# The Path to [F]ellowship

Elaine Smolock, Ph.D.

*Director of Writing Services and Training Grant Development*

Center for Professional Development | Graduate Education and Postdoctoral Affairs

*PREP Co-director*

Department of Microbiology and Immunology

CPD Workshop Series - January 2020

# Objectives

Part 1 – 1/22

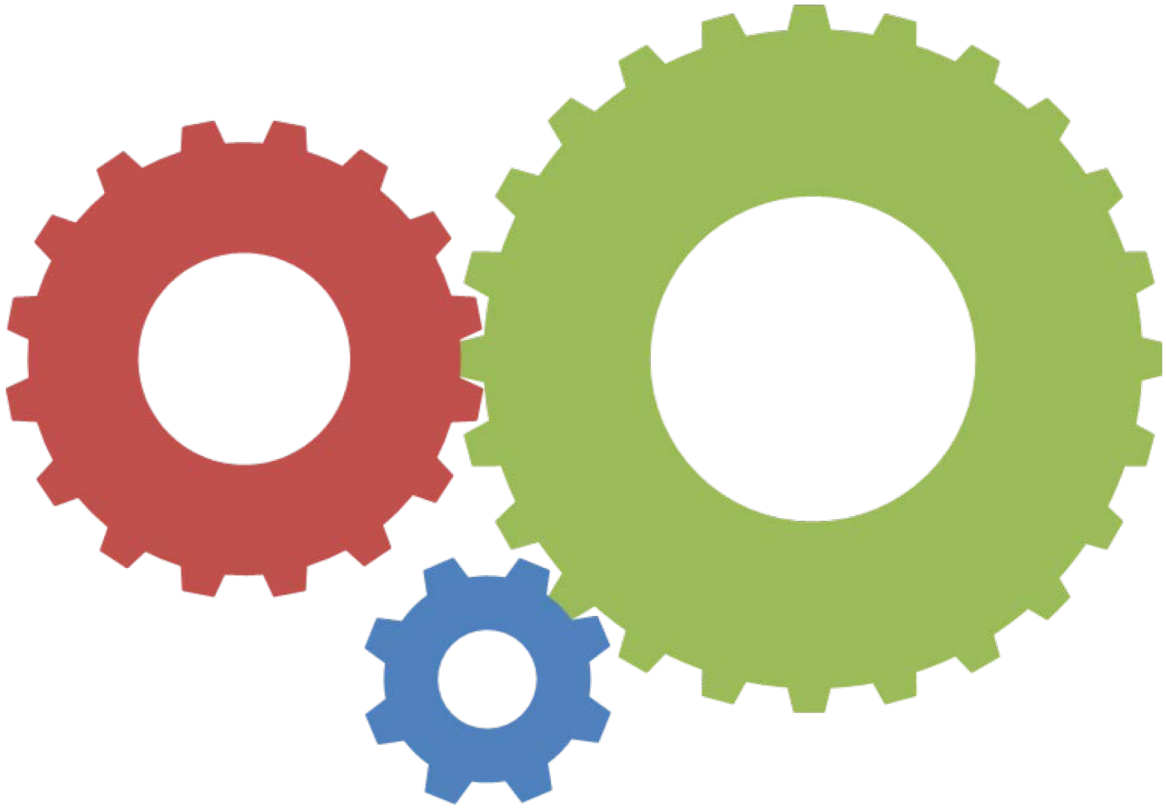
- Overview of F30, F31 and F32 applications including:
  - Deadlines
  - Organization
  - How applications are reviewed
- Biosketch and Goals and Training Plan

Part 2 – 1/27

- Develop Specific Aims
- Research Training Plan

# Exercise #1

# Review the working parts of the Fellowship application



# The 1st thing you should do?

**READ the announcement (FOA)!**

**KNOW the application requirements in the SF424**

- It is YOUR RESPONSIBILITY to understand the requirements!
- NOTE: It is also YOUR OBLIGATION to make sure your SPONSOR(S) UNDERSTANDS the requirements!

# Reading the FOA

- The FOA contains information specifically focused on what the program officers are interested in scientifically, what research areas are high priority, and what NIH would like to see as an emphasis of research proposal.
- The FOA also contains additional and highly specific information that might deviate from the standard instructions in the SF424.
- https://grants.nih.gov/grants/how-to-apply-application-guide/video/choose-FOA/index.htm
- IT IS CRITICAL TO READ **ALL** OF THE **FOA AND** THE **SF424**

# And then do your homework

Who is supporting F-series this cycle:

- FOA List

Who funded at what percent each Fiscal Year (FY)

- https://report.nih.gov/success_rates/index.aspx

Postdocs

- https://researchtraining.nih.gov/career/postdoctoral-residency

Predocs

- https://researchtraining.nih.gov/career/graduate

You do NOT have to reinvent the wheel!

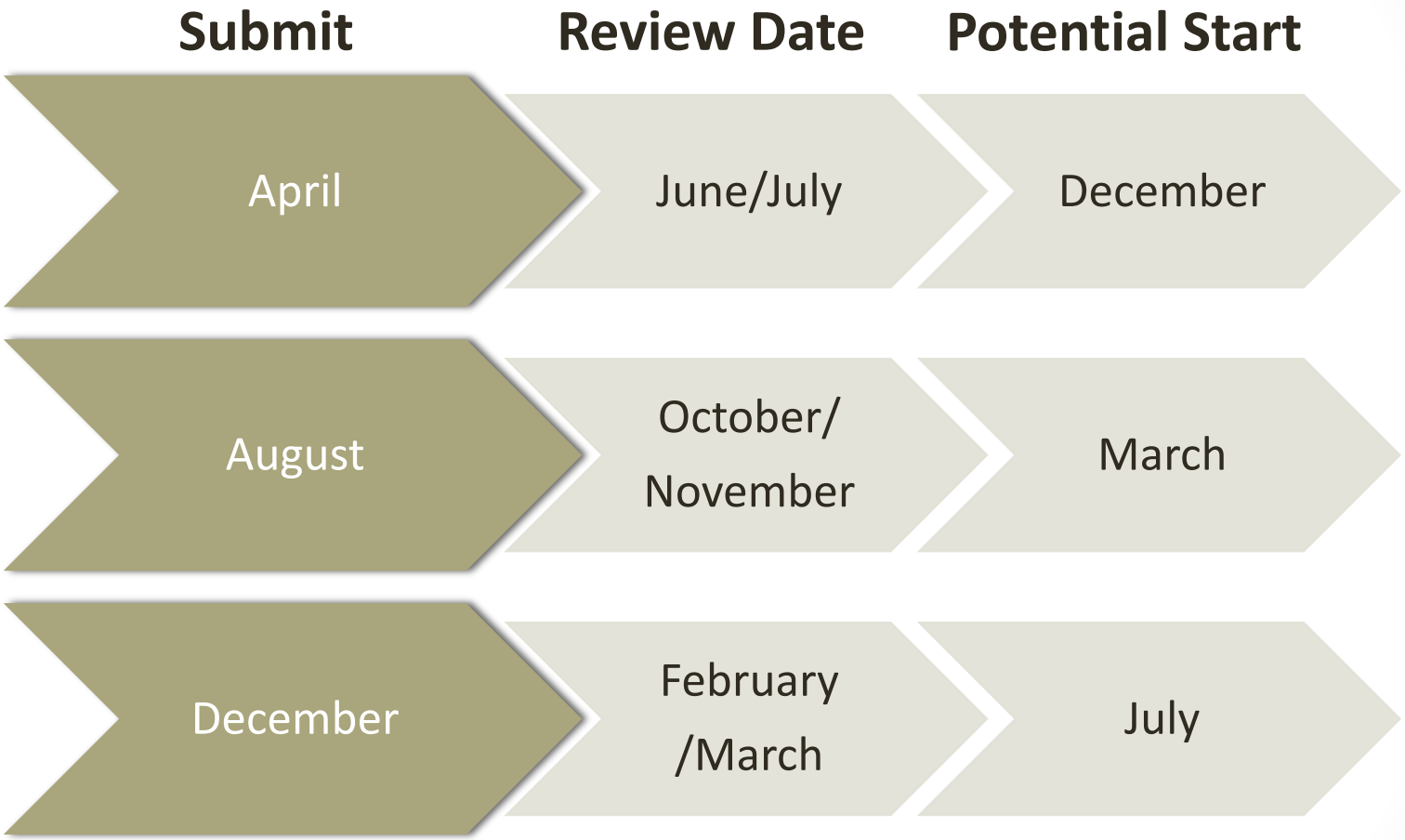
https://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/write-your-application.htm

- https://grants.nih.gov/grants/how-to-apply-application-guide.html - data
- https://grants.nih.gov/grants/how-to-apply-application-guide/forms-e/fellowship-forms-e.pdf
- https://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/find-forms.htm

# Logistics & Time Management

- Start ***at least 3*** months out from the deadline
- Talk to your mentor about a plan
  - PLAN
    1. Career/Training
    2. Science/Research
- Talk to your internal grants officer
  - NIH grants are typically due to ORPA 5 business days prior to the actual NIH deadline
- Talk to the NIH Program Officer (PO)
  - Ask does my project fit your funding announcement and mission
- Register with eRA Commons (NIH website) to secure PI status
- ***Identify references
  - https://grants.nih.gov/grants/how-to-apply-application-guide/submission-process/reference-letters.htm

# Think 2 Cycles



# Formatting

- http://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/format-attachments.htm

- Comply with the directions regarding:
  - Margins
  - Font style and size
  - Page limits
- Make it nice to the eye – there is a psychology to reading!!
  - Create clear sections and divisions
  - Bold, italicize, underline headings, Aims, hypotheses
  - Be consistent
  - Indent paragraphs

# Budgets

- This is essentially pre-determined as the fellowship offers a stipend and described amount to be used for other training related purposes.

