UNIVERSITY OF TORONTO

Donnelly Centre
for Cellular + Biomolecular Research

Grant Writing Workshop:

Cindi Morshead
Department of Surgery
Donnelly Centre

Writing a successful grant application

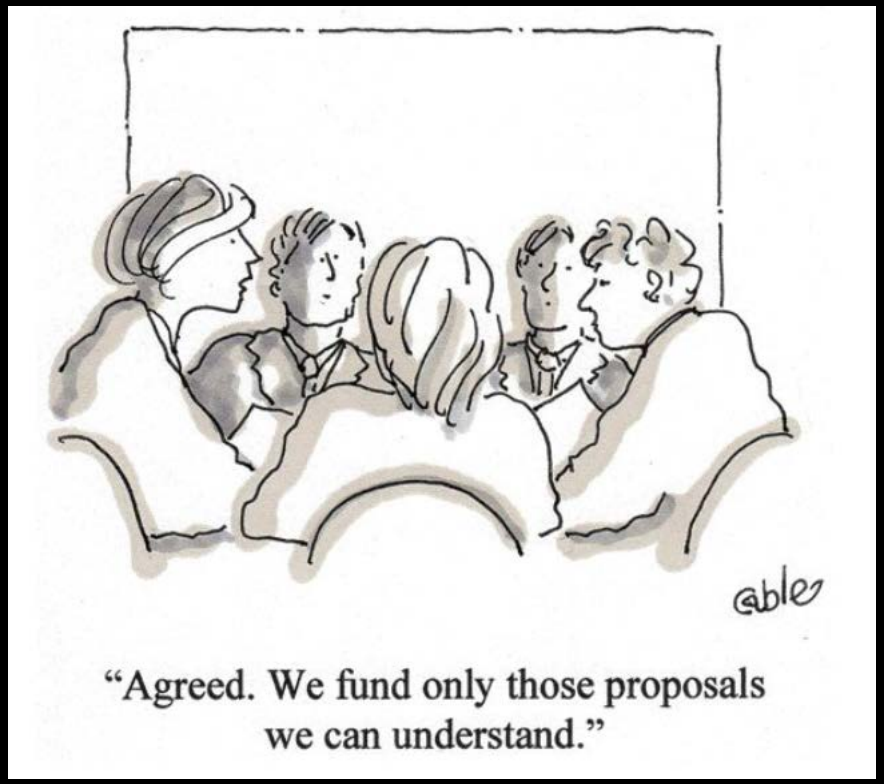
Start here

content adapted from guidebook for new investigators (McInnes, Andrews, Rachubinski): http://www.cihr-irsc.gc.ca/e/27491.html

Writing a successful grant application

Get here and the fun starts

Your audience is the review panel



Your grant must stand out

Primary Reviewer, Secondary Reviewer, Reader

You must convince the reviewers…

1. This is a project that must be done
   - It will yield significant results
   - It is more important (cooler; more significant) than the other proposed projects
2. You (and your team) are the right people to do it
   - You have the skills and resources to be successful (track record and prelim data)
   - You have thought through the project

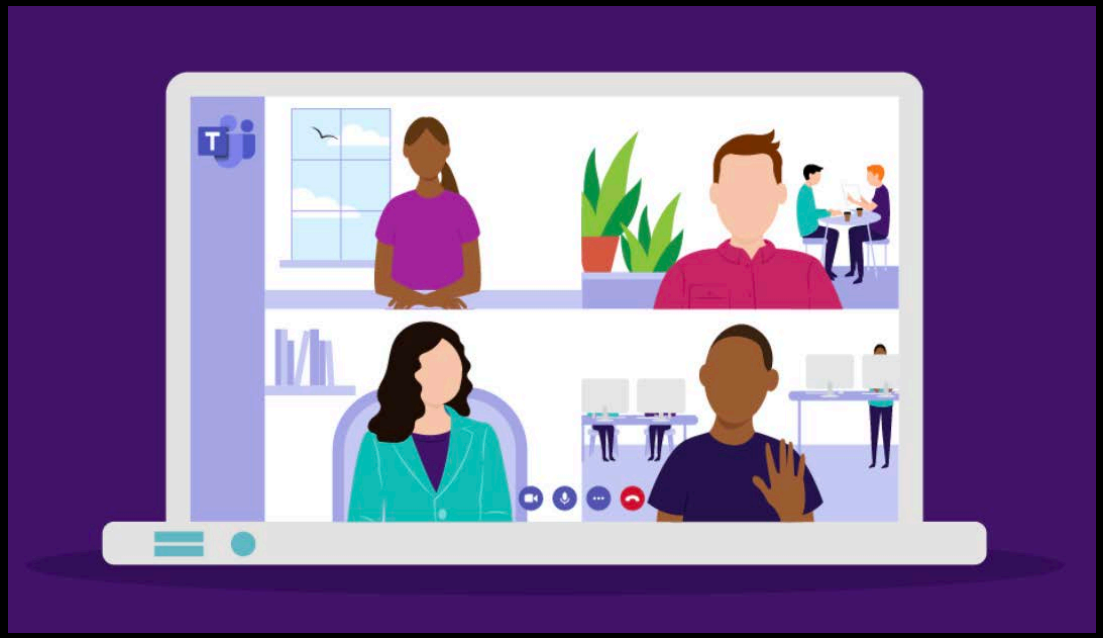
You must intrigue the reviewers

WRITING A GREAT GRANT

Key things to help prepare you

- 🔑 **Read successful grants from your colleagues** (from people at the same stage of career)

Key things to help prepare you



🔑 **Meet with your colleagues to**:

Get input on the presentation and scientific content

Don’t leave it to the last minute

🔑 **Start writing early – a little every day**

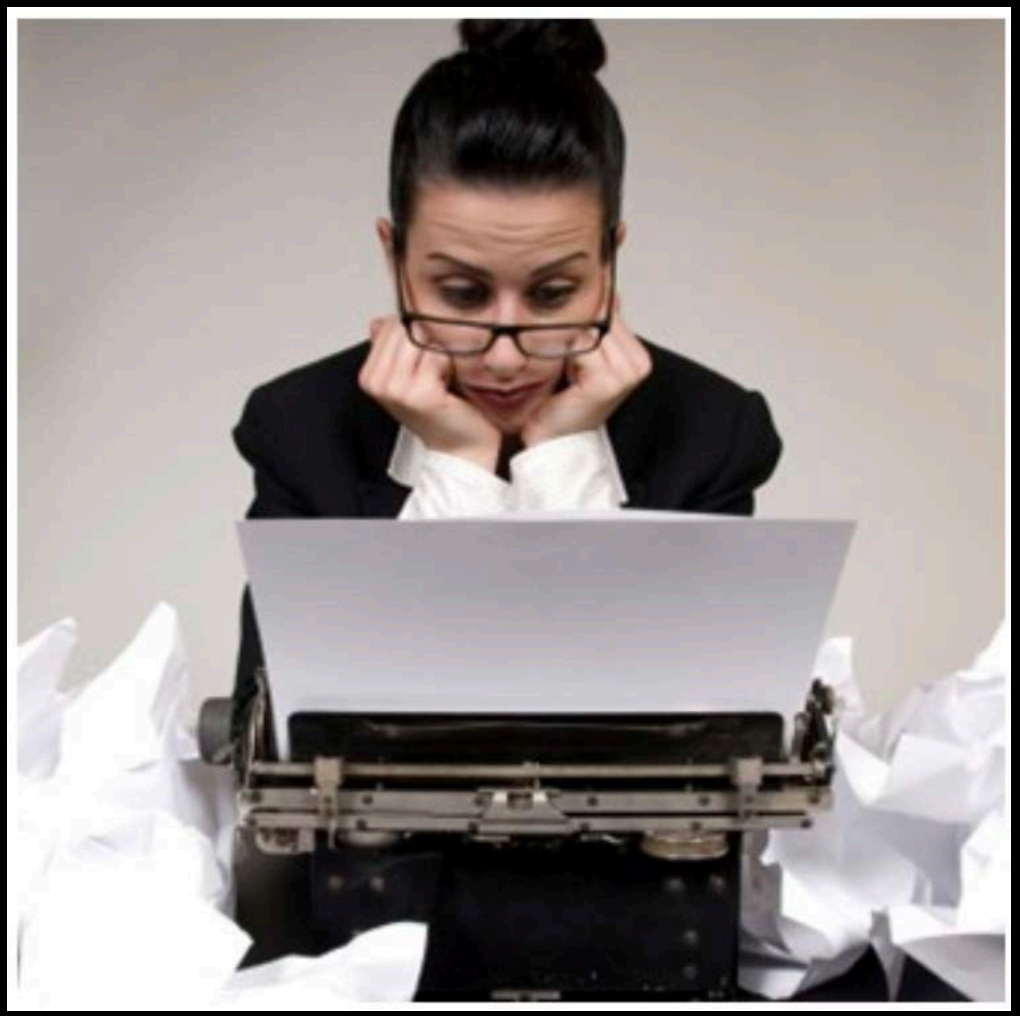
🔑 **Don’t leave the “other stuff” to the last minute**

Canadian Common CV - tedious and time consuming

Most significant contributions – reviewers will read this!
Make it relevant to the program that you are proposing.

