Career Development and Research Funding/Grantsmanship for Pathology House Staff

Dept. of Pathology
Residency Career Development Series

May 8, 2017

Jaime S. Rubin, Ph.D.
Dept. of Medicine
College of Physicians and Surgeons
Columbia University

Course: “Funding and Grantsmanship for Research and Career Development Activities”
http://grantscourse.columbia.edu/
Topics to be Discussed

- **Types of Awards**
  - Fellowships (F’s), Training grants (T’s), Career Development awards (K’s), Research grants (R’s), Loan Repayment Program

- **Funding Agencies**
  - Federal
    - National Institutes of Health
  - Voluntary Health Organizations, Professional Societies, Foundations

- **Approaches for Competitive Applications**
  - Career Development and Research Proposals

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- **Approaches for Competitive Applications**
  - Career Development and Research Proposals
Not All Funding Opportunities Are the Same

- **Different mission statements**
  - Fellowships (F’s)/Training grants (T’s)
  - Career development (K’s)/Scholar awards
  - Research project (R’s)

- **Different funding**
  - Stipend/Salary
  - Pilot awards vs. Comprehensive research costs

- **Different time frames**
  - Not renewable: e.g. 5 years (K’s), 3 years (F’s), 2 years (T’s)
  - Renewable: 4 - 5 years (R01) each competitive period
Types of Awards

- Individual fellowships
- Training grants
- Career transition awards
- Career development awards
- Research grants
- Program Projects
- Administrative supplements
- Cooperative agreements
- Institutional Clinical & Translational Science Award (CTSA)
- Subcontracts
- Contracts
- Loan Repayment Program
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Timeline of Funding for Junior Investigators

- T35 Training Grant: Summer Research between 1st and 2nd Years
- Research Support
- Individual Post-doc Fellowship or Institutional T32 Post-doc Training Grant slot

Medical School | Internship/Residency | Fellowship – Research Years | Instructor/Assistant Professor

Year-long Enhancement Programs
MD/PhD Fellowship or Institutional T32

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Post-doc:
Institutional Training Grant
(NIH-T32)

- Post-docs selected by institution
- Research training in specific area
- Defined number of slots
- Stipend, health fees, tuition, travel

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Post-doc: Individual Fellowship

- Supports specific individual
- Stipend, health fees, tuition, travel
- NIH: F32

Review criteria:
- Individual fellow
- Mentor
- Research project
- Research environment

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Post-doc Fellowships (F32’s)
Applications, awards, and success rates

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Post-doc: Individual Fellowships

Non-government, non-profit agencies

- Voluntary Health Organizations
- Professional Societies
- Private Foundations
Post-doc: Individual Fellowship
- Voluntary Health Organizations, Foundations, Professional Societies -

- American Cancer Society
  - Postdoctoral Fellowships
- American Philosophical Society
  - Daland Fellowships in Clinical Investigation
- Damon Runyon Cancer Research Foundation
  - Damon Runyon Fellowship Award
Timeline of Funding for Junior Investigators

- **T35 Training Grant**
  - Summer Research between 1st and 2nd Years

- **Research Support**

- **Individual Post-doc Fellowship or Institutional T32 Post-doc Training Grant slot**

- **Medical School**
  - Year-long Enhancement Programs
  - MD/PhD Fellowship or Institutional T32

- **Internship/Residency**

- **Fellowship – Research Years**
  - Career Transition Award

- **Instructor/Assistant Professor**

NIH: Pathway to Independence Award

- Career Transition Award (K99/R00)
- No citizenship requirement
- Applicants must:
  - Have earned a clinical or research doctorate;
  - Have no more than 4 years of research experience since completing the requirements of the doctoral degree
  - Have not been the principal investigator of an NIH research grant (e.g., R01, R03, R21), career development award (e.g., K01, K07, K08, K23, K25), other peer-reviewed NIH or non-NIH research grant over $100,000 direct costs per year, or have been a project leader on a sub-project of a program project (P01) or a center (P50) grant.

1-2 years as a mentored **K award** for “post-docs”

- Funding level is Institute-specific
  - NIDDK, NIA: $75K for salary plus fringe benefits, $25K for research support (+ 8% I.C.)
  - 75% effort

3 years as a **Research award** for independent investigators

- Total/year:=$249,000 (salary and research expenses)
  - D.C. + institution’s I.C. rate
- Must have an independent research position
Career Transition Awards

BWF: Career Awards for Medical Scientists

- Supports physician-scientists to bridge advanced postdoctoral/fellowship training and the early years of faculty appointment
- Must hold an M.D., D.D.S., or D.V.M.
- 75% effort to research-related activities
- Funding: $700,000 over five years
  - Postdoctoral/Fellowship Portion: Years 1 and 2
    Annual Total: $95,000
  - Faculty Portion of the Award: Years 3-5
    Annual Total: $170,000

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Timeline of Funding for Junior Investigators

- **Medical School**
  - T35 Training Grant
    - Summer Research between 1st and 2nd Years

- **Internship/Residency**
  - Research Support

- **Fellowship – Research Years**
  - Individual Post-doc Fellowship or Institutional T32 Post-doc Training Grant slot

- **Instructor/Assistant Professor**
  - Year-long Enhancement Programs
    - MD/PhD Fellowship or Institutional T32
  - Career Transition Award
  - Individual Mentored K Career Development Award

Research Career Programs (K)

- Provides predominantly salary support
- Minimum requirements for the amount of effort that must be devoted to research and career development (e.g. 75%, some exceptions to 50%)
- Up to 5 years
- Specified salary levels
- US citizen/permanent resident.
- Can reduce effort to 50% in last 2 years if PI of NIH research grant
Mentored Clinical Scientist Development Award (K08)

- Support to develop outstanding independent clinician research scientists
- Basic and translational science

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Mentored Patient-Oriented Research Career Development Award (K23)

- **Patient-oriented research**: Research conducted with human subjects (or on material of human origin) for which an investigator directly interacts with human subjects.


