> <ul style="list-style-type: none"><li>• Testable, simple, written as a statement</li><li>• Plausible – supported by preliminary data</li><li>• Establishes participants (people), variables (fruit and veg content of diet) and predicts effect (GI cancer rate)</li></ul>	<p><b>“Dietary supplements are health-promoting because people believe that they are good for them”</b></p> <ul style="list-style-type: none"><li>• Not scientifically plausible</li><li>• Not specific – which supplements?</li><li>• Bad evidence</li><li>• Cannot be tested using the scientific method</li><li>• Too ambitious</li></ul>





## Proposal Elements

- Abstract
- Specific Aims
- Introduction, literature review, background/significance
- Preliminary results
- Research design, research plan (methods)
- Alternative strategies
- Summary or impact statement
- References
- Budget
- Personnel, biographical sketches
- Institution information (equipment, facilities)





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## Follow the guidelines

- Review agencies or Journals will refuse your proposal if you . . .
  - Don't follow instructions
  - Don't use the required forms
  - Submit late
  - Don't follow formatting guidelines for font type, margins, *etc.*
  - Submit incomplete application or documents
  - Necessary approval signatures missing
  - Neglect plans for hazardous or restricted materials
  - Exceed page limitations
  - Plagiarize (or heavily borrow) from other applications or publications
  - Exceed indicated budget limit





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# Elements of a Proposal

- Title
- Abstract
- Preamble (optional) and Specific Aims
- Introduction, literature review, background and/or significance
- Preliminary results
- Research design, research plan (methods)
- Alternative strategies
- Summary or impact statement
- References
- Budget
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# Title: Bad and Better

## Wordy:

- Red Haired Musicians and their Preference for Musical Style

## Concise:

- Music Style Preference of Red Haired Musicians

## Wordy:

- The Systematic Development of a Local Initiative to Create a Learning Center for Community Education

## Concise:

- A Local Learning Center for Community Education





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# Abstract

- **Brief** (half page) description of the **overall goals** and **importance** of proposal
- **Stands alone** as separate file
- **May be only part read by reviewers**
- **Benefit to society** – human (animal) health
  - Lives, money saved
  - Improve life
  - Advances understanding
  - Innovation
- **Single paragraph**, text only, no citations
- **“Sets the Hook”**
- **Refine** throughout process of writing proposal - **usually last section finalized**



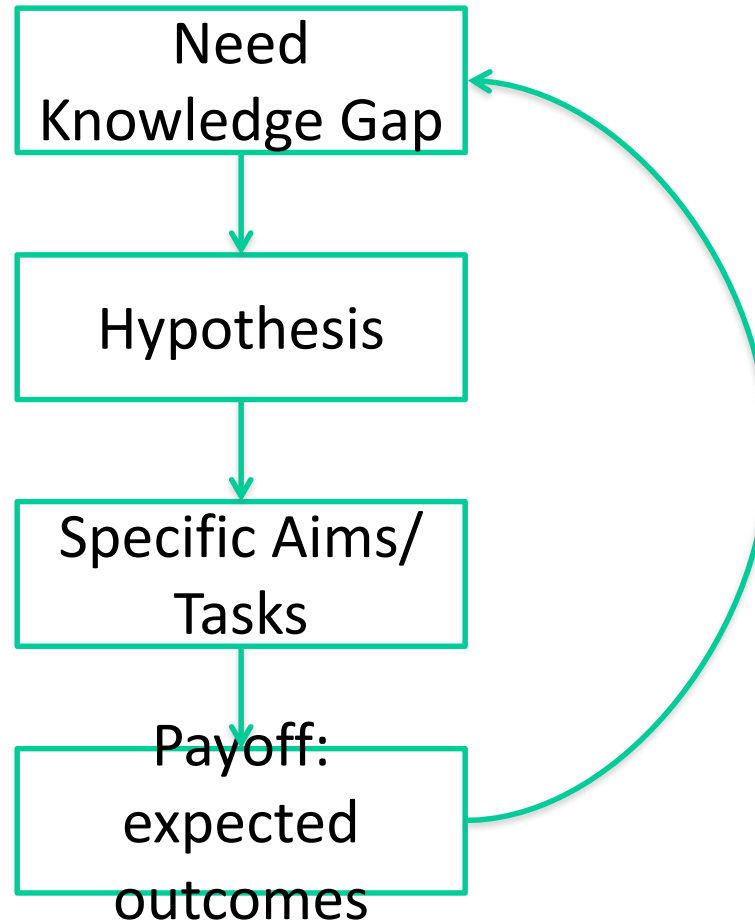


# Goals of Aims Page

- **Convince reviewers** that there is a significant problem, issue or gap in knowledge
- **Immediately identify** what proposal is about
- Summarizes **current knowledge (2-3 known facts)**
- Identify **unknowns**, how unknowns present problem, **knowledge gap**
- Clearly state **hypothesis that logically follows** from preceding
- Identify **objectives** (or Aims)
- Introduce short- and long-term **goals**
- How project will **address knowledge gap**
- **Project payoff - benefit to society**

Goal: After reading first paragraph, reviewer **wants** to fund you, is intrigued and engaged to read further.