Budget - Make it appropriate for the stage of your career!

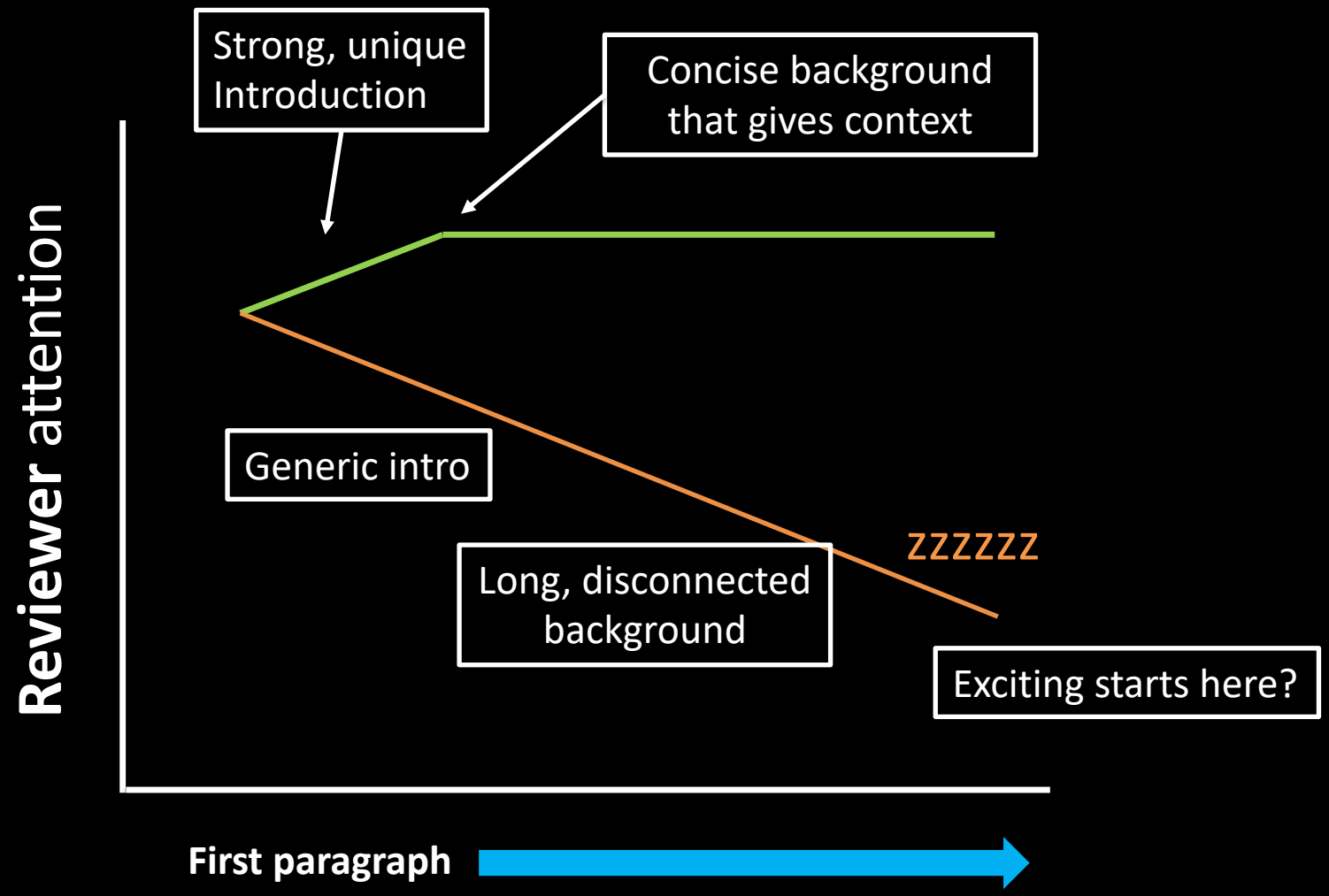
The nitty gritty of writing



Write well

- 🔑 **Get started by just getting it on paper**
- 🔑 **Remodel it so it makes sense (“flows”) and tells your story**
- 🔑 **Rework so it looks visually appealing**
- 🔑 **Submit**

Get off to a strong start: Engage the reviewers early



Summary and Background

- The problem you are addressing
- Why is it important?
- What will you accomplish?
- What has been done/not done
- The approach you will use; new tools or resources you will bring to the problem

PUT IT UP FRONT

After the summary and background….

- Reviewer should be intrigued and excited
- Should have a basic understanding of your project and why it is important
- Should be convinced that this research is a great idea
- Will be looking for details to confirm that you are capable of what you say you will do

Research Plan

Write the Research Plan around each Specific Aim

Each specific aim needs to include:

- the experimental plan (techniques/approach)
- anticipated outcomes (predictions)
- potential pitfalls and solutions (alternate plan)

Convince the reviewer you have the appropriate expertise (can include preliminary findings here to support your expertise/ability to perform the experiments)

Remember to use “I” and “we”

Order of writing

- Summary of the research plan
- Research Plan (~1/2 of the page limit)
  - Include potential pitfalls and solutions
- Background and Preliminary Results (~1/2 of page limit)
- Significance

Make your proposal easy to understand and to read

Help, don’t irritate, the reviewers

- **Follow the instructions!**
  - page limits (CIHR is 10 pages including figures, tables
  - 2cm margins
  - 6 lines per inch (12 point font)

You can’t “trick” them. They have seen it all.

Help, don’t irritate, the reviewers

- **Don’t underestimate the value of ”white space”**
  - Leave spaces between paragraphs/sections
  - Give the reader a “visual” break
- **No tiny, illegible figure legends**
- **Use figures, flow charts, illustrations, diagrams, bullet points**
- **Use headings and subheadings to help the reviewer locate information**
- **Don’t overwhelm with acronyms**

Help yourself!

- **Remember to focus on the “big picture” and don’t drown the reviewer in details. Too much information is a real thing!**
- **Keep in mind who the reviewers are - not all are experts in the field.**
- **Tell them why each experiment needs to be done and the importance of it’s outcome. Don’t make them guess. They may guess wrong.**

Help yourself!

- **Make sure the budget is appropriate. If you are a new investigator – don't ask for salaries for 5 PDF's.**

- **Consider applying for a 3 year grant instead of 5 as a new PI.**

Help yourself!

- Get a successful grant writer to read your grant
- When you think you're done, read your grant AGAIN from start to finish.
- Make sure to read through the PDF that is generated.
- PRESS SUBMIT!

And you still may not be funded…

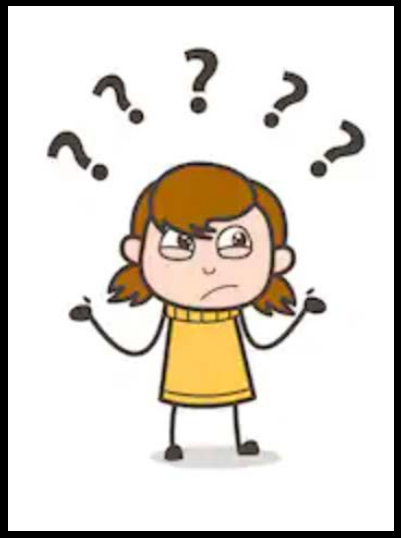
"Is it just me or are these review panels getting a lot tougher?"

If you don’t get funded…

- Don’t get discouraged!
- Listen to the reviewers
  - Scientific Officer Notes (a summary of the discussion that ensued) and reviewer 1 and reviewer 2 evaluations
  - All are important

Read carefully and determine…

Did the reviewers misunderstand what you were trying to convey? Did they ask for clarification? Did they have questions about outcomes that you can address? Do they request preliminary data to support your claim?



SOLUTION:
These are fixable. This is a good sign. They are inviting a revision.

Add missing information, data, clarify

Read carefully and determine…

Were they questioning if the work was feasible by your team?

Get collaborators on board to establish the required expertise

Read carefully and determine…

Were the reviewers enthusiastic about the work? Did they think it was important?

This can be a fatal flaw and difficult or impossible to fix.

