Writing your research statement

Peter M. Hoffmann
Professor of Physics
As an academic, you are a professional writer

As a scientist, you are a professional writer
Purpose of Research Statement

• To obtain a faculty position, research statements are always required.

• A good research statement demonstrates:
  • Expertise
  • Previous experience and accomplishments
  • Originality
  • Ability to write proposals
  • Writing skills
  • Enthusiasm
  • Ability to collaborate or complement research at target institution

• A research statement is part personal statement and part research proposal
Basics

• How long: Typically 2-5 pages
• Structure:
  • Motivation/Introduction/Background
  • Statement of problem (objective)
  • Previous experience
  • Hypothesis
  • Summary of plans – specific aims (all on first page)
  • Details about various aims (approach, expected findings, impact, future work) (1-3 pages)
• Use (good) diagrams, figures liberally to illustrate and break up monotony
Research plan narrative

Introduction (first page):
• Hook: What? (broadly, 1-3 sentences, present overarching theme and motivation)
• Why? What is the problem to be solved?
• Brief background (paragraph)
• Central hypotheses (1-3 sentences)
• Why you? (Expertise, why are you interested, a few sentences)
• What? How? (specific aims, list or bullet points)

Each aim:
• What? (briefly)
• How?
• Why this way?
• What is the expected outcome and impact?
• What future work will this lead to?
In short...

Tell a story!
Title and Introduction

• **Title**: Short & clear, summarizes, encourages reader to read the proposal

• **Introduction (1 page)**: The hook, motivation, essential background and context, specific problem to be addressed, hypotheses, what will you do?, what is the likely impact of proposed work
Introduction

• There is no second chance to make a good first impression

• The most important sentence in any article is the first one.
  —WILLIAM ZINSSER, On Writing Well

• Show, don’t tell

• Don’t:

  “Discoidin domain receptors have attracted considerable interest in the research community.”,

  or

  “This proposal is organized as follows. In Section 2, we introduce the research. In Section 3, we discuss the expected results. In Section 4, we cut and paste text from the Introduction.”

• Do:

  “Cancer cells hijack cell receptors to assist in cell migration, spreading cancer throughout the body. As one example, discoidin receptors help cells sense collagen and are believed to be important players in cancer metastasis, but the details of their interaction with collagen and their role in the proliferation of cancer cells are unknown. In this research we will aim to determine how these receptors interact with collagen in both normal and cancerous cells by ...”
Another example

• *In recent years, an increasing number of psychologists and linguists have turned their attention to the problem of child language acquisition. In this article, recent research on this process will be reviewed.*

**Better:**

• *All children acquire the ability to speak a language without explicit lessons. How do they accomplish this feat?*
Exercise 1

• What should the first sentences ("the hook") achieve?
• Think – Pair – Share
Exercise 2

• Write 1-3 sentences that will “hook” your readers to want to read the rest of your research proposal.
• Share with a partner
• report
Research narrative

- **Research/project**: What? Clear statement of what you are planning to do (Specific Aims)
- **Design**:
  - Overall strategy and methodology
  - How will data be collected, analyzed, and interpreted
  - Just enough details to give the reader a good idea, but don’t “get lost in the weeds”.
  - Possible alternative approaches and potential pitfalls.
- **Expected results/future work**:
  - If your work is successful, what will you have achieved?
  - What would different results tell you?
  - Where would you go from there?
How much should I propose?

- Don’t propose too much. Don’t propose to cure cancer.
- Don’t pick problems that are too broad or diffuse to study effectively in your first 3-4 years.
- For each aim, you might pick a quantity of work that would take about 1 year of effort.
How much detail do I need to provide?

You need to include enough detail for someone to evaluate whether the work can be done effectively and to demonstrate your mastery of the methods involved.
Allow a lot of time to write the statement

- Developing good research ideas
- Reading relevant literature
- Many editing cycles
- Developing good figures and diagrams
- Have colleagues read and review
Novelty and Significance

• Research must be novel: Provide new insights
• Research must be significant – have an impact on the field
Novelty and Significance

• Example 1: I will study the percentage of people who were blue socks on Mondays.
  • Novel?
  • Significant?

• Example 2: I will study in what type of molecules our genetic information is stored.
  • Novel?
  • Significant?
Exercise 3

What is novel about your aim and approach?
What is significant?
How do you develop significant and novel projects?