Cancer Prevention, Control, Behavioral, and Population Sciences Career Development Award (K07)

- NCI program
- Support individuals with health professional or science doctoral degrees who are not fully established investigators
<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Activity Code</th>
<th>NIH Institute / Center</th>
<th>Number of Applications Reviewed</th>
<th>Number of Applications Awarded</th>
<th>Success Rate(^2)</th>
<th>Total Funding(^3)</th>
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<td><strong>K23</strong></td>
<td><strong>Activity Total</strong></td>
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<td><strong>207</strong></td>
<td><strong>36.0%</strong></td>
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</tr>
</tbody>
</table>
Research Career Development/Scholar Programs

- **American Cancer Society**
  - Mentored Research Scholar Grant

- **Damon Runyon Cancer Research Foundation**
  - Clinical Investigator Award

- **Doris Duke Charitable Foundation**
  - Clinical Scientist Development Award

- **Robert Wood Johnson Foundation**
  - Harold Amos Medical Faculty Development Program

Timeline of Funding for Junior Investigators

Medical School
- T35 Training Grant
  - Summer Research between 1st and 2nd Years

Internship/Residency
- Research Support

Fellowship – Research Years
- Individual Post-doc Fellowship or Institutional T32 Post-doc Training Grant slot

Instructor/Assistant Professor
- Institutional K12 Career Development Slot

Year-long Enhancement Programs
- MD/PhD Fellowship or Institutional T32

Career Transition Award

Individual Mentored K Career Development Award

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Mentored Clinical Scientist Development Program Award (K12)

- Support to an institution for career development experiences for clinicians leading to research independence.

- Institutions recruit and select candidates into their programs

- Candidates must meet the same criteria as for the individual mentored clinical scientist development award.

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
CTSA Awards: A Home for Clinical and Translational Science

Source: Zerhouni (NIH) [9/06]

Mentored Clinical Scientist Development Program Award (K12)

- CTSA - Clinical and Translational Scientist Award

- TRANSFORM Scholars Mentored Career Development program
  [Training and Nurturing Scientists for Research that is Multidisciplinary]
CU Irving Institute/CTSA Funding Programs

- **TRANSFORM TL1 Postdoctoral Precision Medicine Training Program**: Two-year mentored training program combining integrated didactic training, mentoring, and multidisciplinary research.

- **Precision Medicine Research Fellowship**: Two-year program to train physicians/researchers to use genomics and complex clinical data to improve clinical care and clinical outcomes by tailoring prevention, screening, and medical interventions based upon individual patient characteristics.
CU Irving Institute/CTSA Funding Programs

- **KL2 Program:** TRANSFORM KL2 Scholars Mentored Career Development program
- **Irving Scholars:** Florence and Herbert Irving Clinical Research Career Awards - $60,000/year for 3 years
- **Irving Institute/CTO Pilot Awards:** $50,000 awards for P&S junior faculty to conduct pilot studies leading to future independent funding
- **Imaging Core Pilot Awards:** Funding for junior investigators: magnetic resonance imaging (MRI), optical imaging, PET tomography, single photon emission computed tomography/computed tomography (SPECT/CT), and ultrasound
CU Irving Institute/CTSA Funding Programs

- **Collaborative and Multidisciplinary Pilot Research Awards (CaMPR):** Two-phase program that provides planning and start-up funding to newly-configured investigative teams to support the planning of novel, cross disciplinary projects.

- **CaMPR-BASIC Awards:** Two-phase program that provides funding to form a new collaborative team consisting of two principal investigators at the Assistant Professor level: one from a Basic Science department and one from a Clinical department.
CU Irving Institute/CTSA Funding Programs

- **Health Practice Research Pilot Awards:** For junior investigators to pursue an informatics-based project in an operational clinical setting (w/ the Dept of Biomedical Informatics)

- **Personalized Medicine Pilot Awards:** For research focused on approaches to tailor medical care (prevention, diagnosis, and/or treatment) to the individual patient. Studies may include the use of biomarkers, genomic data, aggregated clinical data, and/or patient reported data to develop personalized medical care.
CU Irving Institute/CTSA Training Programs

- **Reach for the First R01 Course:** Participants receive five free hours of biostatistical consulting, access to CTSA resources, two expert pre-reviews on an early draft of their R01 application, and bi-monthly, closely-monitored meetings to ensure structure and timeliness in completing the tasks required to successfully submit a first R01 application.
CUMC Research Training/Didactic Programs

- **Columbia Summer Research Institute (CSRI):** 5-week (10 credit) training program in research design and statistical analysis for patient-oriented research.

- **Epidemiology and Population Health Summer Institute (EPIC):** Dept. of Epidemiology's series of week-long, non-credit courses - provides foundational knowledge and applied skills for advancing population health research.