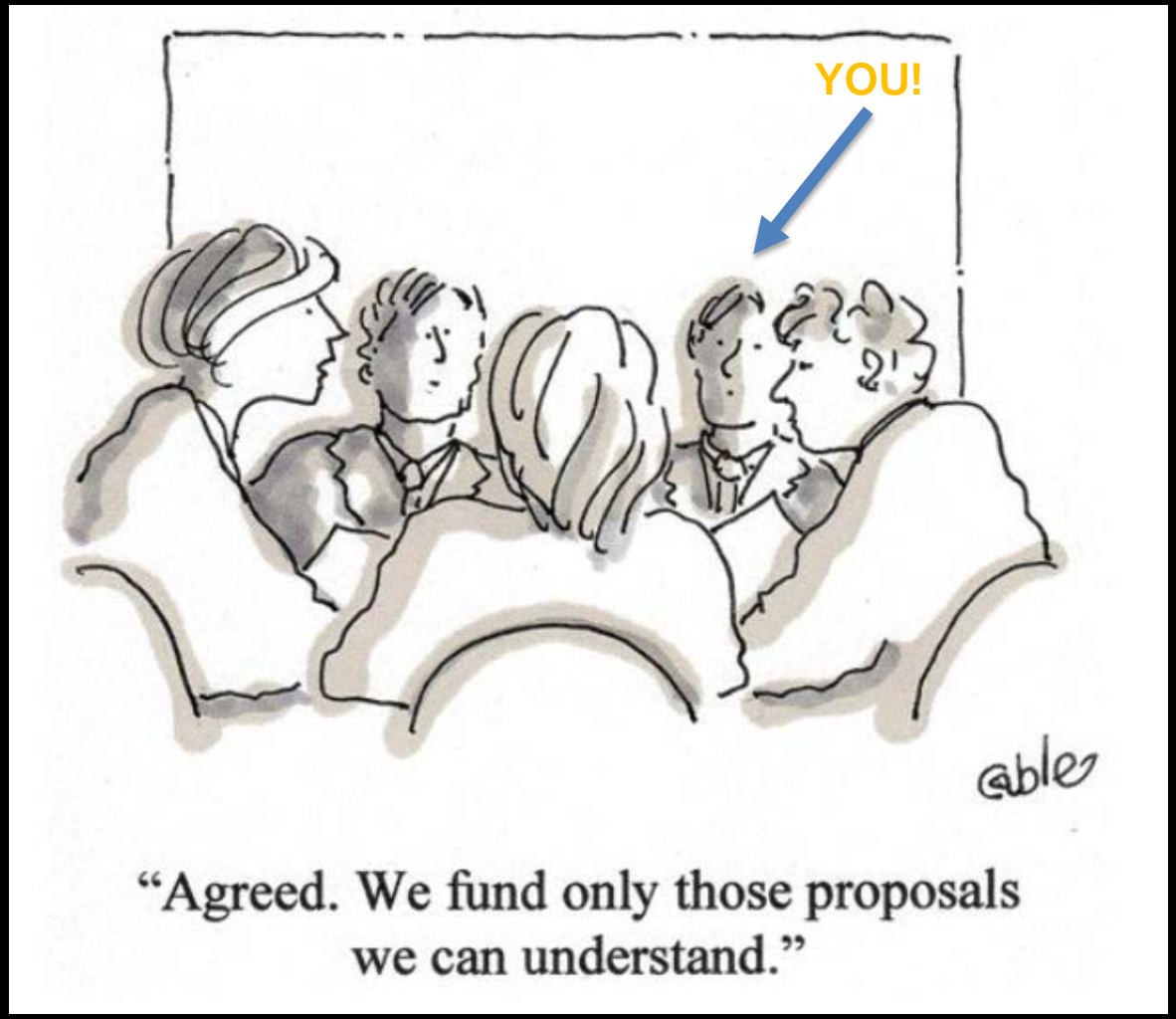
Responding to reviewers

How <u>not</u> to respond to reviewers' comments.

Be courteous and respectful and <u>never</u> suggest that the reviewers are incompetent.

e

Other things to do (like there wasn't already enough!)

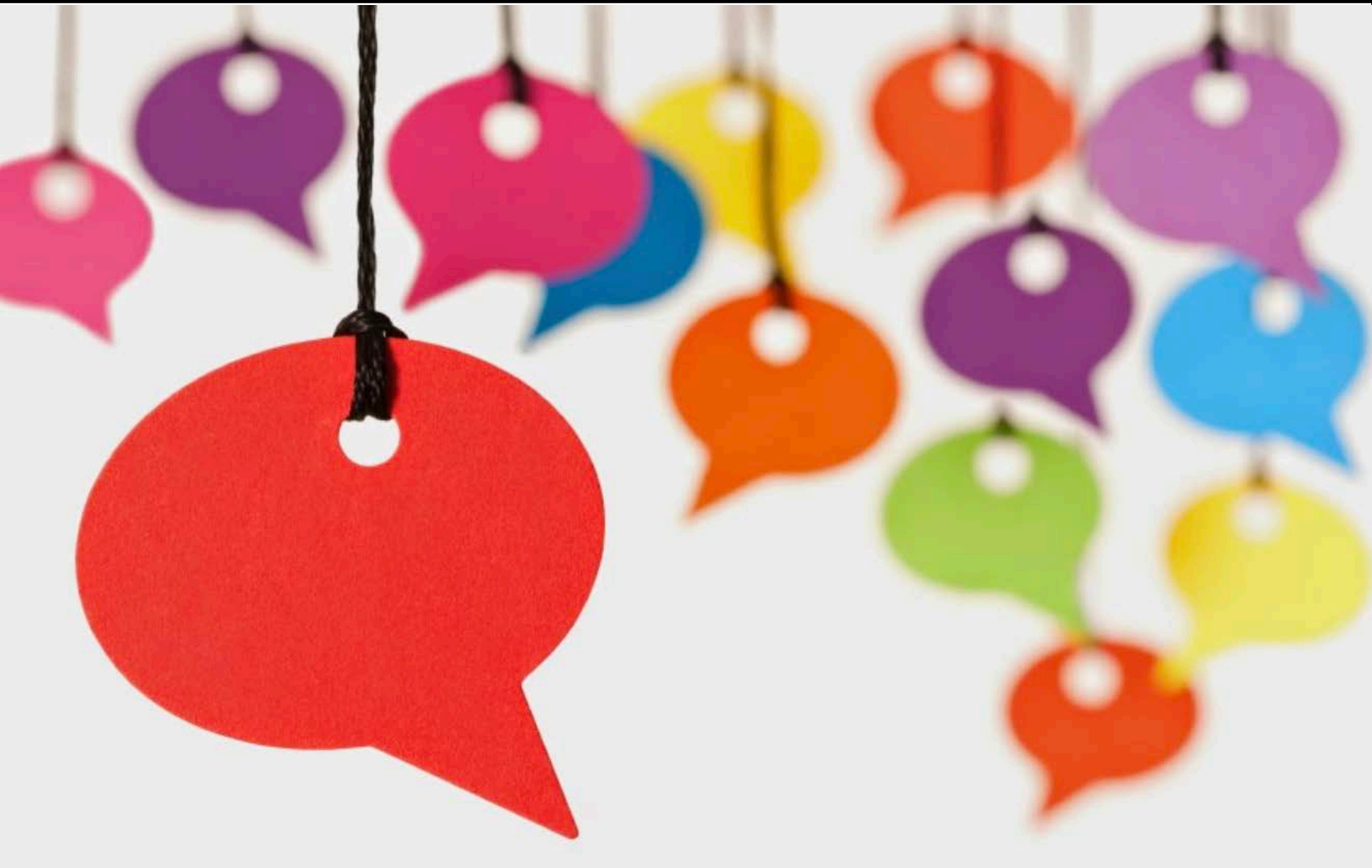


Other things to consider

Productivity

Independence issue

Discussion



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Core Facilities and Services in the Faculty of Medicine

Natasha Christie-Holmes

Research Operations Officer, Faculty of Medicine

natasha.christie@utoronto.ca

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- Dedicated management teams to provide specific technical expertise, training and protocol development assistance for research personnel

- Maximizing the impact of funding success to propel research at a Faculty-wide level and support future grant applications

- Supported through cost-recovery structures and strategic planning of grant-associated operational funding

https://medicine.utoronto.ca/core-facilities-services

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Division of Comparative Medicine (DCM)

- Interim Director: Nitin Bhardjwal, DVM, PhD
- Manager: Frank Giuliano, RMLAT
- http://www.dcm.utoronto.ca/
- Federally and Provincially accredited Animal Care program at the Faculty of Medicine
- Preeminent veterinary technical staff including 5 Masters level animal technicians
- Over 60, 000 ft^2 dedicated to *in vivo* research, including germfree, gnotobiotics and SPF+ exclusion
- Multiple full animal imaging modalities on-site supported by dedicated technical expert

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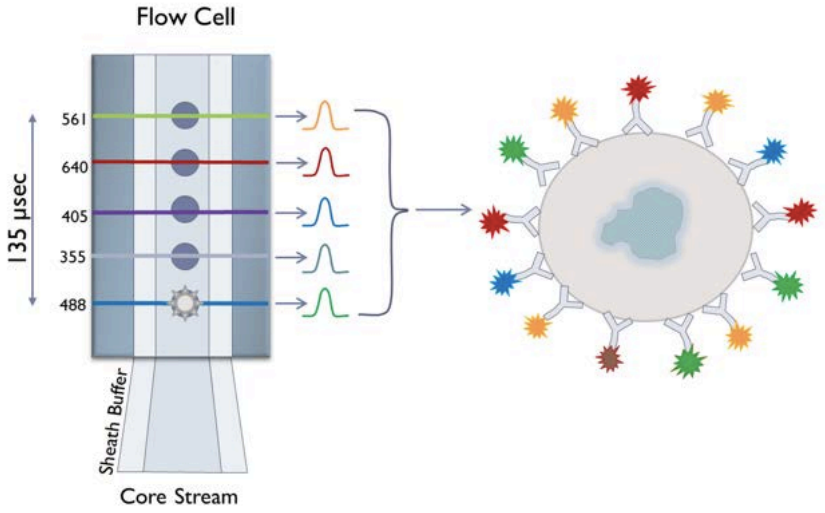
Flow Cytometry Facility