Office of Research and Project Administration

"ORPA"

Ask and they will tell!!!

# Page Limits

- https://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/page-limits.htm - fell

COMPLY

| Section of Application | Page Limits * (if different from FOA, FOA supersedes) |
|---|---|
| **Project Summary/Abstract** | 30 lines of text |
| **Project Narrative** | Three sentences |
| **Introduction to Resubmission or Revision Application** (when applicable) | 1 |
| **Applicant's Background and Goals for Fellowship Training** | 6 |
| **Specific Aims** | 1 |
| **Research Strategy** | 6 |
| **Respective Contributions** | 1 |
| **Selection of Sponsor and Institution** | 1 |
| **Training in the Responsible Conduct of Research** | 1 |
| **Sponsor and Co-Sponsor Statements** | 6 |
| **Letters of Support from Collaborators, Contributors, and Consultants** | 6 |
| **Description of Institutional Environment and Commitment to Training**<br><br>Note: This page limit includes the Additional Educational Information required for F30 and F31 applications. | 2 |
| **Applications for Concurrent Support** (when applicable) | 1 |
| **Biographical Sketch** | 5 |

# Differences between Research Grants vs. Fellowships

**Research Grant (R-series)**

**R Funding Descriptions**

- Heavy focus on the RESEARCH, especially with regards to SIGNIFICANCE and INNOVATION
- Heavy focus on the productivity of the PI

**Fellowships (F-series)**

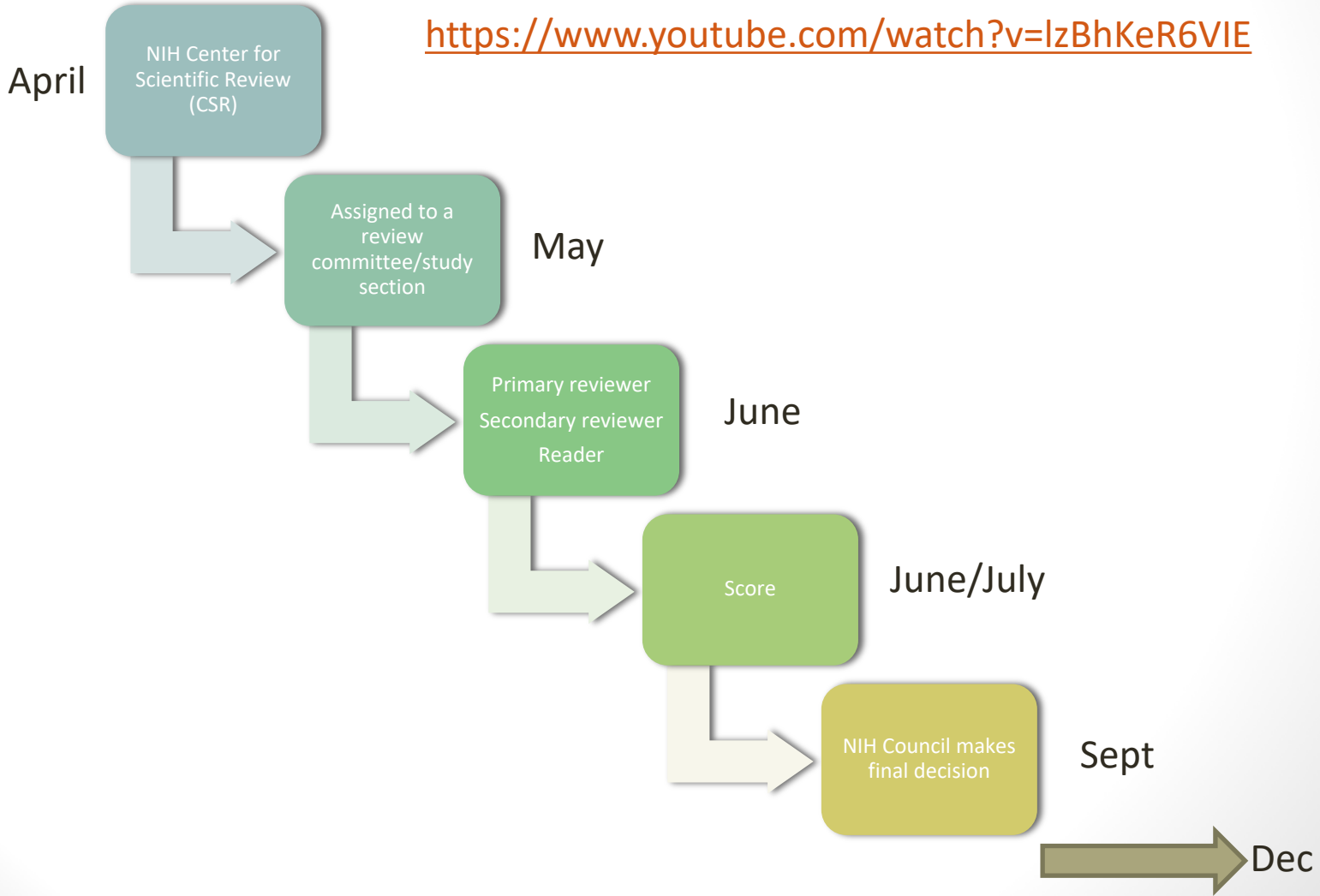
**F Funding Descriptions**

- Heavy focus on the APPLICANT and TRAINING PLAN
- Research plan is certainly important but there should be mention of TRAINING in the research approach

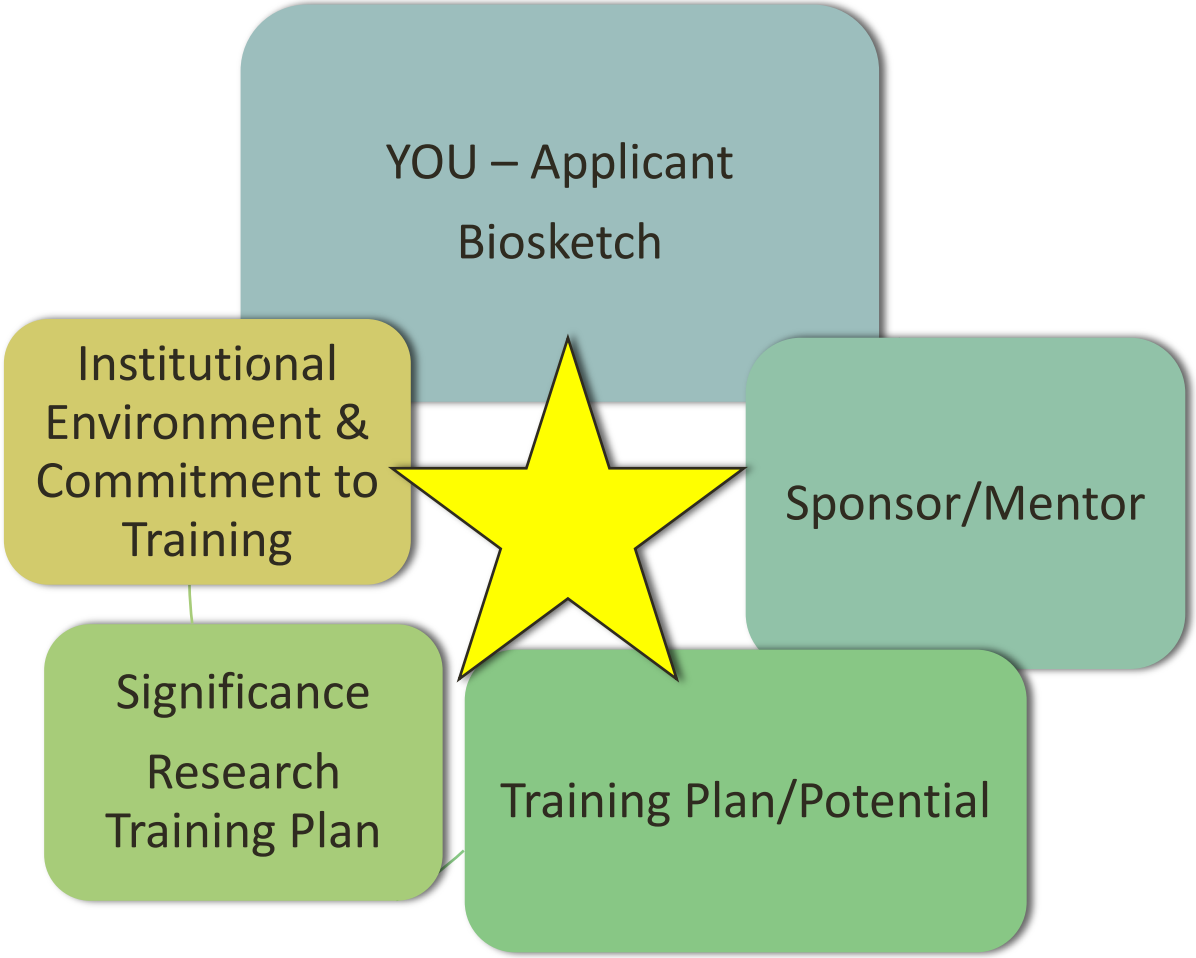
# Peer Review

- http://grants.nih.gov/grants//peer_review_process.htm

https://www.youtube.com/watch?v=lzBhKeR6VIE



# How are the parts weighed?



# Scoring

- The review criteria for the F30, F31 and F32 fellowships include 5 major categories that are ranked in terms of their strengths and weaknesses:
  - Fellowship Applicant (Biosketch)
  - Sponsor and Collaborators
  - Research Training Plan
  - Training Potential
  - Institutional Environment and Commitment to Training

https://grants.nih.gov/grants/peer/critiques/f.htm

## F30/F31/F32/F33 Review

If you cannot access the hyperlinks below,
visit http://grants.nih.gov/grants/peer/critiques/f_D.htm.