- **Patient-Oriented Research (POR) Master's of Science Program:** Two-year, 30-credit M-SPH degree program of comprehensive didactic training for conducting clinical and translational research.
Timeline of NIH Funding for Junior Investigators

Medical School

Short term Training

Year-long “Enhancement” Programs

Internship/Residency

Research Support

Individual Post-doc Fellowship or Institutional T32 Post-doc Training Grant slot

Fellowship – Research Years

Instructor/Assistant Professor

Institutional K12 Career Development Slot

NIH Loan Repayment Program

Career Transition Awards

Individual Mentored K Career Development Award

NIH’s Extramural Loan Repayment Program

http://www.lrp.nih.gov/

- Up to $35,000/year towards educational loan debt
- Conduct qualified research activities for at least 50% of professional effort (or 20 hours per week) for 2 years
- Qualifying educational loan debt equals or exceeds 20% of the applicant's institutional base salary

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NIH’s Extramural Loan Repayment Program

- May competitively apply for one-year renewal
- Repayments represent taxable income and are paid in addition to loan

Eligibility:

- U.S. citizen/Permanent residence
- Recipient of M.D., Ph.D., D.D.S. D.M.D., or other specified equivalent doctoral degree
NIH’s Extramural Loan Repayment Program

Extramural Programs

- Clinical Research
- Health Disparities Research
- Clinical Researchers from Disadvantaged Backgrounds
- Pediatric Research
- Contraception and Infertility Research
<table>
<thead>
<tr>
<th>LRP</th>
<th>New + Renewal</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Applications</td>
<td>Awards n</td>
<td>Success Rate %</td>
<td>Applications</td>
<td>Awards n</td>
<td>Success Rate %</td>
<td>Applications</td>
<td>Awards n</td>
<td>Success Rate %</td>
<td>Applications</td>
<td>Awards n</td>
<td>Success Rate %</td>
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<td>866</td>
<td>57</td>
<td>874</td>
<td>400</td>
<td>46</td>
<td>655</td>
<td>466</td>
<td>71</td>
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<tr>
<td>Pediatric Research</td>
<td>630</td>
<td>312</td>
<td>50</td>
<td>404</td>
<td>157</td>
<td>39</td>
<td>226</td>
<td>155</td>
<td>69</td>
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<tr>
<td>Health Disparities Research</td>
<td>486</td>
<td>125</td>
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<td>303</td>
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<td>18</td>
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<tr>
<td>Clinical Research for Individuals from Disadvantaged Backgrounds</td>
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<tr>
<td>Contraception and Infertility Research</td>
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<td>23</td>
<td>56</td>
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<td>43</td>
<td>13</td>
<td>11</td>
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<td><strong>1,351</strong></td>
<td><strong>49</strong></td>
<td><strong>1,641</strong></td>
<td><strong>635</strong></td>
<td><strong>39</strong></td>
<td><strong>1,095</strong></td>
<td><strong>716</strong></td>
<td><strong>65</strong></td>
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## National Institutes of Health

**Division of Loan Repayment**

### Fiscal Year: 2015

<table>
<thead>
<tr>
<th>LRP</th>
<th>Awards</th>
<th>Funding</th>
<th>Mean Award</th>
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<tbody>
<tr>
<td>Clinical Research</td>
<td>866</td>
<td>$43,757,421</td>
<td>$50,528</td>
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<tr>
<td>Pediatric Research</td>
<td>312</td>
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<td>Contraception and Infertility Research</td>
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<td>1,351</td>
<td>$69,368,686</td>
<td>$51,346</td>
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Physician-Scientist Workforce

6. NIH should expand Loan Repayment Programs and the amount of loans forgiven should be increased to more realistically reflect the debt burden of current trainees. This program should also be made available to all students pursuing biomedical physician-scientist researcher careers, regardless of particular research area or clinical specialty.
NIH Career Development Support to Independent Research Funding

K08/K23 -> Independent Grant
K12 | K23 -> Independent Grant
K12 | K23 -> Independent Grant
K08/K23 -> Independent Grant
K12 -> Independent Grant
R01 Research Award

Independent Investigator

Funds research project
- Salaries of PI and other research personnel
- Supplies, reagents, etc
- Animal costs
- Patient care costs
- Core facilities
- Page charges for publications

Multi-Year (4yrs – 5yrs)
Renewable (e.g. original grant + 2 renewals = 15yrs)
R01 Research Grant

- Supports a discrete, specified project
  - “Specific Aims”
- “Comprehensive” funding
  - Salary of PI and research staff, supplies, animal costs, patient care costs, travel, publication costs
- Modular budgets up to $250,000/year
- Multi-year (4yrs – 5 yrs)
- Renewable
  - e.g., original grant + 2 renewals = 15 years
- Flexibility
- Most NIH-supported investigator-initiated research is through this funding mechanism

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Research Project Grants: Applications, Awards, and Success Rates

Small Research Grants (R03)

- Supports, e.g.:
  - Pilot or feasibility studies;
  - Collection of preliminary data
  - Secondary analysis of existing data
  - Small, self-contained research projects
  - Development of new research technology

- 2 years of funding
- Budget: Direct costs up to $50,000/yr
- Not renewable
- Some Institutes only accepts applications in response to their specific funding opportunity announcements

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Exploratory/ Developmental Grants (R21)

- Encourages new, exploratory and developmental research projects by providing support for the early stages of project development. Sometimes used for pilot and feasibility studies.
- 2 years of funding
- Budget: $275,000 (D.C.) over two years
- Investigator-initiated R21 studies not funded by all Institutes
Topics to be Discussed