- Director: Tania Watts, PhD
- Manager: Natalie Simard, PhD
- http://flowcytometry.utoronto.ca/
- Equipped with 7 analyzers (3 to 5 laser each; up to 18 colour acquisition) and 3 cell sorters allowing for large multiparameter analysis
- Supported by dedicated operators with extensive FCM knowledge and over 20 years of experience
- Comprehensive training program partnership with Expert Cytometry(ExCyte™) and SickKids Hospital for research personnel



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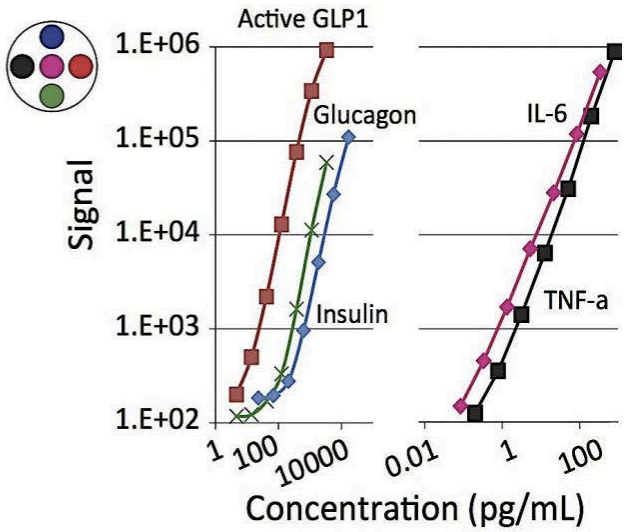
Diet, Digestive tract and Disease (3D) facility

- Director: Herb Gaisano, PhD
- Manager: Alexandre Hardy, PhD
- Multiple analytic platforms to facilitate molecular investigations
- Various imaging platforms from molecular level to full small animal scans
- Partnership with DCM to provide technical expertise in animal imaging



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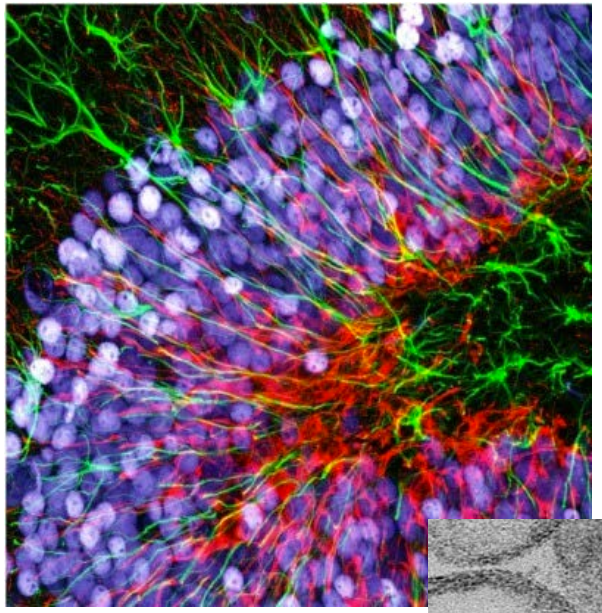
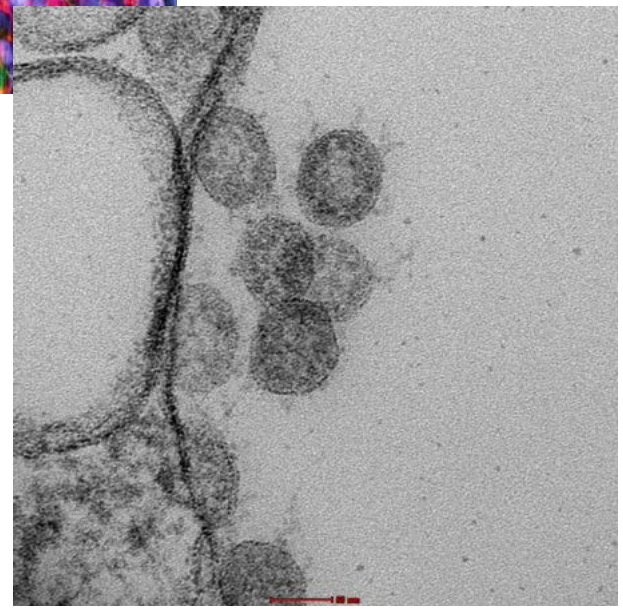
Microscopy Imaging Lab (MIL)

- Director: Stephen Girardin, PhD
- Manager: Lindsey Fiddes, PhD
- Consolidated microscopy core including confocal, fluorescence, scanning (SEM) and transmission (TEM) electron microscopes
- Expert technical team trains research personnel in microscopy techniques and development of protocols
- Dedicated preparatory lab for SEM/TEM samples, Equipped for Cryo-TEM prepration
- Providing full-service microscopy (prep and scanning)





TEM of Vero cells infected with SARS-CoV-2, 120,000x
(Isolated in C-CL3 Unit, Imaged by MIL)
Banerjee et al, 2020

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Combined Containment Level 3 (C-CL3) Unit

- Director: Scott Gray-Owen, PhD
- Manager: Betty Poon, MSc
- Federally licensed facilities for research involving RG3 pathogens
- Dedicated regulatory team providing guidance, validation and oversight
- Facilities for small animal *in vivo* studies and molecular *in vitro* research

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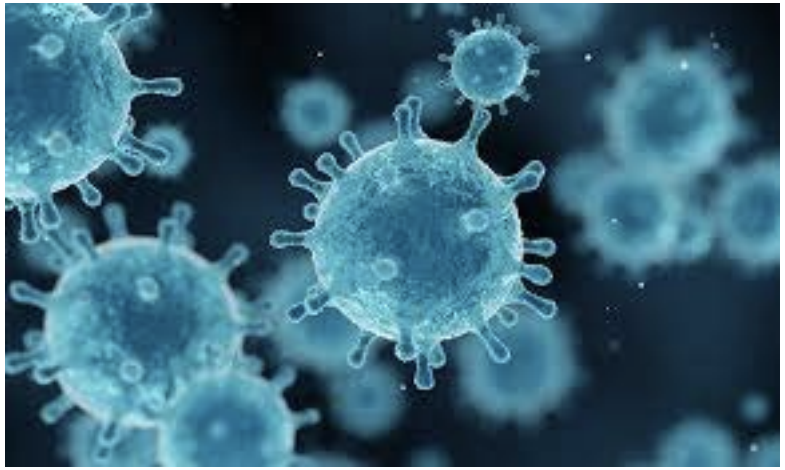

Virology Core Lab and Biobank

- Director: Scott Gray-Owen, PhD
- Manager: Betty Poon, MSc
- New, adaptive CL2+ space for viral research
- Foundational work on seasonal coronaviruses, HIV
- Extends FoM infectious disease expertise to support other Faculties
- Leveraging opportunities for collaboration and building foundation for future studies on COVID-19 samples

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Central Sterilization Service (CSS)

- Providing glass-washing, laundry and sterilization services
- Centralized stock of glass and plasticware for all MSB researchers to access
- Multiple sterilization cycles daily allowing flexibility for lab schedules
- After-hours autoclaves available to trained users

How to Write a Persuasive Grant Proposal

Golnaz Farhat, PhD

Grants & Awards Editor

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Goals for today:

- To identify the building blocks of a good proposal
- To provide practical tips to improve your writing

Proposal writing is a genre

"A good proposal is an elegant sales pitch."

Robert Porter (Virginia Tech.)