Application #:

Applicant:

### OVERALL IMPACT

Reviewers will provide an overall impact score to reflect their assessment of the likelihood that the fellowship will enhance the candidate's potential for, and commitment to, a productive independent scientific research career in a health-related field, in consideration of the following scored and additional review criteria. An application does not need to be strong in all categories to be judged likely to have a major impact.

Overall Impact/Merit *Write a paragraph summarizing the factors that informed your Overall Impact sco*

IMPORTANT
Highlights the major strengths and weaknesses
and the overall enthusiasm to be funded

## SCORED REVIEW CRITERIA

Reviewers will consider each of the five review criteria below in the determination of scientific and technical merit, and give a separate score for each.

1. Fellowship Applicant

**Strengths**

- 

**Weaknesses**

- 

2. Sponsors, Collaborators, and Consultants

**Strengths**

- 

**Weaknesses**

- 

3. Research Training Plan

**Strengths**

- 

**Weaknesses**

- 

4. Training Potential

**Strengths**

- 

**Weaknesses**

- 

5. Institutional Environment & Commitment to Training

**Strengths**

- 

**Weaknesses**

- 

https://grants.nih.gov/grants/peer/guidelines_general/scoring_system_and_procedure.pdf

## FELLOWSHIPS & CAREER AWARDS

**Overall Impact:**
The likelihood that the proposed training (F) or career development (K) will enhance the candidate's potential for a productive, independent scientific research career in a health-related field.

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

**Evaluating Overall Impact**
Consider the 5 criteria
(weighting based on reviewer's judgment):

| Fs | Ks |
|---|---|
| • Applicant<br>• Sponsor(s)<br>• Research Training Plan<br>• Training Potential<br>• Institutional Environment & Commitment | • Candidate<br>• Career Development Plan/Goals*<br>• Research Plan<br>• Mentor(s)**<br>• Environment & Institutional Commitment |

and other score influences, e.g. human subjects, animal welfare, inclusion plans, and biohazards

*K05 and K24: Plan to Provide Mentoring
**K02: Consultants/Collaborators

*e.g. Proposes training or career development of high value/benefit for the candidate who has high potential for developing into a productive, independent scientist. May have some or no weaknesses in the criteria.*

*e.g. Proposes training or career development of high or moderate value/benefit for the candidate who has high or moderate potential for further development, but weaknesses in the criteria reduce the overall impact to medium.*

*e.g. Proposes training or career development of moderate value/benefit for the candidate who shows moderate potential. May have some weaknesses in the criteria.*

*e.g. Proposes training or career development of moderate or low value/benefit for the candidate who has moderate or low potential for further development. Weaknesses in the criteria reduce the overall impact to low.*

*e.g. Proposes training or career development of low value/benefit for the candidate who shows low potential. May have some weaknesses in the criteria.*

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

# Percentiles

How is this calculated and what does it mean?

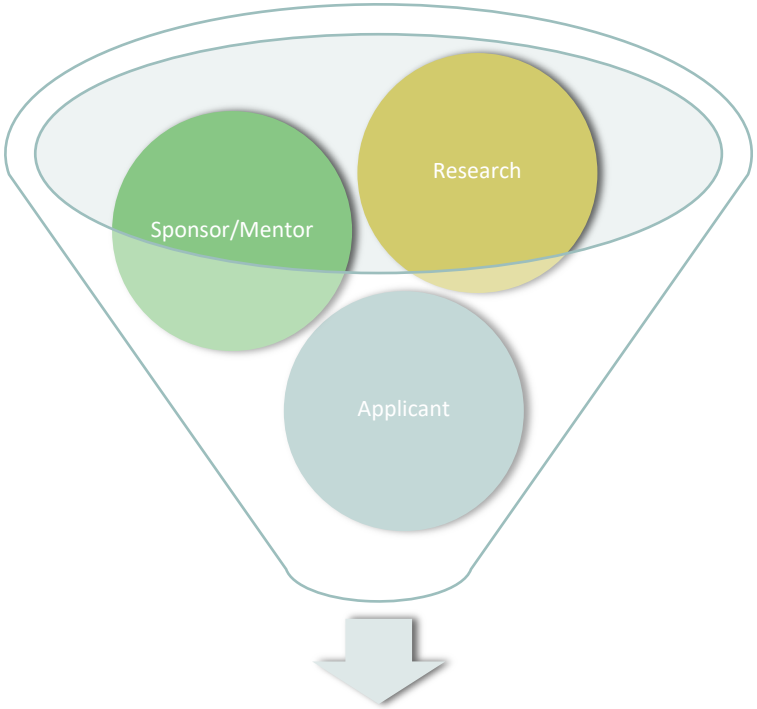
**$P = 100/N \times (k - ½)$**

- P = Percentile
- K = Numerical Rank of Impact Score
- N = Total Number of Applicants

- Represents the percent of applications that scored the same or **lower than your application according to impact scores

**Lower percentiles = higher merit

# Agreement!




Training Plan/Potential

# Applicant Exercise #2

**Career Goal Statement: What is your primary goal after your formal training is complete?**

# Applicant Exercise #3

**Share some concerns or worries you have about you as an applicant?**

# Biosketch

## Who are you and who do you want to be?

**Sell the reviewers on your value!**


You want to tell a **STORY** about how your background/experiences intersect with the research you are proposing or in a training situation for the research field.

**https://grants.nih.gov/grants/forms/biosketch.htm**

# Biosketch

Jaime Rubin, Ph.D. from the NYAS on the Biosketch:

"This is where you sell them on yourself," she said. "The science is important, but they're not funding the research, they're funding you. If they don't feel like they know you after reading those pages, you need to rewrite them."

Ref: https://www.nyas.org/ebriefings/grantsmanship-for-graduate-students-and-postdocs-f30-f31-f32/

# Objective 2: Biosketch

**Biographical Sketch – 5 pages**

A. Personal Statement
B. Positions and Honors
C. Contributions to Science
D. Research Support/Scholastic Performance

SciENcv

# ‘A’ Personal Statement

# ‘A’ Personal Statement

- **Briefly** describe why you are well-suited to receive the award for which you are applying. The relevant factors may include aspects of your training; your previous experimental work on this specific topic or related topics; your technical expertise; your collaborators or scientific environment; and your past performance in this or related fields (you may mention specific contributions to science that are not included in Section C).
- You may cite up to four publication or research products that highlight your experience or qualifications
- If you wish to explain impediments to your past productivity, you may include a description of factors such as family care responsibilities, illness, disability, and active duty military service.
- **DIVERSITY AWARDS: Candidates for research supplements to promote diversity in health-related research should, in addition to addressing the points noted above, also include a description of their general scientific achievements and/or interests, specific research objectives, and career goals. Indicate any current source(s) of educational funding**.

# Tips for constructing 'A'

Narrative Talking Points:

- What is your long-term goal and/or research interests and why?
- List in chronological order your research experiences or work experiences related to your career trajectory
- How does your training put you into a great position to do the research currently being proposed, specifically? Discuss strengths that are not already obvious in the Positions and Honors Section (B)
- What have YOU ('I') done – show don't just tell
- Diversity – is your diversity something you want to weave into your story/narrative and how should you do this

# Exercise #4 – Breakdown an Example

My long term research interests involve the development of a comprehensive understanding of key developmental pathways and how alterations in gene expression contribute to human disease. My academic training and research experience to date have provided me with an excellent background in molecular biology and microbiology. While in high school I was awarded an NIH Diversity Supplement award to work as a research technician for two summers in Dr. Indira Creative's lab at the University of Hawaii. As an undergraduate at Swarthmore College, I conducted research with Dr. Xavier Factor on the mechanisms of action of a new class of antibiotics. This resulted in a co-authorship publication, as well as an invitation to present a poster at the annual Antibiotica meeting in Denver, Colorado. For my graduate training at UC San Diego, I have moved into the fields of genetics and biochemistry by studying the regulation of transcription in yeast, under Dr. Tanti Auguri. Dr. Auguri is an internationally recognized leader in the field of yeast genetics and has an extensive record for training predoctoral and postdoctoral fellows. Along with giving me new conceptual and technical training, the proposed training plan outlines a set of career development activities and workshops – e.g. public speaking, literature analysis, biomedical ethics, and career options. For my initial project I am currently developing a novel protocol for the purification for components of large transcription complexes which I hope to submit as a first author publication in the next few months. As a native Hawaiian, I am the first in my family to graduate from college so I am excited to keep pushing forward with my education. Overall, I feel that my choice of sponsor, research project, and the training I will get from this fellowship will give me a solid foundation for my long-term goal to become an academic researcher.

Robertson-Chang L, Factor X. Testing the ability of antibiotic Gen Y to kill Gram-negative bacteria. Antibiotica annual meeting; 2011 September; Denver, CO.