- **Types of Awards**
  - Fellowships (F’s), Training grants (T’s), Career Development awards (K’s), Research grants (R’s), Loan Repayment Program

- **Funding Agencies**
  - Federal
    - National Institutes of Health
  - Voluntary Health Organizations, Professional Societies, Foundations

- **Approaches for Competitive Applications**
  - Career Development and Research Proposals

Pathology-Specific Funding Agencies

- **Academy of Clinical Laboratory Physicians and Scientists**
  - Paul E. Strandjord Young Investigator Award Program

- **American Association of Neuropathologists**
  - Trainee Travel Awards

- **American Society for Clinical Pathology**
  - Resident Subspecialty Grants

- **American Society of Cytopathology/Foundation**
  - Young Investigator Grant
  - Travel Scholarship
  - Patient Advocacy Grant

Pathology-Specific Funding Agencies

- **Association for Molecular Pathology**
  - Travel Awards

- **Rodger C. Haggitt Gastrointestinal Pathology Society**
  - Travel Awards

- **National Blood Foundation**
  - Early-Career Scientific Research Grants Program
  - Strategic Research and Education Grants Program

- **United States and Canadian Academy of Pathology**
  - Pathologists-In-Training Travel Scholarships

Pathology-Specific Funding Agencies

- **American Society of Hematology**
  - ASH Bridge Grant
  - Abstract Achievement Awards and Outstanding Abstract Achievement Awards
  - Clinical Research Training Institute
  - Research Training Award for Fellows
  - Translational Research Training in Hematology
  - Physician-Scientist Career Development Award
  - HONORS (Hematology Opportunities for the Next Generation of Research Scientists)
  - Minority Medical Student Award Program
  - The Minority Medical Student Award Program
  - ASH Minority Resident Hematology Award Program
Topics to be Discussed

- **Types of Awards**
  - Fellowships (F’s), Training grants (T’s), Career Development awards (K’s), Research grants (R’s), Loan Repayment Program

- **Funding Agencies**
  - Federal
    - National Institutes of Health
  - Voluntary Health Organizations, Professional Societies, Foundations

- **Approaches for Competitive Applications**
  - Career Development and Research Proposals

NIH Career Development (K) Application

- Model for other career development/scholar grant programs supported by voluntary health organizations, private foundations, and professional societies
Overall Impact  Write a paragraph summarizing the factors that informed your Overall Impact score.
<table>
<thead>
<tr>
<th>1. <strong>Candidate</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths</strong></td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td><strong>Weaknesses</strong></td>
</tr>
<tr>
<td>•</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. <strong>Career Development Plan/Career Goals &amp; Objectives/Plan to Provide Mentoring</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths</strong></td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td><strong>Weaknesses</strong></td>
</tr>
<tr>
<td>•</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. <strong>Research Plan</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths</strong></td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td><strong>Weaknesses</strong></td>
</tr>
<tr>
<td>•</td>
</tr>
</tbody>
</table>
4. **Mentor(s), Co-Mentor(s), Consultant(s), Collaborator(s)**

**Strengths**
- 

**Weaknesses**
- 

5. **Environment and Institutional Commitment to the Candidate**

**Strengths**
- 

**Weaknesses**
- 

1 + 12 Pages Combined

- **Candidate Information**
  - Section 2

- **Research Plan**
  - 3. Specific Aims (1 page)
  - 4. Research Strategy
2. Candidate Information

- Candidate’s Background
- Career Goals and Objectives:
  Scientific Biography
- Career Development/Training
  Activities During Award Period
Candidate’s Background

- Personal background for this career path
- Other training experiences
- Other research experiences
- Reasons for basic, clinical, translational, behavioral, multidisciplinary research, relevant publications

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Career Goals and Objectives

- Unique expertise/Scientific history
  - Previous work
    - Consistent themes, or
    - Why research interests have changed direction
  - e.g. Joint appointments, Multidisciplinary

- Skills that are lacking
  - Identification of specific modules to address areas for growth, provides justification of award
  - Role of specific Mentor(s) and Advisory Committee member(s)
- Justify award
  - Fits into past and future research career

- Short-term Career Goals
  - Timeline for funded period

  **Year 1:** Preliminary data

  **Year 2:** Submit publications (possible journals),
  Presentations at national meetings (examples),
  Formulation of project to submit for R01 application

  **Year 3-5:** By the end of the funded period, applicant will
  be an independent investigator near to R01 funding

Long-term Career Goals

- Scientific goals
  - Basic science, translational, clinical, epidemiologic, behavioral

- Mentoring goals
  - How mentoring has been important to you
  - Previous/current mentoring responsibilities

- Networking goals
  - Multidisciplinary activities, grants, etc
Career Development/Training Activities During Award Period

- Review of didactic courses, training, and research experiences to date
- New research skills/knowledge required
- Identification of training modules required to fill gaps in knowledge in order to reach long term goals
  - Rational for each of the modules
New Section on each Module

- Reason for module

Specific Description of each “Mode of Learning”
- Role of Mentors and Advisors
- Specific courses, workshops, and other didactics
- Details on research meetings

Module: Career skills
- Grantsmanship
- Becoming a mentor
- Laboratory management