Academic Writing VS Proposal Writing

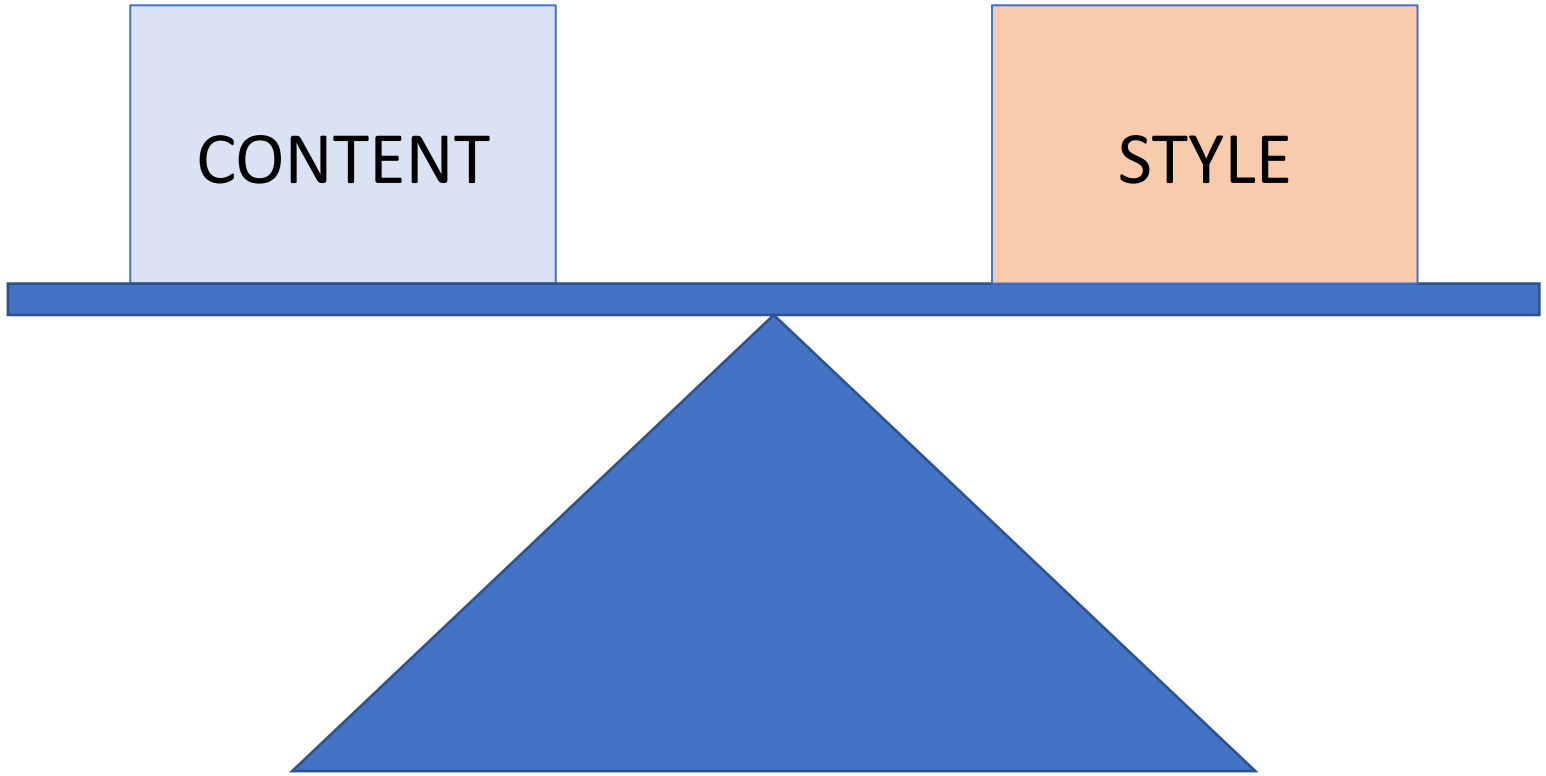
Scientific Manuscript	Grant Proposal
Explaining	Selling
Back-facing	Forward-facing
Objective, dispassionate	Conveys excitement and plays on emotion
Specialized terminology	Accessible language
Centered around the pursuit of knowledge	Centered around sponsor's priorities

Consider your audience

- They are not experts in your field
- They are busy
- They have to review many proposals
- They are also reviewing manuscripts and theses
- They may be multi-tasking
- They are tired

From *The Grant-Writer's Handbook (Gerard M Crawley)*

What makes a proposal persuasive?



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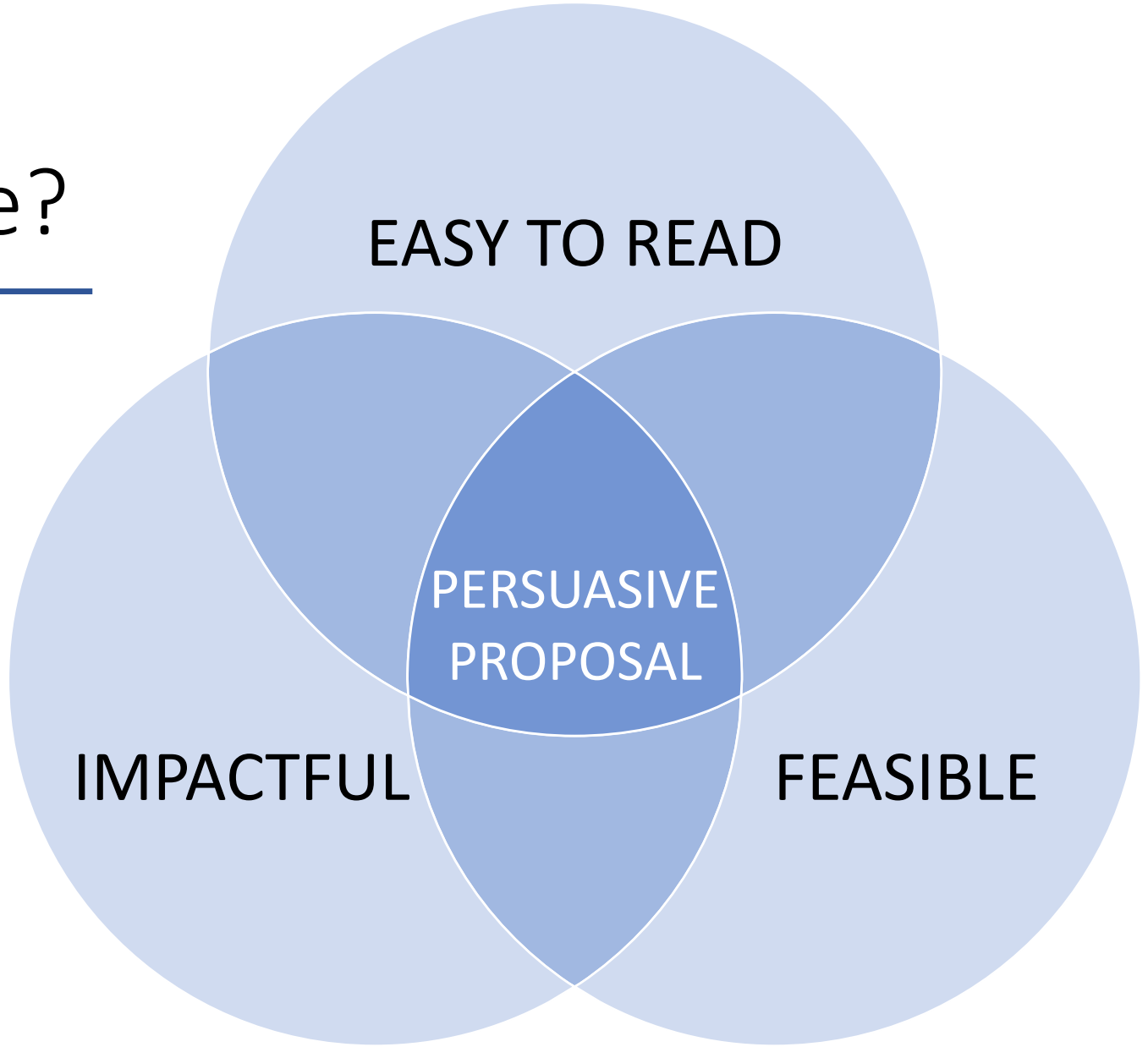

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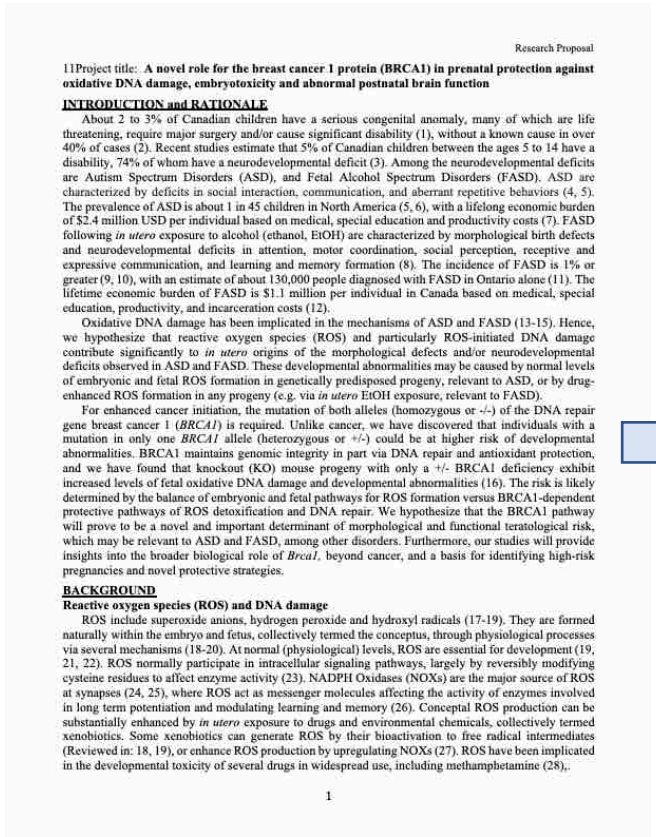
Formatting