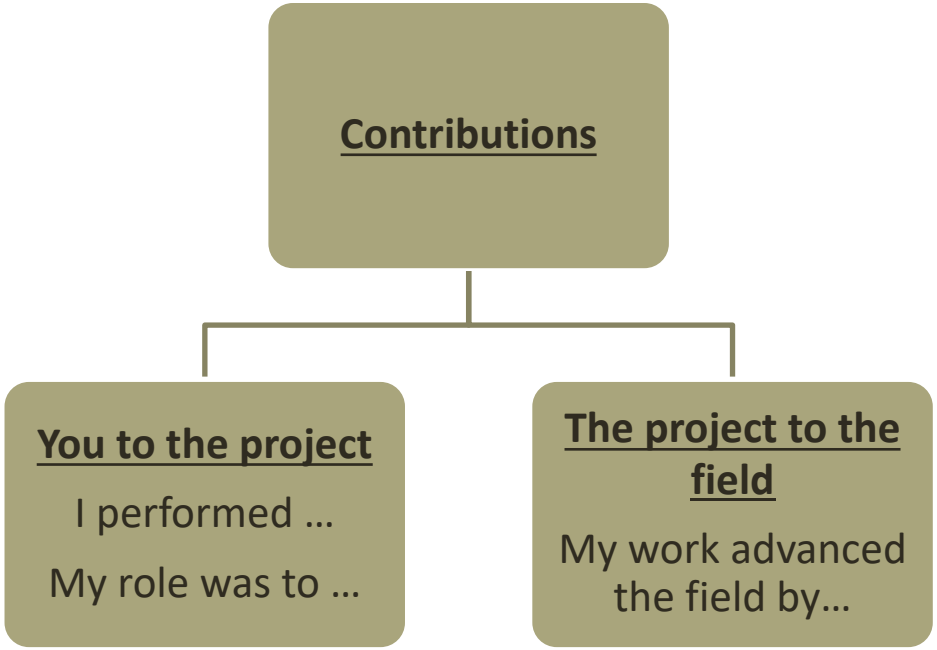
Robertson-Chang L, Auguri T. A tandem affinity purification tag approach allows for isolation of interacting proteins in Saccharomyces cerevisiae. Yeast Genetics and Molecular Biology Meeting; 2013 September; Seattle, WA.

# ’B’ Positions and Honors

- List in chronological order all non-degree training, including postdoctoral research training, all employment after college, and any military service.
  - State the Activity/Occupation and include start/end dates, field, name of institution/company, and the name of your supervisor/employer. If you are not currently located at the applicant organization, include your projected position at the applicant organization as well.
- Students, postdoctorates, and junior faculty should include scholarships, traineeships, fellowships, and development awards, as applicable.
- Clinicians should include information on any clinical licensures and specialty board certifications that they have achieved.

# ‘C’ Contributions to Science

- For each contribution – limited up to 5 - indicate the following:
  - the historical background that frames the scientific problem;
  - the central finding(s);
  - the influence of the finding(s) on the progress of science or the application of those finding(s) to health or technology;
  - your specific role in the described work.



# ‘C’ Contributions to Science

- For each contribution, you may **cite up to four publications or research products that are relevant to the contribution**. If you are not the author of the product, indicate what your role or contribution was. Note **that while you may mention manuscripts that have not yet been accepted for publication as part of your contribution, you may cite only published papers to support each contribution.** Research products can include audio or video products (see the NIH Guide Notice on Guidance for Videos Submitted as NIH Application Materials); conference proceedings such as meeting abstracts, posters, or other presentations; patents; data and research materials; databases; educational aids or curricula; instruments or equipment; models; protocols; and software or netware.
- You may provide a URL to a full list of your published work. This URL must be to a Federal Government website (a .gov suffix). NIH recommends using My Bibliography. Providing a URL to a list of published work is not required.

# ‘D’ Research Support/Scholastic Performance

- List ongoing and completed research projects from the past three years that you want to draw attention to. Briefly indicate the overall goals of the projects and your responsibilities. Do not include the number of person months or direct costs.
- **Predoctoral applicants/candidates (including undergraduates and post-baccalaureates):** List by institution and year **all** undergraduate and graduate courses, with grades. In addition, explain any grading system used if it differs from a 1-100 scale; an A, B, C, D, F system; or a 0-4.0 scale. Also indicate the levels required for a passing grade.
- **Postdoctoral applicants:** List by institution and year all undergraduate courses and graduate scientific and/or professional courses relevant to the training sought under this award, with grades. In addition, explain any grading system used if it differs from a 1-100 scale; an A, B, C, D, F system; or a 0-4.0 scale. Also indicate the levels required for a passing grade.

# Applicant Exercise #5

**Sketch out points you want to make/develop for A, B and C**

**Background and Goals for Fellowship Training – 6 pages total**

A. Doctoral Dissertation (F32) and Research Experience (F31)
B. Training Goals and Objectives
C. Activities Planned Under this Award

# A. Doctoral Dissertation (F32) and Research Experience (F31)

- Briefly summarize your past research experience, results, and conclusions, and describe how that experience relates to the proposed fellowship. In some cases, a proposed fellowship may build directly on previous research experiences, results, and conclusions. In other situations, past research experiences may lead a candidate to apply for a fellowship in a new or different area of research. Do not list academic courses in this section.
- **Applicants with no research experience:** Describe any other scientific experiences.
- **Advanced graduate students** (i.e., those who have or will have completed their comprehensive examinations by the time of award): Include a narrative of your planned doctoral dissertation (may be preliminary).
- **Postdoctoral fellowship applicants:** Specify which areas of research were part of your predoctoral thesis or dissertation and which, if any, were part of a previous postdoctoral project.

# B. Training Goals and Objectives

- Describe your overall training goals for the duration of the fellowship and how the proposed fellowship will enable the attainment of these goals.
- Identify the skills, theories, conceptual approaches, etc…to be learned or enhanced during the award.
- Discuss how the proposed research will facilitate your transition to the next career stage if applicable.

# Research Goals

| Skill of Knowledge Gap | Action to Address Gap | Proposed Action Frequency/Timing | Means of verifying gap closure |
|---|---|---|---|
| *Animal Research Skills* | Literature reading | Daily | Finishing animal related experiments |
| | UCAR training[1] | When needed | |
| *Flow Cytometry Skills* | Literature reading | Daily | Finishing flow related experiments |
| | FCR training[2] | When needed | |
| | Advisor and collaborator training | When needed | |
| | | When needed | |
| *Genomics Skills* | Literature reading | Daily | Success in pilot experiments with previous controls under advisor/collaborator monitoring. Afterward, Finishing Genomics related (ATAC-seq, and ChIP-seq) experiments |
| | Advisor and Collaborator training | When needed | |
| | GRC[3] training | When needed | |
| *Statistical Analysis Skills*[4] | Literature reading | Daily | High impact publication |
| | Courses / Workshops | When available | |
| | Statistical consulting[4] | When needed | |

# ‘Non Research’ Goals

| Skill of Knowledge Gap | Action to Address Gap | Proposed Action Frequency/Timing | Means of verifying gap closure |
|---|---|---|---|
| *Critical Thinking Skills* | Advisor meetings[1] | Biweekly | Feedback and constructive criticism from advisor |
| | Literature reading | Daily | |
| | Courses / Workshops[2] | Twice a year | |
| | Journal clubs[3] | Biweekly | |
| *Writing Skills* | Advisor meetings[1] | Biweekly | Feedback and constructive criticism from advisor, and a writing specialist |
| | Courses / Workshops[2] | Twice a year | |
| | Writing specialist meetings[4] | Once a month | |
| *Public Speaking Skills* | Lab meetings presentations | Once a week | Feedback and constructive criticism from advisor, committee, or other audience; discussion with outside seminar speakers |
| | Committee meetings and seminar presentations[5] | Once a year | |
| | Journal club[3] presentations | Twice a year | |
| | Poster presentations | Twice a year | |
| *Time Management Skills* | Advisor meetings[1] | Biweekly | Meeting my weekly planned tasks, and eventually achieving my proposed aims according to the timeline. |
| | Committee meetings | Once a year | |
| | Lab meetings | Once a week | |
| *Coordination with Collaborators*[6] | Collaborator training | When needed | Publishing with new collaborators |
| | Joint labs meeting | Once a month | |
| *Communication and Making New Connections*[7] | Attending conferences | Once/twice a year | Making new collaborations and securing a postdoctoral position. |
| | Attending scientific social events[8] | When available | |
| | Guest speaker invitations | Once a year | |

# C. Activities Planned

- The activities planned under this award should be individually tailored and well integrated with your research project.
- Describe, by year, the activities (research, coursework, professional development, clinical activities, etc…) you will be involved in during the proposed award. Estimate the percentage of time to be devoted to each activity. The percentage should total 100 for each year.
- Describe the research skills and techniques that you intend to learn during the award period.
- Describe the planned, non- research activities (e.g. those related to professional development and clinical activities) that you plan to engage in during the award period.
- Provide a timeline detailing the proposed research training and related activities for the entire duration of the fellowship award.