Table: Career Development/ Training Activities During Award Period
<table>
<thead>
<tr>
<th>Module</th>
<th>Mentor(s)</th>
<th>Mode of learning</th>
</tr>
</thead>
</table>
| Scientific Area (1-3)   | Specific names     | Coursework (completed and new)  
1-on-1 meetings (schedule? e.g. weekly)  
Guided readings  
Research meetings (schedule? e.g. weekly)  
Applied training  
Clinical experience |
| Career skills           | All mentors        | Improving communication skills  
Grant writing course  
Professional workshops/seminars  
Collaborations  
Abstracts and manuscripts  
Small grant application submission |
| Dissemination of Research Results |                      | Supervising technical support personnel, organizing lab meetings, journal clubs |
| Research management     |                    | e.g. training new lab members, undergraduate, summer students                    |
| Mentorship              |                    |                                                                                  |

### Mentors/Advisory Committee

- Scientific area per mentor/committee member
- Schedule of meetings

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>Role</th>
<th>Area of Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name (Title)</td>
<td>Mentor</td>
<td></td>
</tr>
<tr>
<td>Name (Title)</td>
<td>Co-Mentor</td>
<td></td>
</tr>
<tr>
<td>Name (Title)</td>
<td>Advisory Board Member</td>
<td></td>
</tr>
<tr>
<td>Name (Title)</td>
<td>Advisory Board Member</td>
<td></td>
</tr>
<tr>
<td>Name (Title)</td>
<td>Advisory Board Member</td>
<td></td>
</tr>
<tr>
<td>Name (Title)</td>
<td>Collaborator</td>
<td></td>
</tr>
<tr>
<td>Name (Title)</td>
<td>Consultant</td>
<td></td>
</tr>
</tbody>
</table>
Summary of coursework

- List previous relevant coursework
- Proposed coursework
  - Course number and description
  - Include courses on grant writing and responsible conduct of research
- Additional didactic activities
  - e.g. Those offered by professional societies, workshops, symposiums
Clinical and/or Teaching activities

- Be specific, mention hrs. per week, restate % of time dedicated to research

Percentage of time for each activity

Timetable
<table>
<thead>
<tr>
<th>Career Development Activities</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mentorship</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mentor (name) – frequency (e.g. weekly) of individual meetings, frequency of lab meetings, frequency and listing of specific journal clubs, seminars, and other recurring relevant programs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Co-Mentor (name) – frequency (e.g. weekly) of individual meetings, frequency of lab meetings, frequency and listing of journal clubs, seminars, and other recurring relevant programs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Advisory Group – frequency (e.g. quarterly) of meetings</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

## Career Development Activities

<table>
<thead>
<tr>
<th>Experimental Training</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mentor</strong> (name) – Specific area of research and/or methodology</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Co-Mentor</strong> (name) – Specific area of research and/or methodology</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Co-Investigator 1</strong> (name) – Specific area of research and/or methodology</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Co-Investigator 2</strong> (name) – Specific area of research and/or methodology</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Collaborator 1</strong> (name) – Specific area of research and/or methodology</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Collaborator 2</strong> (name) – Specific area of research and/or methodology</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

## CU Formal Coursework – P&S, M-SPH, GSAS, etc.

<table>
<thead>
<tr>
<th>Course #1: Specific Course # / Formal Title</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G4010</strong>: Responsible Conduct of Research and Related Policy Issues</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>M9780</strong>: Funding for Research Activities</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Career Development Activities</strong></th>
<th><strong>Year 1</strong></th>
<th><strong>Year 2</strong></th>
<th><strong>Year 3</strong></th>
<th><strong>Year 4</strong></th>
<th><strong>Year 5</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Workshops &amp; Additional Training Programs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold Spring Harbor Course on.....</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woods Hole Workshop on.....</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Association for.... Junior Investigators Training on.....</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTSA “K to R” Program</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>IRB 101 Course</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>NYAS Science Alliance Sessions on......</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Scientific Conferences-Communication Skills (Oral / Poster Presentations)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symposium of the NY Academy of....(annual)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Congress of.... (annual)</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>American Association for.... (annual)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Society of...... (biannual)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Career Development Activities</td>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
<td>Year 4</td>
<td>Year 5</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Mentoring Skills (responsibility shared with K mentors)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students (summer, undergraduate, medical)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Communication Skills (Written)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation of manuscripts for peer reviewed journals</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Grant Writing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTSA pilot award for junior investigator (to supplement K award)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center for...... award for new investigators</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>R01 preparation and submission (on research funded by K award)</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

NIH Career Development Support to Independent Research Funding

- K08/K23 → Independent Grant
- K12 | K23 → Independent Grant
- K12 | K23 → Independent Grant
- K08/K23 → Independent Grant
- K12 → Independent Grant

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Number of Scored Applications from First-time Investigators are Dropping

-535 Applications
+339 Applications
### Challenging Times for All Researchers

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall success rate for NIH RO1* Proposals</td>
<td>32%</td>
<td>24%</td>
</tr>
<tr>
<td>Success rate on first submission</td>
<td>29%</td>
<td>12%</td>
</tr>
</tbody>
</table>

### Especially for Young Investigators

<table>
<thead>
<tr>
<th></th>
<th>Then 1990</th>
<th>Now 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at first Ro1* grant</td>
<td>39</td>
<td>43</td>
</tr>
<tr>
<td>% of R01s* that go to first-time investigators</td>
<td>29%</td>
<td>25%</td>
</tr>
</tbody>
</table>