EASY TO READ

- Include white space



Research Proposal

11Project title: **A novel role for the breast cancer 1 protein (BRCA1) in prenatal protection against oxidative DNA damage, embryotoxicity and abnormal postnatal brain function**

INTRODUCTION and RATIONALE

About 2 to 3% of Canadian children have a serious congenital anomaly, many of which are life threatening, require major surgery and/or cause significant disability (1), without a known cause in over 40% of cases (2). Recent studies estimate that 5% of Canadian children between the ages 5 to 14 have a disability, 74% of whom have a neurodevelopmental deficit (3). Among the neurodevelopmental deficits are Autism Spectrum Disorders (ASD), and Fetal Alcohol Spectrum Disorders (FASD). ASD are characterized by deficits in social interaction, communication, and aberrant repetitive behaviors (4, 5). The prevalence of ASD is about 1 in 45 children in North America (5, 6), with a lifelong economic burden of $2.4 million USD per individual based on medical, special education and productivity costs (7). FASD following *in utero* exposure to alcohol (ethanol, EtOH) are characterized by morphological birth defects and neurodevelopmental deficits in attention, motor coordination, social perception, receptive and expressive communication, and learning and memory formation (8). The incidence of FASD is 1% or greater (9, 10), with an estimate of about 130,000 people diagnosed with FASD in Ontario alone (11). The lifetime economic burden of FASD is $1.1 million per individual in Canada based on medical, special education, productivity, and incarceration costs (12).

Oxidative DNA damage has been implicated in the mechanisms of ASD and FASD (13-15). Hence, we hypothesize that reactive oxygen species (ROS) and particularly ROS-initiated DNA damage contribute significantly to *in utero* origins of the morphological defects and/or neurodevelopmental deficits observed in ASD and FASD. These developmental abnormalities may be caused by normal levels of embryonic and fetal ROS formation in genetically predisposed progeny, relevant to ASD, or by drug-enhanced ROS formation in any progeny (e.g. via *in utero* EtOH exposure, relevant to FASD).

For enhanced cancer initiation, the mutation of both alleles (homozygous or -/-) of the DNA repair gene breast cancer 1 (*BRCA1*) is required. Unlike cancer, we have discovered that individuals with a mutation in only one *BRCA1* allele (heterozygous or +/-) could be at higher risk of developmental abnormalities. BRCA1 maintains genomic integrity in part via DNA repair and antioxidant protection, and we have found that knockout (KO) mouse progeny with only a +/- BRCA1 deficiency exhibit increased levels of fetal oxidative DNA damage and developmental abnormalities (16). The risk is likely determined by the balance of embryonic and fetal pathways for ROS formation versus BRCA1-dependent protective pathways of ROS detoxification and DNA repair. We hypothesize that the BRCA1 pathway will prove to be a novel and important determinant of morphological and functional teratological risk, which may be relevant to ASD and FASD, among other disorders. Furthermore, our studies will provide insights into the broader biological role of *Brca1*, beyond cancer, and a basis for identifying high-risk pregnancies and novel protective strategies.

BACKGROUND

Reactive oxygen species (ROS) and DNA damage

ROS include superoxide anions, hydrogen peroxide and hydroxyl radicals (17-19). They are formed naturally within the embryo and fetus, collectively termed the conceptus, through physiological processes via several mechanisms (18-20). At normal (physiological) levels, ROS are essential for development (19, 21, 22). ROS normally participate in intracellular signaling pathways, largely by reversibly modifying cysteine residues to affect enzyme activity (23). NADPH Oxidases (NOXs) are the major source of ROS at synapses (24, 25), where ROS act as messenger molecules affecting the activity of enzymes involved in long term potentiation and modulating learning and memory (26). Conceptal ROS production can be substantially enhanced by *in utero* exposure to drugs and environmental chemicals, collectively termed xenobiotics. Some xenobiotics can generate ROS by their bioactivation to free radical intermediates (Reviewed in: 18, 19), or enhance ROS production by upregulating NOXs (27). ROS have been implicated in the developmental toxicity of several drugs in widespread use, including methamphetamine (28),.

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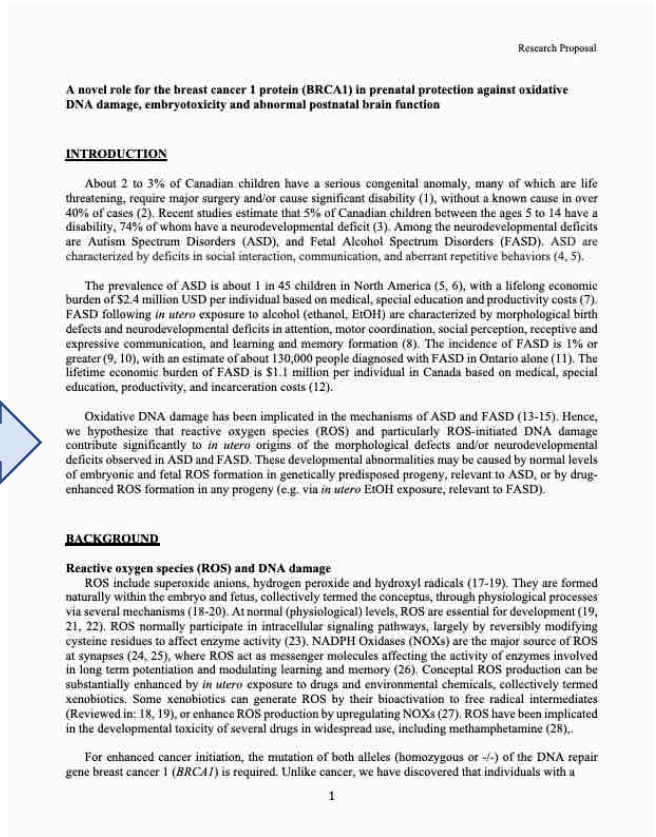

Research Proposal

A novel role for the breast cancer 1 protein (BRCA1) in prenatal protection against oxidative DNA damage, embryotoxicity and abnormal postnatal brain function

INTRODUCTION

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1

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EASY TO READ

Formatting

- Include white space
- Use **bold to highlight** important points, avoid italics, *they are harder to read*
- Break down into sections and use headings to help the reviewer navigate your proposal

Hint: use the review criteria as your section headings!

EASY TO READ

Writing Style

- Write clearly, plainly, and concisely
- Write a persuasive introduction: if you make your proposal interesting it's easier to read
- No silly mistakes

IMPACTFUL

Tell a strong story

There is a SIGNIFICANT PROBLEM and we have the SOLUTION!

- Play on the reviewer's emotions
- Make the reviewer your advocate
- Highlight the NOVELTY of your solution
- Do this all on the first page

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FEASIBLE

Show that you can pull it off

- Competence of Investigators
- Strength of Collaborations
- Access to Infrastructure
- Successful Preliminary Results
- Detailed Research Plan
- Timeline

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Practical Tips for Writing a Persuasive Proposal

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Start Early

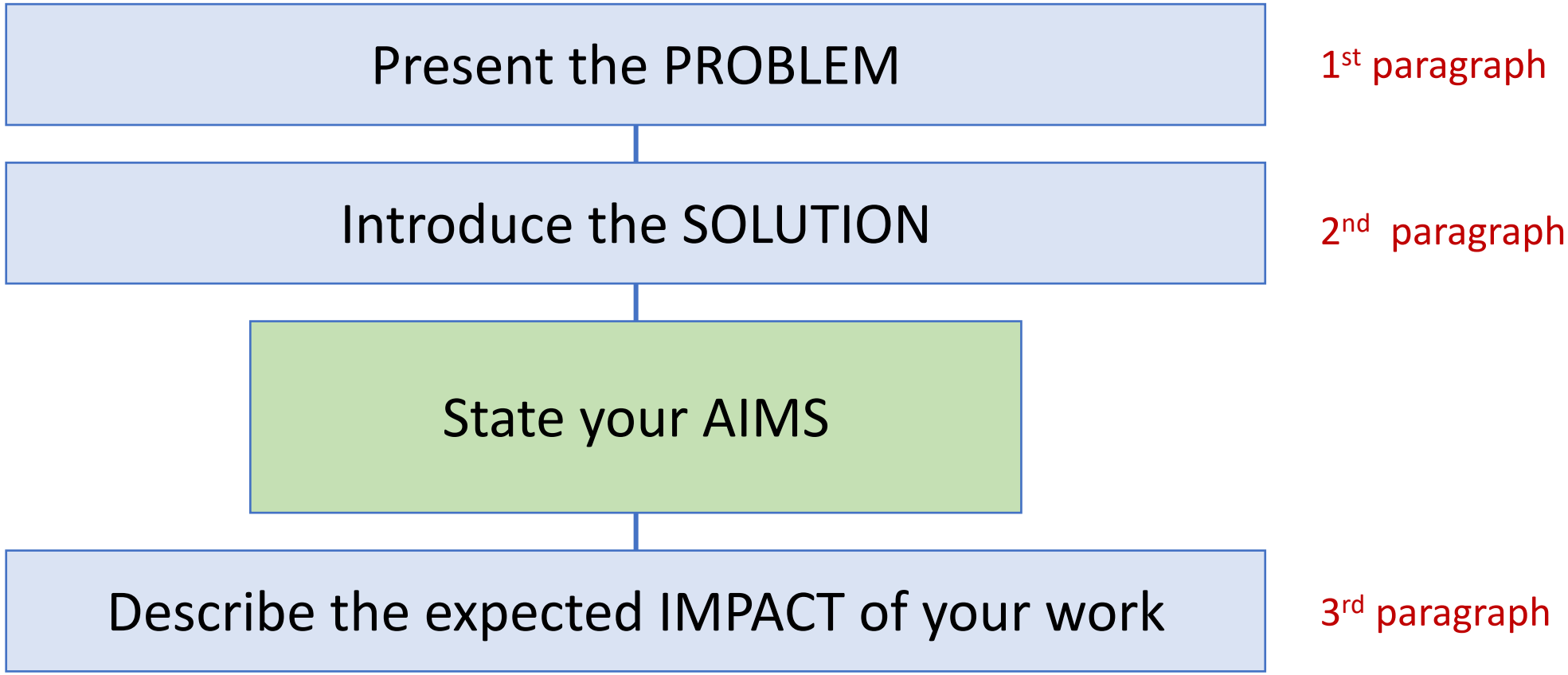
- At least 3 months before the deadline
- Read successful grant proposals
- Read the guidelines carefully (and more than once)
- Pay attention to the sponsor’s priorities
- Note keywords in the funding announcement; use them in your proposal