| | Pre-Funding Period | Year 1 | Year 2 |
|---|---|---|---|
| Mentored research activities (60% effort) | | | |
| Training for research skills for AIM 1.1: CHIP-seq | ✓ | ✓ | |
| Training for research skills for AIM 1.2: CHIP-seq | | ✓ | ✓ |
| Training for research skills for AIM 2.1 | ✓ | ✓ | |
| Training for research skills for AIM 2.2: CRISPR | | ✓ | ✓ |
| Training for research skills for AIM 3: CRISPR | | ✓ | ✓ |
| Grants and publications writing | ✓ | ✓ | ✓ |
| Scholarships applications for conferences | ✓ received for ESH | ✓ | ✓ |
| Lab meetings | ✓ | ✓ | ✓ |
| Teamwork with collaborators | ✓ | ✓ | ✓ |
| Committee Meetings | ✓ | ✓ | ✓ |
| Checkpoints for following proposed timeline | ✓ | ✓ | ✓ |
| Career development activities (25% effort) | | | |
| Career workshops | ✓ | ✓ | ✓ |
| Grant writing workshops | ✓ | ✓ | ✓ |
| Journal clubs and non-coursework seminars | ✓ | ✓ | ✓ |
| Attending conferences and building new connections in the field | ✓ attended ESH | ✓ | ✓ |
| Research departmental presentations | ✓ | ✓ | ✓ |
| Poster presentations | ✓ | ✓ | ✓ |
| Reaching out to new collaborators | | ✓ | |
| Inviting guest speaker | | ✓ | ✓ |
| Meeting with a writing specialist | ✓ | ✓ | ✓ |
| Meeting with a professional developmental specialist | | ✓ | ✓ |
| Reaching out to established connections for meetings and lab visits for interest in possible postdoc positions | | ✓ | ✓ |
| Coursework (15% effort) | | | |
| Attending classes (Critical Thinking, Advanced Writing) | | ✓ | |
| Pharmacology department Seminars | ✓ | ✓ | ✓ |
| Teaching assistance | ✓ | | |
| Benchmarks | | | |
| First-authored papers | ✓ under revision | ✓ | ✓ |
| Applying for a Postdoc Position | | | ✓ |

**Activities Planned Under This Award**

**As a graduate student currently finishing my third year**, I have completed almost all of my required course work, with my only class obligation being a neuroscience student seminar once a week. In this seminar, students from the Neuroscience Graduate Program present a 30-minute talk about their ongoing research. I will attend this class once a week for the remainder of my graduate career, presenting my own research at least once a year. Currently I am spending thirty percent of my time running subjects to collect the pre-training measures described in this grant. Some of these subjects are local and are tested for about an hour once a week, while the majority are traveling from out of town, and so are in lab eight hours a day for one week before returning home. Another twenty percent of my time is currently spent mentoring two undergraduate students in the lab. In addition, I attend a once a week "motion" journal club organized by a number of collaborative labs (Huxlin, Tadin, DeAngelis, Pasternak, Hayden, and Heafner), as well as participating in weekly lab meetings, which in total takes about ten percent of my time.

**As my third year comes to a close I will finalize programming and piloting of the training and analysis software to be used in this grant.** I will continue to collect training data on local subjects who train for one hour a week in lab with an eye tracker, and I will continue to analyze the training data sent by our out-of-town patients every week. Using these data, we monitor progress and adjust training on a constant basis, sometimes making small tweaks to the training program, the most common of which include shifting the training location deeper into the blind field once someone appears to have recovered performance at a first location, or adding additional training sites. Each of these changes requires me to write and send a new program to that patient, with all the associated instructions on how to install and run it. In addition, I will continue to participate in student seminar and the motion journal club, and will audit *Computational Methods in Cognitive Science,* a course designed to teach graduate students about statistical tools and learning in statistical systems for the study of cognitive processes. This course will supplement my current learning of Bayesian modeling and statistical analysis, which will be particularly useful for analyzing data in Aim 2 of this grant. Around forty percent of my time will be spent analyzing data that has previously been collected. Currently I have two papers under review, which will likely require revisions near the end of summer, totaling 10 percent of my time. A third paper is in preparation, which will serve as background for Aim 2 of this grant. I intend to submit this manuscript for publication in the early fall of my fourth year.

**During the fall of my fourth year I will begin to have subjects enrolled in our training for Aim 1.1 and Aim 1.2 return to lab this fall for post-testing psychophysics and fMRI.** Post-training testing will take up around thirty percent of my time. During this time, subjects will undergo post-training visual tests, including verification of improvements reported from home training with controlled fixation, testing of adjacent non-trained (but pre- tested) locations on fine direction discrimination, analysis with the Perceptual Template Model at recovered locations, and the collection of Humphrey visual fields and fMRI data for retinotopic mapping. The data collected here will be used for analysis in all of Aim 1 and Aim 2.1. It is during this time that I will apply my learning of statistical analysis to analyze fMRI data, comparing pre- to post-retinotopic maps, and performing pRF analysis. All tests are detailed in my grant application. Subjects will then be switched into training groups for Aim 2.2 if appropriate, and additional subjects will be recruited. The spring of my fourth year will likewise be focused on analyzing collected data for the first half of the semester, and then collecting another round of post- training data on returning subjects towards the end of the semester.

**By the start of my fifth year I hope to be near the final stages of my research**. Due to subject attrition I may need to spend a portion of this year collecting additional data for my own experiments as well, however I expect this to be minimal. I will spend the majority of my time completing data analysis and preparing manuscripts for publication. During this time I have also planned to attend a number of conferences, which will allow me to present data in both oral and poster presentation, as well as search for post-doctoral positions. These conferences include the Vision Sciences Society Annual Meeting and the Ophthalmological Society of America Fall Vision Meeting. I will also continue to assist with the day to day activities required for running the lab, including testing new subjects and training incoming graduate students to take on responsibilities after I graduate. In addition, I will attempt to secure a postdoctoral position as early into my fifth year as possible, allowing me to focus on publishing manuscripts until I graduate before joining a new lab as a post-doctoral fellow.

# Applicant Exercise #6

- **Fill in some of the blanks on the next pages to help you develop your training goals and activities planned.**
- ***Note: The following template is only meant to be used as a guide. You can reformat, add/subtract, or restructure as necessary based on YOUR training!!!!**

# Mentor/Sponsor

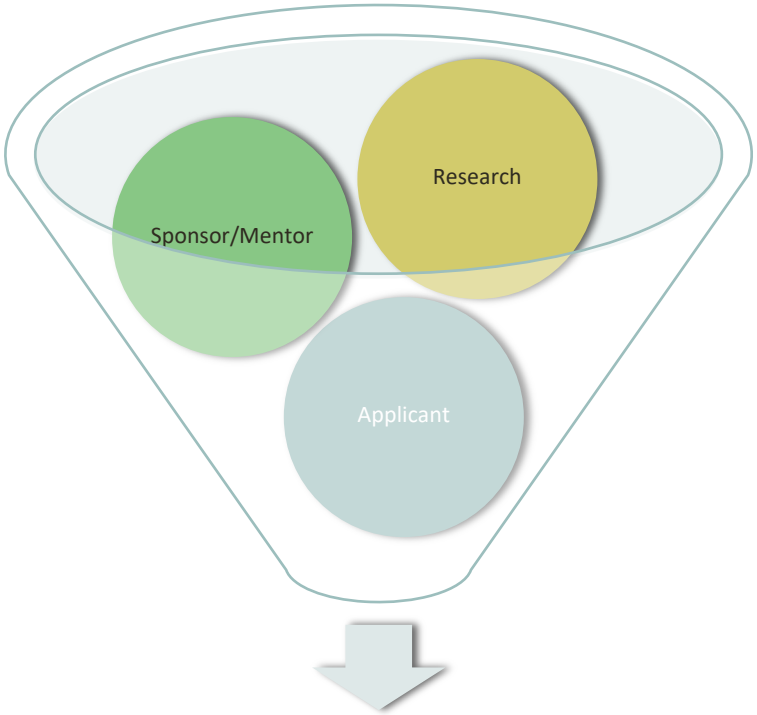
**Biographical Sketch**

- Your sponsor(s) should already have this completed – **BUT the personal statement should be modified to fit the need of the application!**

**Sponsor/Co-Sponsor Statement – 6 pages**

A. Research Support Available
B. Sponsor's/Co-Sponsor's Previous Fellows/Trainees
C. Training Plan, Environment, Research Facilities
D. Number of Fellows/Trainees to be Supervised During the Fellowship
E. Applicant's Qualification and Potential for a Research Career

# Applicant Goals and Training Plan




Training Plan/Potential

# Break

# Part 2

Research Training Plan

# Research Training Plan

- **Specific Aims** — 1 page
- **Research Strategy** — 6 pages
  - **Significance**
  - **Approach**
  - **Preliminary Studies**
  - **Impact and Training Potential**
- **Literature Cited** — Not included in page limit

# Research Training Plan

- Respective Contributions (1 page)
  - Describe the collaborative process between you and your sponsor/co-sponsor(s) in the development, review, and editing of this Research Training Plan. Also discuss your respective roles in accomplishing the proposed research.

- Selection of Sponsor (1 page)
  - Describe the rationale/justification for the selection of both the sponsor and the institution.
    - Explain why the sponsor, co-sponsor (if any), and institution were selected to accomplish the research training goals. If the proposed research training is to take place at a site other than the applicant organization, provide an explanation here.
    - **Foreign Institution.** If you are proposing a research training experience at a foreign institution, describe how that the foreign institution and sponsor offer special opportunities for training that are not currently available in the United States. Key factors in the selection of a foreign institution should be described. The need for and level of proficiency in reading, speaking, and comprehending the foreign language should be addressed.
    - **Postdoctoral and Senior Fellowship Applicants requesting training at their Doctorate or Current Institution:** Training is expected to broaden a fellow's perspective. Therefore, if you are requesting training at either your doctorate institution or any institution where you have been training for more than a year, you must explain why further training at that institution would be valuable. Individuals applying for senior fellowships who are requesting training at the institution at which they are employed should provide a similar explanation.