*R01 Equivalents: RO1, R29, R37  
Source: National Institutes of Health
Age Distribution of NIH RPG Investigators: 1980

Average Age
New R01 Investigator: 37.2

Sources: IMPAC II Current and History Files
Age Distribution of NIH RPG Investigators: 2006

Average Age
New R01 Investigator: 42.2

Sources: IMPAC II Current and History Files

Jaime S. Rubin, Ph.D.: http://grantscourse.columbia.edu
Preliminary Projection of Age Distribution of NIH RPG Investigators: 2020

Sources: IMPAC II Current and History Files and Preliminary Demographic Projection Model
Figure 1. Average Age of Principal Investigators with MD, MD-PhD, or PhD at the time of First R01 Equivalent Award from NIH, Fiscal Years 1980 to 2011
“Over the past three decades, we’ve seen profound shifts in the average age at which a principal investigator receives their first R01. During the period from 1980 to 2001, the average age increased nearly 0.3 years per year. Since that time, the average age at first R01 award has leveled off near 42 for PhDs. It is higher for researchers with an MD or an MD/PhD.” [Dr. Sally Rockey, NIH Deputy Director for Extramural Research (2/3/12)]

http://nexus.od.nih.gov/all/2012/02/03/our-commitment-to-supporting-the-next-generation

Jaime S. Rubin, Ph.D.: http://grantscourse.columbia.edu
NIH R01 Principal Investigators: Age 36 and Younger / Age 66 and Older

http://nexus.od.nih.gov/all/rock-talk/

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Young, Brilliant and Underfunded

By ANDY HARRIS

We'll never know what medical breakthroughs were missed because young scientists were not provided with resources.

The New York Times

OCT. 2, 2014
A study for the National Bureau of Economic Research from 2005 examined the age at which over 2,000 Nobel Prize winners and other notable scientists in the 20th century came up with the idea that led to their breakthrough. Most were between 35 and 39. Yet the median age of first-time recipients of R01 grants, the most common and sought-after form of N.I.H. funding, is 42, while the median age of all recipients is 52. More people over 65 are funded with research grants than those under age 35.
Young scientists lead the way on fresh ideas

Analysis of millions of papers finds that junior biomedical researchers tend to work on more innovative topics than their senior colleagues do.

Young researchers are much more likely than older scientists to study exciting innovative topics, according to a text analysis of more than 20 million biomedical papers published over the past 70 years. More-senior researchers are more likely to publish in hot areas when they are supervising a younger scientist.

Young scientists go for fresh ideas.
Callaway E.

Age and the Trying Out of New Ideas
Mikko Packalen, Jay Bhattacharya
NBER Working Paper No. 20920

http://www.nature.com/news/young-scientists-lead-the-way-on-fresh-ideas-1.16934
http://www.nber.org/papers/w20920

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Pairings of young first authors and mid-career last authors are the most likely to work on the hottest biomedical topics.

Share of publications trying out new ideas
- >23%
- 20–23%
- 17–20%
- <17%

Early Stage Investigator (ESI)

- Has **not** previously been awarded “significant NIH independent research award”
  - Includes R01’s, projects on P01
  - Does **not** include: R03’s, R21’s, F’s, K’s, loan repayment

- **Within 10 years of terminal research degree/completion of medical residency**
  - Extensions permitted
    (family care, additional clinical training)
# Early Stage Investigators: NHLBI

<table>
<thead>
<tr>
<th>Grant Program</th>
<th>Grant Program Description</th>
<th>Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>R01</td>
<td>Research Project Grant</td>
<td>15</td>
</tr>
<tr>
<td>R01 ESI</td>
<td>Early Stage Investigators</td>
<td>25</td>
</tr>
</tbody>
</table>

FY17

http://www.nhlbi.nih.gov/research/funding/general/current-operating-guidelines

R01-Equivalent grants, New (Type 1): Success rates, by career stage of investigator

[Graph showing success rates for first-time and established investigators from 1998 to 2016.]
Topics to be Discussed

- **Types of Awards**
  - Fellowships (F’s), Training grants (T’s), Career Development awards (K’s), Research grants (R’s), Loan Repayment Program

- **Funding Agencies**
  - Federal
    - National Institutes of Health
  - Voluntary Health Organizations, Professional Societies, Foundations

- **Approaches for Competitive Applications**
  - Career Development and Research Proposals
Approaches for Competitive Applications

- Identify Funding
- Prepare to Write the Grant Application
- Complete the Grant Application
How to Find Funding Opportunities

- Networking
- Speak to colleagues who are in a similar field
- Speak to colleagues who have been on governmental or private agency review panels
- Speak to colleagues who are on (advisory) boards of private agencies
- Acknowledgement section of publications, oral/poster presentations, press releases, etc.

General Resources

- **Grants.gov**
  - Database and application system for Federal grants

- **FedBizOpps (Federal Business Opportunities)**
  - Single point-of-entry for Federal contracts
General Resources

- **Foundation Center**
  - [http://foundationcenter.org/](http://foundationcenter.org/)
  - [http://foundationcenter.org/newyork/](http://foundationcenter.org/newyork/)

- **SPIN funding database**
  - [https://www.infoed.columbia.edu/](https://www.infoed.columbia.edu/)
  - e-mail alerts matching research area(s) of interest
- National Institutes of Health

- Tips for Writing Grant Applications
  - [http://grantscourse.columbia.edu/writing.htm](http://grantscourse.columbia.edu/writing.htm)
Other Sources of Information

- Sponsor publications/website/social media which describe research/programmatic interests (e.g. newsletters, strategic plans, annual reports)
- Sponsor e-mail alert modules
  - NIH
      - Able to save queries and have “ongoing” results e-mailed as funding alerts
SPIN Funding Database

https://www.infoed.columbia.edu/

Select keywords from the SPIN controlled vocabulary to use in your search.