Write a skeleton:

- What is the PROBLEM you are trying to solve?
- WHY is it important?
- Where is the GAP in research?
- What is the SOLUTION you are offering?
- What are your OBJECTIVES and AIMS?
- How is your work NOVEL?
- What will be the IMPACT of your work?

convincing introduction

Anatomy of a persuasive introduction



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1st paragraph: provide **socio-economic** context

An estimated 400,000 Canadians (including 10,000 children) suffer from acute brain damage resulting from stroke[2]. The care and treatment of brain injury as a result of stroke costs the Canadian healthcare system $3.2 billion annually. The number of people living with brain injuries caused by stroke is expected to double in the next 20 years[2].

1st paragraph: introduce the PROBLEM

An estimated 400,000 Canadians (including 10,000 children) suffer from acute brain damage resulting from stroke[2]. The care and treatment of brain injury as a result of stroke costs the Canadian healthcare system $3.2 billion annually. The number of people living with brain injuries caused by stroke is expected to double in the next 20 years[2]. **There is a lack of therapeutic strategies to enhance brain repair or regeneration following damage to the brain. The few treatment options that exist reduce disability in a limited number of patients. Most stroke survivors live with enduring long-term disability.**

1st paragraph: identify the KNOWLEDGE GAP

An estimated 400,000 Canadians (including 10,000 children) suffer from acute brain damage resulting from stroke[2]. The care and treatment of brain injury as a result of stroke costs the Canadian healthcare system $3.2 billion annually. The number of people living with brain injuries caused by stroke is expected to double in the next 20 years[2]. There is a lack of therapeutic strategies to enhance brain repair or regeneration following damage to the brain. The few treatment options that exist reduce disability in a limited number of patients. Most stroke survivors live with enduring long-term disability. **To identify novel therapeutic targets, we must understand how stem cells known as radial precursor cells first build the brain during development and then persist in the adult brain as neural stem cells to repair damage.**

1st paragraph: include relevant background

An estimated 400,000 Canadians (including 10,000 children) suffer from acute brain damage resulting from stroke[2]. The care and treatment of brain injury as a result of stroke costs the Canadian healthcare system $3.2 billion annually. The number of people living with brain injuries caused by stroke is expected to double in the next 20 years[2]. There is a lack of therapeutic strategies to enhance brain repair or regeneration following damage to the brain. The few treatment options that exist reduce disability in a limited number of patients. Most stroke survivors live with enduring long-term disability. To identify novel therapeutic targets, we must understand how stem cells known as radial precursor cells first build the brain during development and then persist in the adult brain as neural stem cells to repair damage. **Cues from outside the cell (extrinsic cues) are critical to the ability of radial precursor cells and neural stem cells to build and repair the brain. Extrinsic cues instruct these stem cells to either quiesce, divide, die or differentiate.**

2nd paragraph: state your long-term goal

Our goal is to understand when, how and why extrinsic cues control radial precursor cells so we can develop novel treatment strategies for brain repair.

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2nd paragraph: propose your objectives

Our goal is to understand when, how and why extrinsic cues control radial precursor cells so we can develop novel treatment strategies for brain repair. **Our first objective is to characterize a novel 'on/off switch' which controls proliferation of radial precursor cells and neural stem cells in response to extrinsic cues and maintains these cells in a quiescent or 'slow-dividing' state. Our second objective is to combine two-dimensional spatial information with high-throughput single-cell genomic data to localize quiescent radial precursor cells and neural stem cells.**

2nd paragraph: what is the rationale?

Our goal is to understand when, how and why extrinsic cues control radial precursor cells so we can develop novel treatment strategies for brain repair. Our first objective is to characterize a novel 'on/off switch' which controls proliferation of radial precursor cells and neural stem cells in response to extrinsic cues and maintains these cells in a quiescent or 'slow-dividing' state. **With a deep understanding of this 'on/off switch' we can design novel treatments to force this switch, which shuts down stem cells into the 'off' position and mobilizes neural stem cells following brain injury.** Our second objective is to combine two-dimensional spatial information with high-throughput single-cell genomic data to localize quiescent radial precursor cells and neural stem cells. **This will reveal the sources of extrinsic cues that keep neural stem cells from being mobilized.**

State your aims

- Use active, descriptive titles

  Aim 1: Characterization of stem cell ‘on/off’ switch (not a great aim)

  Aim 1: To characterize a key ‘on/off’ switch controlling the proliferation of quiescent or ‘slow-dividing’ radial precursor cells and neural stem cells (much better)

- Aims should be related but not dependent on each other
- Use your aims as headings in your proposed methodology

3rd paragraph: describe the impact

To develop new treatments for brain injury we must have a molecular understanding of tissues at the single-cell level. Leveraging the discovery of new therapeutic targets to enhance repair and regeneration following brain injury would improve the quality of life of stroke patients and would reduce the financial burden on the Canadian healthcare system.

Introduction

An estimated 400,000 Canadians (including 10,000 children) suffer from acute brain damage resulting from stroke[2]. The care and treatment of brain injury as a result of stroke costs the Canadian healthcare system $3.2 billion annually. The number of people living with brain injuries caused by stroke is expected to double in the next 20 years[2]. There is a lack of therapeutic strategies to enhance brain repair or regeneration following damage to the brain. The few treatment options that exist reduce disability in a limited number of patients. Most stroke survivors live with enduring long-term disability. To identify novel therapeutic targets, we must understand how stem cells known as radial precursor cells first build the brain during development and then persist in the adult brain as neural stem cells to repair damage. Cues from outside the cell (extrinsic cues) are critical to the ability of radial precursor cells and neural stem cells to build and repair the brain. Extrinsic cues instruct these stem cells to either quiesce, divide, die or differentiate.

Present the problem:
- engage the reviewer
- play on emotions

Our goal is to understand when, how and why extrinsic cues control radial precursor cells so we can develop novel treatment strategies for brain repair. Our first objective is to characterize a novel 'on/off switch' which controls proliferation of radial precursor cells and neural stem cells in response to extrinsic cues and maintains these cells in a quiescent or 'slow-dividing' state. With a deep understanding of this 'on/off switch' we can design novel treatments to force this switch, which shuts down stem cells into the 'off' position and mobilizes neural stem cells following brain injury. Our second objective is to combine two-dimensional spatial information with high-throughput single-cell genomic data to localize quiescent radial precursor cells and neural stem cells. This will reveal the sources of extrinsic cues that keep neural stem cells from being mobilized.

Present the solution:
- reviewer becomes your advocate

We will achieve these objectives through the following specific aims:

Aim 1: To characterize a key 'on/off' switch controlling the proliferation of quiescent or 'slow-dividing' radial precursor cells and neural stem cells;

Aim 2: To develop spatially-resolved single cell transcriptomics to interrogate 'slow-dividing' radial precursor cells and quiescent neural stem cells;

Aim 3: To apply our spatially-resolved scRNA-seq method to identify extrinsic cues controlling 'slow-dividing' radial precursor cells and quiescent neural stem cells and to identify the source of these cues.

State your aims:
- table of contents

To develop new treatments for brain injury we must have a molecular understanding of tissues at the single-cell level. Leveraging the discovery of new therapeutic targets to enhance repair and regeneration following brain injury would improve the quality of life of stroke patients and would reduce the financial burden on the Canadian healthcare system.