- Responsible Conduct of Research ( 1 page)
  - **Format:** Describe the required format of instruction (i.e., face- to- face lectures, coursework, and/or real- time discussion groups). A plan with only on- line instruction is not acceptable.
  - **Subject Matter:** Describe the breadth of subject matter (e.g., conflict of interest, authorship, data management, human subjects and animal use, laboratory safety, research misconduct, and research ethics).
  - **Faculty Participation:** Describe the role of the sponsor/mentor (s) and other faculty involvement in the instruction.
  - **Duration of Instruction:** Describe the total number of contact hours of instruction, taking into consideration the duration of the program.
  - **Frequency of Instruction:** Instruction must occur during each career stage and at least once every four years. Document any prior instruction during the applicant's current career stage, including the inclusive dates instruction was last completed.
- ** You are all required to take the Ethics course which covers 9-10 specific topics which can be highlighted in this section a point of emphasis

# Selection of Sponsor(s) and Institute: Exercise #7

- Why did you choose your mentor?

- Why did you choose the UR/Department/Program?

# How to write your Research Exercise #8

- Do you know what your research is?
- Do you have a plan?

- Take 5-10 minutes to tell the person next to you the following:

1. Significance and background of your research
2. The overall hypothesis
3. Research Aims
4. What training will you get from completion of your proposal?

# Get Organized

"Think this is bad? You should see the inside of my head."

# How to read the literature

- Use the formulaic nature of papers to your advantage
  - Abstract/Intro: identify goal(s) of the study
  - Figures: determine whether the evidence supports key claims
  - Discussion: identify other papers to read
    - Especially if they disagree with the one in hand
- Don’t read every word
  - Especially if you’re reading a pile of studies from a few groups on the same topic

# Outline/Make Tables

1. READ

   Bin the articles into topics

2. Take notes

   Pick a style of note taking and stick with it

   Summarize the salient points of each article in your own words

3. Re-evaluate the articles you assembled!

   If you find you are too heavy on one topic then sift out the most interesting, relevant, & current articles

   If you find one topic is too light then maybe it should not be given a heading in the significance

# Do NOT procrastinate – This takes time

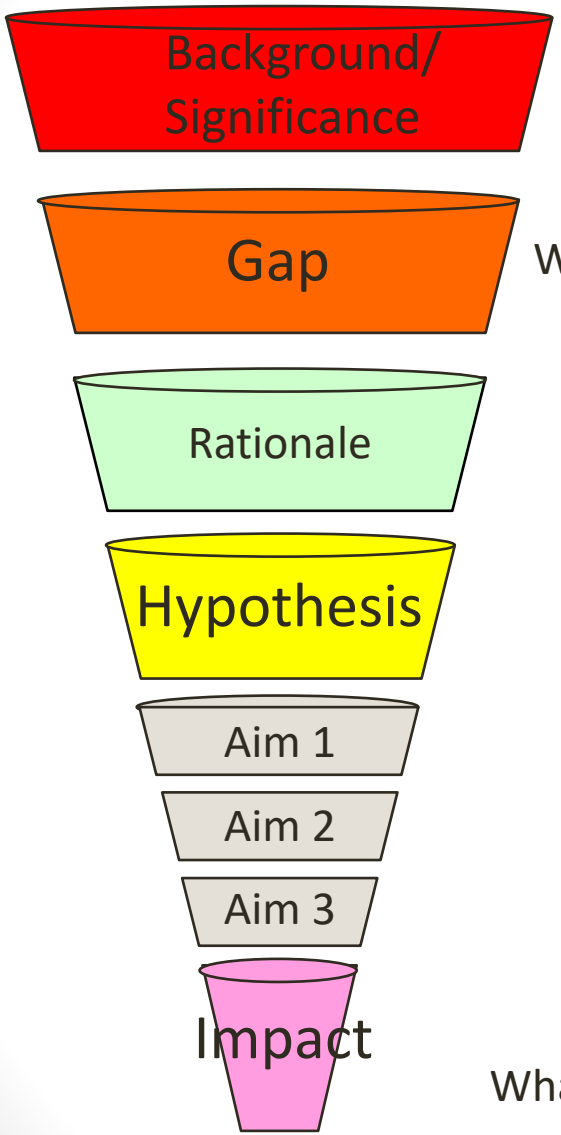
- CVD
  - Vascular smooth muscle cells
    - Proliferation
      - Author, 2015
      - Author, 2014
    - Genes
      - Author, 2016
      - Author, 2013
    - Inflammation
      - Author, 2008
      - Author, 2016
  - Genetics
    - Treatments
      - Author, 2012
      - Author, 2010
    - Intima media thickening
      - Author, 2011
      - Author, 2009

# What are your strategies?

# Specific Aims Page

This is critical to the success of your Research Plan

# Specific Aims Page




Introduce the brevity of the topic and
hook your reader!
Present impact

What is still unknown – Major question to be addressed

Rationale:
Includes some literature and a
summary of your preliminary data

CLEARLY state the OVERALL HYPOTHESIS

List your Aims –
These should be goal driven statements
Each Aim should have its own hypothesis,
general approach, and outcome

State the impact of your proposal
What will the outcome of your research do for the field and
to enhance your training

# Specific Aims

- Vocabulary to work in:
  - Signficance
  - Hypothesis
  - Hook
  - Critical
  - Short-term goals
  - Long-term goals
  - Career goals
  - Outcome
  - Impact
  - Training

- http://www.biosciencewriters.com/NIH-Grant-Applications-The-Anatomy-of-a-Specific-Aims-Page.aspx

# Break down an example Exercise #9

**Specific Aims:**

Overexpression of the transcription factor Ecotropic Viral Integration Site 1 (*EVI1*) in AML is associated with reduced survival and high rates of relapse in patients (1). However, the underlying mechanism of action of EVI1 has not been elucidated and therapeutic targets are lacking. In order to study EVI1, we established a tetracycline inducible EVI1-overexpression mouse model. We reported that EVI1 overexpression skews hematopoietic stem and progenitor cells (HSPCs) towards the myeloid lineage (2). However, our recent data indicate that EVI1 overexpression also blocks erythropoiesis, and we believe this is due to two mechanisms:

1) direct interference of GATA1 function by EVI1:

> Our lab showed that EVI1 binds to a GATA-like motif (GACAAGATAA), and we propose that EVI1 directly competes for key GATA1 binding sites in the genome, and thereby blocks erythropoiesis.

2) upregulation of PU.1:

> We identified DNA binding sites for EVI1 at a -15.45 kb enhancer upstream of *Spi-1*, which encodes a master regulator of myelopoiesis Purine-rich box binding protein 1 (PU.1). Additionally, we found higher levels of PU.1 post EVI1 overexpression. Knocking-down PU.1 by shRNA or by deleting the -14KB element (using the *Spi1*$^{UREdel}$ allele) blocks EVI1-mediated myeloid skewing. Further study of PU.1 dysregulation could clarify the EVI1-induced blockage in erythropoiesis.

*Thus, three specific aims are proposed to study the molecular mechanism underlying erythroid suppression induced by EVI1 overexpression, with the long-term goal of uncovering novel therapeutic targets:*

**Specific Aim 1- I hypothesize that EVI1 blocks erythroid differentiation by competing with GATA1 for key genomic binding sites harboring EVI1/GATA overlap motifs.** This hypothesis predicts:

SA1.1. GATA1 binding within the genome of early erythroid cells will be drastically altered when EVI1 is overexpressed because EVI1 will take the place of GATA1 at these key sites. This will be addressed by performing ChIP-Seq for GATA1 and EVI1 in erythroblasts with and without EVI1 overexpression.

SA1.2. The pattern of open *vs* closed chromatin in erythroblasts will be markedly altered with EVI1 overexpression, as GATA1 is displaced, and chromatin modifiers (SUV39H) are recruited by EVI1. This will be addressed - in collaboration with Dr. Laurie Steiner's lab - by defining the regions of open- and closed-chromatin in the erythroblast genome, with and without EVI1 overexpression, using ATAC-Seq.

**Specific Aim 2. I hypothesize that upregulation of PU.1 by EVI1 contributes to the suppression of GATA1 function.** The hypothesis predicts:

SA2.1. Abrogating the upregulation of PU.1 through deletion of the EVI1 binding site at -14KB will attenuate the blockade of erythropoiesis. This will be addressed using the *Spi1*$^{UREdel}$ allele, which lacks the EVI1 binding site, and, which we have shown, abrogates EVI1-induced myeloid skewing.

SA2.2. Knockout of PU.1 in 32D-Epo cells via CRISPR will abrogate EVI1-mediated interference with erythroid differentiation. Previous studies by Kreider et al demonstrated that EVI1 overexpression interferes with erythropoietin-induced growth and erythroid differentiation of the erythroid-responsive progenitor line, 32D-Epo. We will test our hypothesis by knocking out PU.1 via CRISPR and test if that abrogates the effects of EVI1.