Available Keywords

- AGRICULTURE/FOOD SCIENCES/FOODS
- ARTS/HUMANITIES/CULTURAL ACTIVITIES
- BEHAVIORAL/SOCIAL SCIENCES
- EDUCATION
- ENERGY
- ENGINEERING
- HEALTH AND SAFETY/MEDICAL SCIENCES/BIOMEDICAL
- INTERNATIONAL/GEOGRAPHICAL REGIONS
- LAW
- MANAGEMENT/COMMERCE
- OTHER (ANY/ALL DISCIPLINES)
- SCIENCE & TECHNOLOGY/MATHEMATICS/COMPUTER SCIENCE

Choose Keywords
SPIN Funding Database

Chosen Keywords

Pathology

Select Keywords

AND
OR

Pathology (337)

You have additional filters active. Click here to edit them.

Results Found: 82

Drag a column header and drop it here to group by that column

Save Current Search

Search name: Pathology
User: Select an Option

Would you like to configure SMARTS™ automation? Help
Note: This can be set up or edited under Funding Alerts later.

Receive email updates? HTML
Update frequency: Daily

Save Changes Cancel

e-mail alerts matching research area(s) of interest

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Training

- **Courses:** Proposal Writing Workshop and Bootcamp
- Webinars
- Self-Paced eLearning

The Foundation Directory Online

- 100,000 Grantmakers
- 3.4 million grants
- Tax statements (990’s) showing previous awards
- Access via Columbia University

  - [http://www.columbia.edu/cgi-bin/cul/resolve?clio3328966](http://www.columbia.edu/cgi-bin/cul/resolve?clio3328966)
<table>
<thead>
<tr>
<th>Grantmaker Name</th>
<th>City, State / Country</th>
<th>Total Assets</th>
<th>Total Giving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukemia &amp; Lymphoma Society, Inc., The</td>
<td>White Plains, NY</td>
<td>$242,581,527</td>
<td>$130,249,475</td>
</tr>
<tr>
<td>New York Stem Cell Foundation, Inc.</td>
<td>New York City, NY</td>
<td>$40,418,661</td>
<td>$6,133,035</td>
</tr>
</tbody>
</table>
At A Glance
NEW YORK STEM CELL FOUNDATION
1995 Bdwy., Ste. 600
New York City, NY United States
Telephone: (212) 787-4111
Contact: Susan L. Solomon, C.
E-mail: info@nyscf.org
URL: www.nyscf.org

TYPE OF GRANTMAKER
Public charity

ADDITIONAL DESCRIPTOR

FINANCIAL DATA
(yr. ended 2013-06-30)
Assets: $40,418,661
Total giving: $6,133,035

EIN
202905531

BRIDGE NUMBER
2509003516

990

PROGRAM AREA(S)
The grantmaker has identified the following area(s)

GRANTS TO INDIVIDUALS PROGRAM
Fellowships and research grants for human embryonic stem cell transfer.

GRANTS TO SENIOR SCIENTISTS
The foundation occasionally supports senior scientists and encourages the use of its laboratory by all grantees for embryonic stem cell work.

INNOVATOR AWARDS PROGRAM FOR EARLY CAREER INVESTIGATORS
This award provides $1.5 million over five years to researchers at institutions from throughout the world for the use of their potential of stem cells. The goal is to foster bold and creative ideas in the field of stem cell research, and advance the understanding of human disease. Applicant must have completed a PhD, MD, or DPhil, be within five years of starting a faculty (professor) position, and demonstrate ability to independently supervise a group containing articles that are innovative and high impact. The award has innovation from translation of basic science to a clinical application.

POSTDOCTORAL FELLOWSHIPS
This fellowship provides an annual stipend of $50,000 for postdoctoral fellows at institutions within New York. The research that will explore the basic biology and therapeutic potential of model organisms. The main goal is to foster the eventual use of stem cells for the treatment of human diseases.

TRAVEL FELLOWSHIPS
The foundation works with the International Society for Stem Cell Research to provide travel fellowships for junior investigators to attend the society’s annual meeting, one of the most important annual gatherings of stem cell scientists.

FIELDS OF INTEREST

SUBJECTS
Alzheimer's disease
Autism
Brain and nervous system disorders
Diabetes
Diseases and conditions
Genetic conditions and birth defects
Hematology
Kidney diseases
Leukemia
Liver diseases
Multiple sclerosis
Musculoskeletal diseases
Neurology
Pathology
Philanthropy
Respiratory system diseases
Stem cell therapy

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Identify Funding

- Identify appropriate funding agencies
  - Government
  - Non-government
- Identify appropriate funding mechanisms
  - Research
  - Training
- Create a calendar of application deadlines for identified funding programs

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Approaches for Competitive Applications

- Identify Funding
- Prepare to Complete the Grant Application
- Complete the Grant Application
It’s not the will to win, but the will to prepare to win that makes the difference.