Describe the expected impact

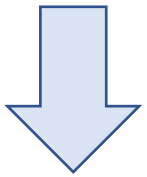
Tips on how to organize your proposal

- Follow the sponsor's guidelines to structure your proposal
- Use the review criteria as section headings
- Match your methods to your aims

Tips and examples to improve your writing

Tip #1: Write plainly, clearly and concisely

"The bovine ruminant traversed over earth's natural satellite in a saltatorial manner."



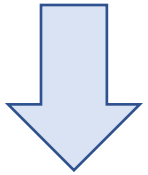
"The cow jumped over the moon."

From: https://imageryandbeyond.wordpress.com

Tip #2: Avoid complex terminology

Use accessible language

"Aneuploidy and translocations lead to progressive alterations in chromosome structure and epigenetic modifications characteristic of tumorigenesis"



"Cells prone to forming tumors characteristically show abnormal chromosome numbers, chromosomal rearrangements, and aberrant patterns of gene expression arising from defects in gene regulation."

Tip #3: Favour the active voice

Active Voice: the subject does the action

"The sonographer acquired the images."

Passive Voice: the subject receives the action

"The images were acquired by the sonographer"

Tip #4: Sometimes the passive voice is better

When using the same subject for sequential sentences in the same paragraph:

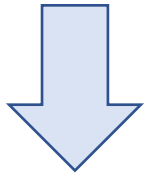
> “Blood samples were acquired daily and cooled immediately. They were then transported to the laboratory for analysis.”

Tip #5: Use short words

Long	Short
utilize	use
terminate	end
initiate	start
subsequent	next

Tip #5: Use short words

"Although investigations of medieval plague victims have identified *Yersinia pestis* as the putative etiologic agent of the pandemic, methodological limitations have prevented large-scale genomic investigations to evaluate changes in the pathogen's virulence over time."



"By studying medieval plague victims, we know that *Yersinia pestis* likely caused the Black Death; however, we don't know how the pathogen's virulence changed over time, because large-scale genomic studies are hard to do."

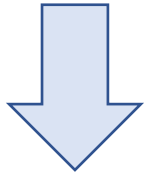
Tip #6: Write short sentences

Remove excessive words that add no meaning

Long	Short
at this point in time	now
has the potential to	can
in light of the fact	because
in the event that	if

Tip #6: Write short sentences

"While a growing body of evidence indicates that large herbivores as a group can exert strong indirect effects on co-occurring species, there are comparatively few examples of strong community-wide impacts from individual large herbivore species."

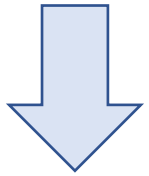


"Research shows that large herbivores can indirectly influence co-occurring species, but few studies focus on a single species of large herbivore and how it affects the whole community."

Tip #7: Use strong verbs

Avoid the use of to have and to be

"Declines in birth rates have been observed in many developed countries, and demographers expect that the transition to a stable population will eventually occur in many undeveloped nations as well."



"Birth rates have declined in many developed countries, and demographers expect that populations will stabilize in many undeveloped nations as well."

Tip #8: Avoid noun strings

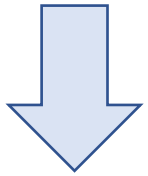
Break up the noun string by adding a verb

"real-time ultrasonographic blood flow techniques"

"ultrasound techniques that detect blood flow in real-time"

Tip #8: Avoid noun strings

"Developing regular exercise programs and diet regimes contributes to disease risk prevention and optimal health promotion."

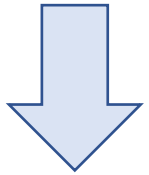


"Regular exercise and attention to diet help prevent disease and promote health."

Tip #9: Watch your tone

Write with confidence; use strong, clear statements.

"Horned beetles could provide an opportunity to combine studies of trait development with experiments looking at sexual selection. After almost ten years of research, I may now have the opportunity, if funded, to piece together disparate parts of the research program, offering opportunities to train young scientists, and potentially providing an understanding of……"

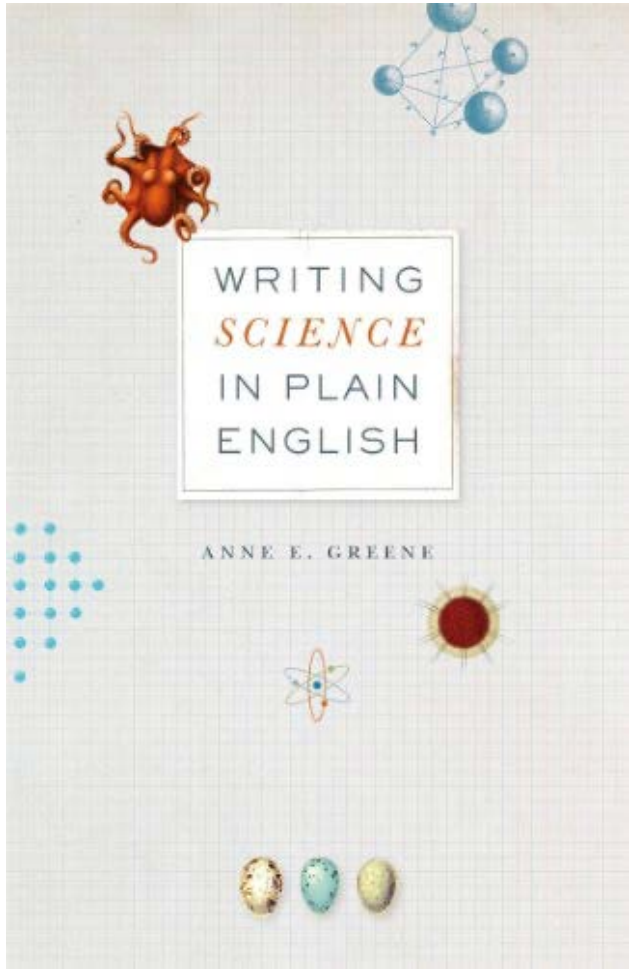


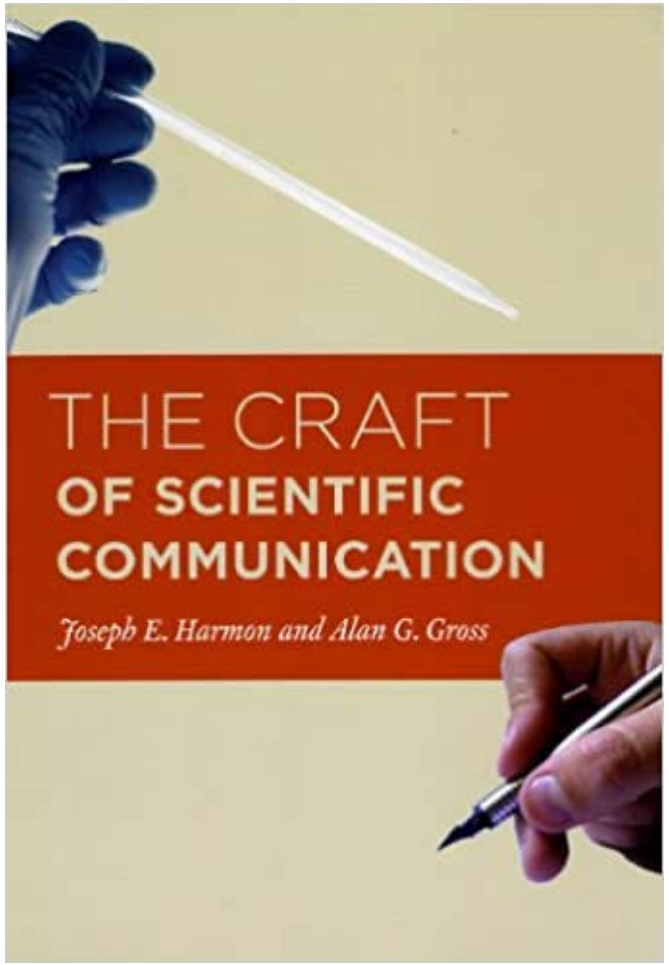
"Horned beetles provide an unusual opportunity to combine studies of trait development with experiments exploring sexual selection. By building on almost ten years of research directed towards this goal, I now have the opportunity to forge a truly integrative research program, offering unique possibilities for inspiring and training young scientists."

Tip #10: Use hard facts and numbers

"I have an impressive publication track record and have been highly successful at securing research funding."

"I have published 47 peer-reviewed research articles in the past 10 years and have secured $1.2M in research funding, including a CIHR Project Grant and an NSERC Discovery Grant."


WRITING
SCIENCE
IN PLAIN
ENGLISH
ANNE E. GREENE


THE CRAFT
OF SCIENTIFIC
COMMUNICATION
Joseph E. Harmon and Alan G. Gross

Final thoughts…

- Consider your audience
- Start early
- Read successful grants
- Tell a strong story
- Make the reviewer your advocate with a persuasive introduction
- Revise, revise, revise

From *The Grant-Writer's Handbook (Gerard M Crawley)*