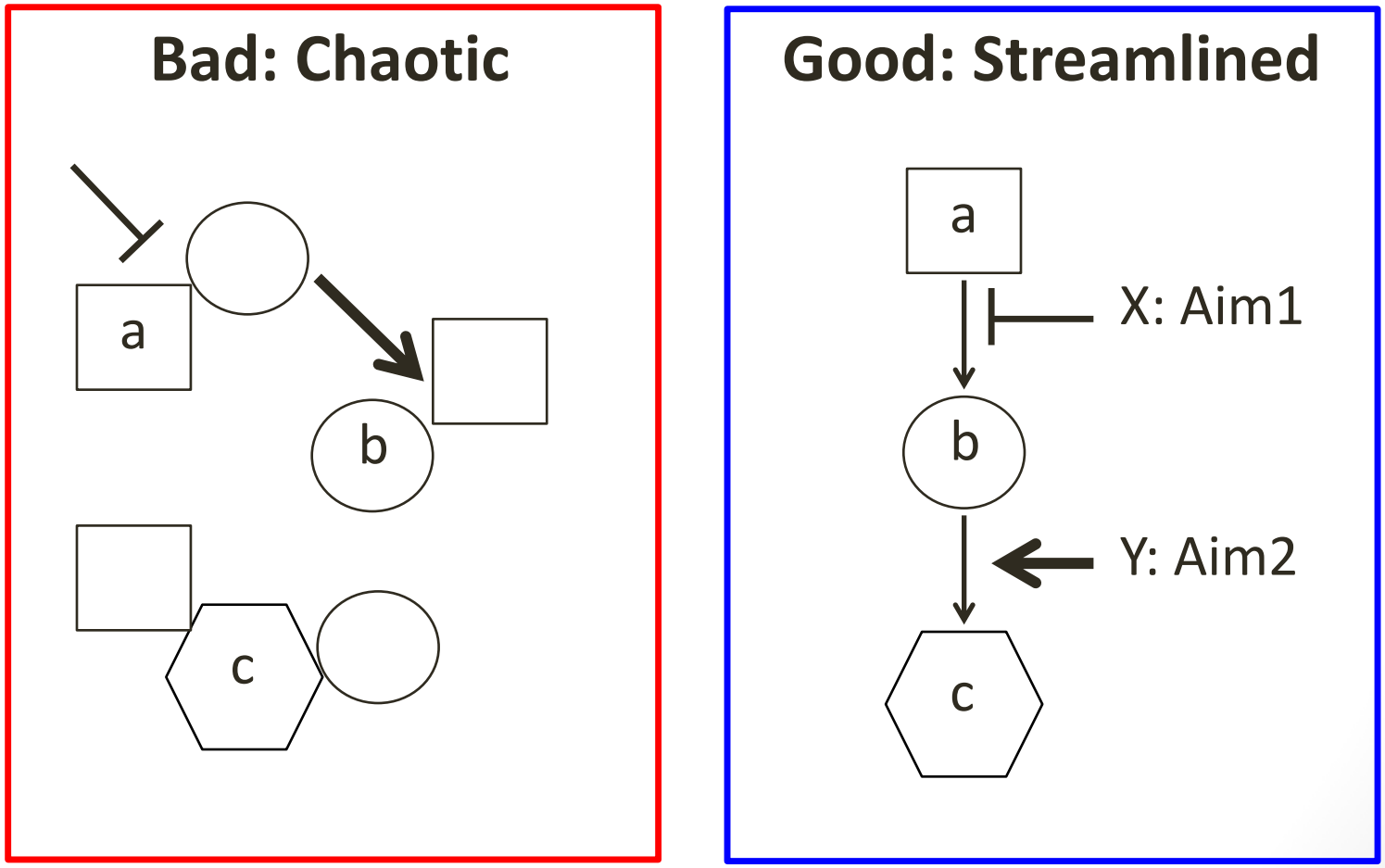
**Specific Aim 3. I hypothesize that erythroid blocking by EVI1 can be rescued**:

SA3 We will perform an agnostic genetic screen for factors involved in the EVI1-mediated blockade of erythropoiesis. Using the 32D-Epo system described above, we will introduce a CRISPR library, and select for escapees that overcome the inhibitory effects of EVI1 overexpression and re-acquire the ability to grow in the presence of erythropoietin. The proposed experiment aims to identify genes that are critical for EVI1's suppression of erythropoiesis and attempts to move our research in the direction of clinical application.

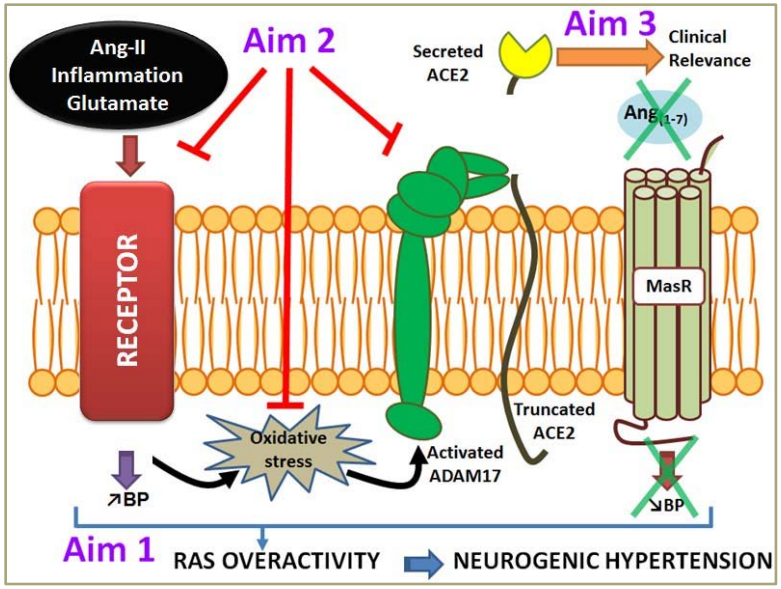
With these three specific aims, I expect to gain insight into the mechanism by which EVI1 interferes with erythropoiesis, and possible new therapeutic targets. Additionally, this grant will provide new scientific training in diverse techniques and build new collaborations.

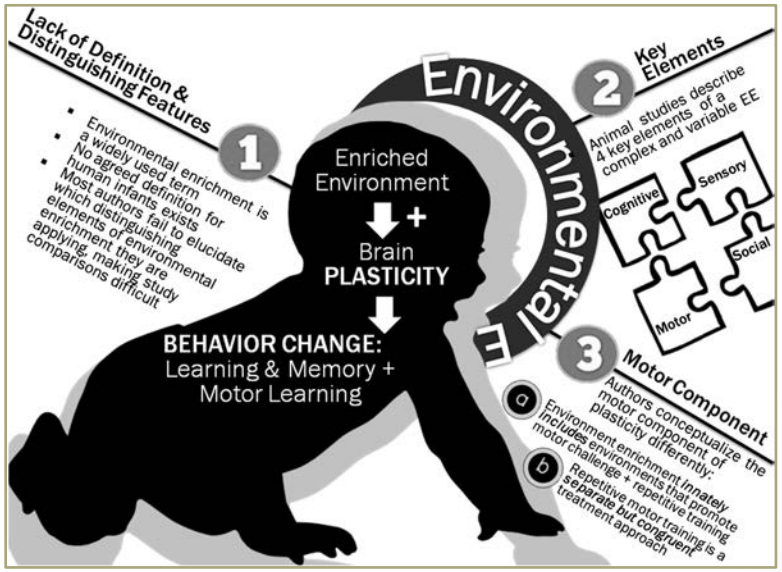
# Sketch (draw) out your aims

# To schema or not?



# Compare


Ang-II
Inflammation
Glutamate
Aim 2
Secreted
ACE2
Aim 3
Clinical
Relevance
Ang (1-7)
RECEPTOR
MasR
Truncated
ACE2
Oxidative
stress
Activated
ADAM17
↗BP
↘BP
Aim 1
RAS OVERACTIVITY
NEUROGENIC HYPERTENSION


Lack of Definition & Distinguishing Features
1
Environmental enrichment is a widely used term
No agreed definition for human infants exists
Most authors fail to elucidate which distinguishing elements of environmental enrichment they are applying, making study comparisons difficult
Enriched Environment
+
Brain PLASTICITY
BEHAVIOR CHANGE:
Learning & Memory +
Motor Learning
Environmental
2
Key Elements
Animal studies describe 4 key elements of a complex and variable EE
Cognitive
Sensory
Social
Motor
3
Motor Component
Authors conceptualize the motor component of plasticity differently:
a
Environment enrichment innately includes environments that promote motor challenge + repetitive training
b
Repetitive motor training is a separate but congruent treatment approach

# Research Strategy – 6 pages
# A. Significance

- This section should describe WHY your research is important and how it will impact the field.
  - **YOU NEED TO CLEARLY STATE THE SIGNIFICANCE!**
- This section should NOT just be a literature review!
- Literature should be cited in the context of its relationship to the importance of your research.