• Pick an area based on interest in the outcome (interesting to others, not just you)
• Look for an unoccupied niche with potential
• Go to talks and read papers outside of your area to get new ideas
• Build a theme – don't have too many fragmented ideas
• Find a balance between low-risk and high-risk projects in your proposal
• Don't be afraid to learn new skills, but consult with the experts and get letters of support
• Differentiate yourself from your peers
“Why has there been an increase in addictions in rural areas?”

“Find out why there has been such an increase and use this knowledge to plan positive interventions”

“It is hypothesized that increase is due to social isolation and large incidences of physical pain due to common professions in rural settings”

“Aim 1: Conduct interviews to determine degree of social connections and job history”

“If a connection to social isolation is made, this will help local service agencies to improve programming for untapped groups of people.”
Exercise 4

Gap or Need

Objective

Central Hypothesis

Specific Aims

Expected Outcomes

“Why has there been an increase in addictions in rural areas?”

“Find out why there has been such an increase and use this knowledge to plan positive interventions”

“It is hypothesized that increase is due to social isolation and large incidences of physical pain due to common professions in rural settings”

“Aim 1: Conduct interviews to determine degree of social connections and job history”

“If a connection to social isolation is made, this will help local service agencies to improve programming for untapped groups of people.

Homework: Write your own version of this for your research (1 aim)
What does it take to get recognized?

- Good idea(s)
- Novelty and Significance
- Confidence and competence
- Honesty and Originality
- Exposition and Writing
- Feasibility
- Knowing the literature and background
- Understanding the hiring process
Exposition and writing

• Good English: Spelling, grammar, sentence structure
• Scientific style:
  • No personal feelings
  • Clear and to the point
  • Avoid jargon, unless necessary
  • Confident writing, but no cockiness
    • “I (or we) will be doing...” instead of “I (or we) may, would, could do...”
• Logical flow: Should tell a consistent, easy-to-follow story
Avoid clutter!

• Avoid unnecessary words and long sentences

Example:

“In this research, the use of a specially designed microscope is employed in order to conduct experiments that probe the most subtle changes in nanoconfined liquids.”

versus

“We will use a specially designed microscope to probe subtle changes in nanoconfined liquids.”

A garden is perfect when there is nothing left to remove

(Zen proverb)
“The permutation of outcomes quickly compounds to a bewildering range of choices — more than the total number of atoms in the entire observable universe.”

Vs.

“The permutation of outcomes compounds to a bewildering range of choices — more than the number of atoms in the universe.”

Exercise 5

Clutter

A great number of times
a greater number of
a little less than
a small number of
a large number of
a period of several weeks
a sufficient number of

Use

often, frequently
more
almost
few
many
several weeks
enough

How about?

at the conclusion of
in order to
finally ended
general public
introducing a new
prior to
in the absence of
Trying to sound “smart”

“Our study participants show a pronounced tendency to be more variable than the norming samples, although this trend may be due partly to the fact that individuals with higher measured values of cognitive ability are more variable in their responses to personality questionnaires.”

Instead:

“Our participants are more variable than the norming samples, perhaps because smarter people respond more variably to personality questionnaires.”
Knowing the literature

• References are important
• Need to research all available references to see if
  • Work has already been done
  • Which work supports conclusion and which doesn’t, and why
  • How your work is different
  • How your work fits into the field at large
• Not citing relevant authors can cause large problems during peer-review
Editing

• 75% of writing is editing
• Don’t expect your first draft to be any good – it won’t be.
• Read, edit, read again, edit etc.
• Have others read it
• Rest it and read again

The beautiful part of writing is that you don't have to get it right the first time, unlike, say, a brain surgeon. ~ Robert Cormier
Write to your audience

• Be kind to your readers: Your writing should be clear and interesting. It should not be “hard work” to read it.

• Know your audience.
  • Experts in broad field of your research, but not necessarily experts in the narrow area you study.
  • Reason: You want to write a statement that generates interest in your work beyond the “three people” who do exactly what you do.
Don’t make your reader fill in the blanks
Exercise 6

Fill in the blank: The d_g ch_ses the c_t

Fill in the blank: Das A_to i_t g_lb.
Good books on writing