## Specific Aims

- Often introduced with a **preamble** – a few sentences to set the stage
- May be **only section read** by reviewers
- Usually **page 1** of publication
- Different designations for different journals





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# Specific Aims: Essential Elements

- The **objectives** of your research proposal
- What you want to **accomplish**
- Project **milestones**
- Identify **knowledge gaps** or research needed
- Explicit **overall goal** of project
- Testable **overall hypothesis**
- Detail 2-4 **specific objectives** (aims) related to overall goal
- Each Aim accompanied by brief rationale statement
- Provides **broad description** of experimental approach to address unknown/gap/need
- Describe **expected outcomes** and why work is **innovative**



# Specific Aims: Common Mistakes

- Confusing and **boring**
- **Fails to convince** of project's merit
- **Doesn't logically follow** Intro or Hypothesis
- Phrases like: "To correlate" ... "To describe" ... "To develop" imply project is **descriptive**
- **"Look and see"** aims don't get funded
- **Interdependent** - dependent upon **confirmation** of earlier aims





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# Background & Significance

- **Focused literature review with relevant citations**
- Goals
  - Gain reader interest in topic
  - Provide relevant background information so reader can understand proposal independently
- **Describes what is known about topic**
- Funnel structure, similar to journal article introduction
  - **Broad** background information
  - **Narrow** to unknowns/research needs
  - **Focus** on proposal objective
  - **Rationale** for proposal





- **Convince** reviewers that project will have **significant impact** on the problem
- **Provide** necessary but not excessive background
- **Assume** reader is skillful and experienced scientist, likely not an expert in your field







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## Broad background information

- Targeted literature review
- introduce disease, cost to society/industry
- Mechanisms of pathogenesis
- How/why



Knowledge Gap

Consequences of knowledge gap – if research not done

How your research plugs knowledge gap

Rationale underlying your research

The Payoff: benefits to society of successful project



# Preliminary data

- **Separate section or embedded within Background or other sections**
- Research **results relevant to topic**
  - observations relevant to objective, aims
  - demonstrate expertise, skill for particular type of analysis (should be in the Approach section)
- Illustrations **publication quality** with **explanatory legend**
- Avoid **complicated** figures, tables
- Provide **interpretation** for reader (i.e., **how results support central hypothesis**)



# Tips: Research design and methods

- **Subheadings for each section**
  - Rationale, working hypothesis (not required, but a helpful reminder)
  - Experimental design
    - Subdivide again if multiple experiments proposed
  - Analysis
  - Expected results
  - Potential pitfalls and alternative strategies



# Tips: Research design and methods

- Describe studies to address stated research problem
- Write to **your audience**
  - keep jargon not widely known to a minimum
- Convey confidence, use future tense
  - “**we will**” not “we could”





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# Anticipated problems, contingencies

- Communicates to reader you have thought of **possible pitfalls, potential flaws and problems**
- Your contingency in each case
- Conveys humility of a scientist





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# Data analysis



- Define **statistical tests** to be used
- Define **experimental variables** to be tested
- What are potential confounding factors and pitfalls?







# Check for common problems

## Aims page

- Excessive length
- Unrealistic or overly ambitious
- Excessive interdependence

## Background & Significance

- Poor organization
- Lack of objectivity
- Amount of detail

## Preliminary data

- Findings not related to proposed work
- Experience of investigator not adequate
- Omission of important points or procedures
- Poor organization

## Research design & methods

- Experimental plan too ambitious
- Aims depend on success of previous aims
- Too much or too little detail
- Expected results unclear





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# Budget must be proportional to Project

- Consider budget **as you design project**
  - The budget and the proposed work must be **justifiable**
  - **Adjust project goals** to reasonably meet the budget limitations, or seek an alternative funding opportunity





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# Budget Elements

- Personnel
- Materials and supplies
- Animal costs
- Field study costs
- Consultants fees
- Facilities fees (institution maintenance, IT service, etc.)
- Travel - field work, farm visits, conferences
- Indirect costs – paid to institution to cover overhead expenses





# What Makes for a Bad Proposal?

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- Too much background literature, too little research plan
- “Fishing expedition” – “look and see” research
- Poor hypothesis
- Overly ambitious
- Lack of convincing preliminary data
- Poor statistical analysis ( Statistical plan unclear, power calculations missing or incorrect)
- Old, tired ideas that won’t advance science.
- Poor organization – ideas jumbled, no logical flow from one section to the next





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## What Makes for an Ugly Proposal?

- Cut and paste from previous proposal, with minimal originality
- Failure to address previous critiques, belligerent attitude toward previous critiques
- Attempts to mislead the reviewer or cover up contrary data
- Poor writing and presentation, misspellings, sloppy editing
- Internally inconsistent
- References aren't coordinated with citations





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# Advice for young scientists

- **Read articles already published by target journal**
  - Study structure and style
- **Try early and often**
- **Don't give up**