# Research Strategy ***Innovation

Often confused with Significance


- Technical Innovation
  - New tools or models
  - New reagents
- Conceptual Innovation
  - New paradigms
  - New formulas
  - Applying standard or older methods in a new way

# Research Strategy
# B. Approach & C. Preliminary Data

Some flexibility here

OPTIONS

1. Separate section for Preliminary Data
2. Incorporate prelim data into the Rationale for each detailed Aim

✧REMEMBER – you are NOT expected to have a lot of preliminary data

# Preliminary Data

- What should go in a preliminary data section
  - Data that supports your hypothesis
  - Data that shows your ability to perform a proposed experiment – feasibility is important

- Think of preliminary data like a results section of a manuscript
  - Rationale/purpose statement for why you did the experiment
  - Walk the reader through the data/figure
  - Include a summary sentence –
    - This is very important as it sets the rationale for the Aims/Approach/Experimental Design

# Exercise #10

In the paragraph underline/circle/highlight:
Rationale
Description of the findings
Summary

**B. Preliminary studies**

**PKD regulates several aspects of epithelial cell biology.** We, along with other investigators, have implicated PKD activity mediating virally-induced epithelial barrier function in 16HBE cells (7, 8). When I started my PhD thesis project, I developed a mouse model to study the effects of PKD inhibition *in vivo*. Interestingly, I found that PKD activity *in vivo* regulated epithelial chemokine release independent of its effects on barrier integrity. In our first studies, we pre-treated C57B/6 mice oropharyngeally (o.p.) with the PKD inhibitor CRT prior to a 10 μg polyI:C o.p. challenge (Fig 2A) and analyzed leukocyte infiltration and CXCL1 recovered from the airspace (Fig 2B, 2C). CRT is a water-soluble high affinity PKD inhibitor that does not inhibit PKC family members (17). We found a dose-dependent reduction in CXCL1 levels and subsequent neutrophilia in BALF after treatment with the PKD-inhibitor. We did not observe any marked changes in barrier function as determined by quantification of protein leak into BALF or by measuring leak of FITC-dextran from the airspace into the vasculature (not shown). However, PKD inhibition with CRT in 16HBE cells reduced baseline levels of IL-8 secretion and limited IL-8 upregulation in response to polyI:C, indicating that PKD regulates cytokine release in both human and mouse cells (Fig 2D). Additionally, preliminary data indicates that PKD inhibition reduces IL-8 mRNA levels in polyI:C-stimulated16HBE cells (Fig 2E). Taken together, these data led to our working model that airway epithelial PKD plays a previously unsuspected role in promoting airway neutrophilia and inflammation after viral infection.

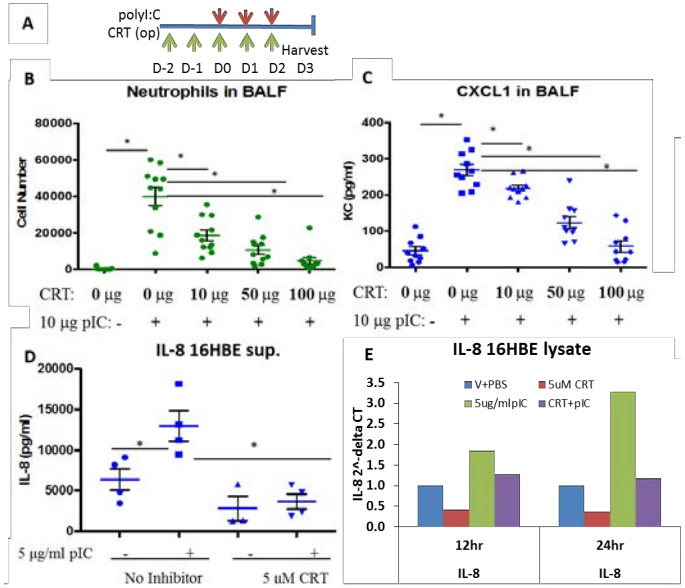



**Figure 2: Inhibition of PKD reduces neutrophil infiltration and KC/IL-8 release.** (A) Mice were administered vehicle or CRT o.p.D-2,-1 and administered CRT plus 10 μg polyI:C o.p. on D0-2. (B, C) BAL fluid was harvested D3 and analyzed for neutrophil (via cytospins) and KC levels (via ELISA). Data are mean ± standard error; N=10. One way ANOVA followed by Tukey post-test. * p <0.05; (D) Human bronchial epithelial cells (16HBE) were cultured as a monolayer submerged in media. After 2hr pre-treatment with 5 μM CRT, polyI:C was spiked in to a final concentration of 5 μg/ml. 6hrs after polyI:C addition the supernatant was collected and analyzed for IL-8; N=4.(E) 16HBE cells were cultured as a monolayer submerged in media. After 2hr pre-treatment with 5 μM CRT, polyI:C was spiked in to a final concentration of 5 μg/ml. 12 and 24hrs after polyI:C addition cells were lysed and analyzed for IL-8 mRNA via RT-PCR. N=2. Data are mean ± standard error Tukey post-test * p <0.05

# Approach/Experimental Design

- Each Aim needs to be described in enough detail so that the reader understands the following:
  1. Rationale (could include the prelim data here)
  2. Goal or question to be addressed
  3. Hypothesis
  4. Experimental approach
  5. Expected outcomes
  6. Limitations and Alternative Approaches

# Approach/Experimental Design Be SMART

- Experiments related to each Aim should be described in sufficient detail to convey:
  - Feasibility
  - Logic
  - Tools/primary materials and equipment
    - Specifics with regards to antibody concentrations and percent gels aren't necessary
  - Don't forget statistical analyses

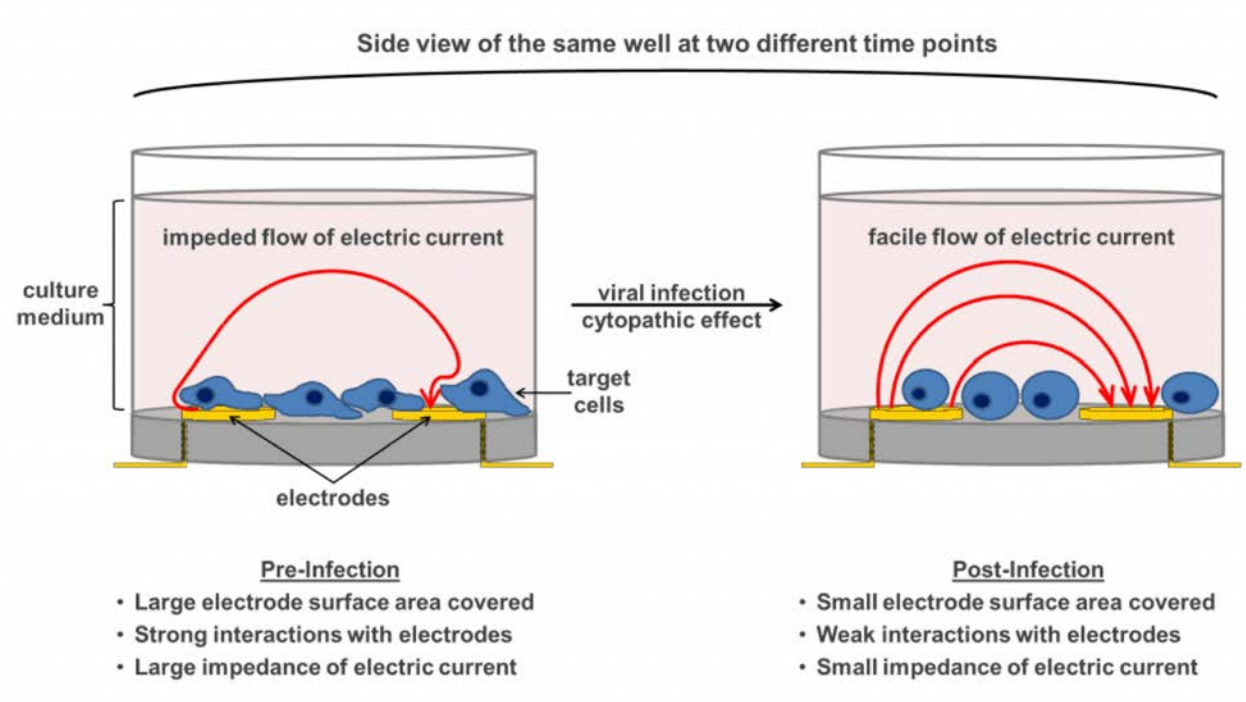
# Approach/Experimental Design

- Each Aim should describe what data you expect will be generated
  - HINT: if you have written a clear, active Aim title and have proposed a specific hypothesis you will be able to deduce the expected outcome!

  - Techniques –
    - Sketch out what you think a bar/line graph would look like
    - What would panels of a figure look like
      - Histology images
      - Flow cytometry
      - Phenotype comparison
    - Qualitative coding of surveys
      - Could you group answers based on thematic questioning

- Alternative Approaches
  - The “What If’s”
  - ‘Interpret your data’
    - We expect outcome A; however, if outcome B happens it might be because there was _____. In which case we will alter the conditions of _____ and retest using _____.

# Example


Side view of the same well at two different time points
impeded flow of electric current
culture medium
target cells
electrodes
viral infection
cytopathic effect
facile flow of electric current
Pre-Infection
• Large electrode surface area covered
• Strong interactions with electrodes
• Large impedance of electric current
Post-Infection
• Small electrode surface area covered
• Weak interactions with electrodes
• Small impedance of electric current

# Impact and Training Potential

- At the end of your Research Strategy remind the reviewer how the research proposal will benefit your long-term career goals and how it will enhance your training.

**Summary and training potential:** Preliminary results indicate that PKD3 plays a crucial role in epithelial IL-8/CXCL1 production and neutrophil recruitment into the airspace following polyI:C challenge. In this study we propose to determine the upstream PKD activation signal for during viral infection and the mechanism connecting PKD activity to IL-8/CXCL1 release. We also plan to investigate the ability of PKD3 reduction to attenuate lung injury following IAV infection. This will open the door to novel therapeutics for a broad range of viral respiratory infections. This research project is also designed to train me in advanced molecular biology techniques (Aim 1) as well train me to integrate the details of molecular mechanisms with the more global scope of cellular immunology (Aim 2). Completion of this project will secure my short term goal of earning a PhD and that, combined with this fellowship, will facilitate securing a post-doctoral position in pulmonary immunology.

# Break out into groups and share a piece of your grant for critiques

The remaining time is yours to write and I am available to answer questions

# Would you like Writing Assistance?

- https://www.urmc.rochester.edu/education/graduate/professional-development.aspx