Bear Bryant, University of Alabama
Prepare to Complete the Grant Application

- Speak with Agency Program Officer
- Speak with colleagues who are/were awardees
- Review funded applications if possible
- Review agency’s review criteria
- Identify what will make the application more competitive
  - Research and/or career development arrangements
  - Access to core facilities/research resources
- Strengthen “Preliminary Work/Pilot Data”
- Who will write confidential letters of reference?

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Research and Career Development Arrangements

- Multiple Principle Investigators (research awards)
- Multiple Mentors (mentored awards)
- Advisors (mentored awards)
- Co-investigators/Collaborations
- Subcontracts to other institutions
- Multidisciplinary/Interdisciplinary

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Prepare to Complete the Grant Application

- Identify and meet with Co-investigators, Collaborators, Consultants, Advisors
  - Identify roles and responsibilities
  - Administrative requirements (e.g. if other countries/institutions are involved)

- Identify necessary core facilities and other research resources

- Meet with research administrators

- Human subjects, lab animals, and any other regulatory issues?

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Approaches for Competitive Applications

- **Identify Funding**
- **Prepare to Complete the Grant Application**
- **Complete the Grant Application**
Complete the Grant Application

- Review the application instructions
- Identify the different components
- Create a checklist
- Create an outline
  - Content, Length of section \((vis a vis\) page limits)
- Identify and delegate responsibilities for the different components
  - Technical/Scientific
  - Administrative – e.g. budget
  - Regulatory
  - Draft letters of collaboration/support

Complete the Grant Application

- Confirm page limits for each component
- Create a schedule for any required meetings
- Determine:
  - Shared computer drive/folders
  - Naming of files (dates?)
  - Track changes?
  - Font, margin, format of literature citation
- Set a **firm** time-line for each responsibility
  - Writing milestones
  - Absolute deadline date for final compilation
Complete the Grant Application

- Read **instructions**
- **Never assume** that reviewers “will know what you mean”
- Refer to **literature** thoroughly and thoughtfully
- Explicitly state the **rationale** of the proposed investigation (“**the hypothesis of my study is...**”)
- Discuss **limitations** and potential “**challenges**” and how these will be addressed (e.g., “**alternate approaches**”)
- Include well-designed **tables and figures**
- Present an **organized**, lucid write-up (use an **outline**)
- Ask colleagues to **review** and comment
Complete the Grant Application

- Read instructions
- Never assume that reviewers “will know what you mean”
- Refer to literature thoroughly and thoughtfully
- Explicitly state the rationale of the proposed investigation (“the hypothesis of my study is…”)
- Discuss limitations and potential “challenges” and how these will be addressed (e.g., “alternate approaches”)
- **Include well-designed tables and figures**
- Present an organized, lucid write-up (use an outline)
- Ask colleagues to review and comment
Include Well-Designed Tables and Figures

- Include explanatory caption with the figure (not buried in text)
- Not overly complicated
- Informative, even if printed in black and white
- Easy for the reviewers to read

Tips:

- Bold label in text (e.g., Fig. 4) so it’s easier for reviewers to locate relevant text for individual Figure
- Try to have Figure and relevant text on the same page
### Timeline for Specific Aims and Benchmarks/Milestones of Research Progress

<table>
<thead>
<tr>
<th>Benchmarks/ Milestones</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary of Specific Aim 1a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary of Specific Aim 1b</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Summary of Specific Aim 2a</td>
<td></td>
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<tr>
<td>Summary of Specific Aim 2b</td>
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<td></td>
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</tr>
<tr>
<td>Summary of Specific Aim 3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Anticipate Questions
and
Answer them before
they are asked
Not everything that can be counted counts.
Not everything that counts can be counted.

Quote Investigator suggests crediting sociologist William Bruce Cameron
http://quoteinvestigator.com/2010/05/26/everything-counts-einstein/

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Investigator

- Competent
- Enthusiastic
- Thorough
- Professional

Personal Statement/
Candidate’s Background

When describing a previous research experience:

- What was the hypothesis/scientific question?
- Why was the study important?
- What were the findings and conclusions?
- What were your role and responsibilities?
- What did you learn and accomplish?
  - “Intellectual aspects”
  - Do not focus on technical aspects
- Cite any resulting publications
- Describe any honors/awards and conference/workshop presentations
Possible Problems Specific for Mentored Career Development Awards

Mentor

- Too many other responsibilities
  (e.g. administrative, clinical)
- Too many other mentees
  (e.g. students, post-docs)
- Not appropriate scientifically
- Too junior
- Limited experience as a mentor
- Limited funds to support proposed research

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Possible Problems Specific for Mentored Career Development Awards

Institution

- Limited scientific/technical resources
- Limited career development opportunities
- Limited opportunities for career advancement

Elements of a Good Proposal

- Feasible
- Relevant
- Unique
- Innovative
- Clear
- Brief
- Consistent
Common Problems with Grant Applications from New Investigators

- Does not address/follow funding agency’s mission, specific instructions, budget limits, etc.
- Overly ambitious
- Not independent of previous mentor’s research
- Fishing expedition
- Not hypothesis driven
- Descriptive, not mechanistic project
- Unfocussed
- No or insufficient preliminary data
- Unrealistic budget
- Methodologies beyond the expertise of investigator or research team

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NIH: one round of applications
Pink Sheet: Reviewers’ Comments
Bell Curve of Reviewer’s Grant Applications

Definitely do not fund

Fine

Definitely fund

Great

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Poor Statistics
Research Resources
not Adequately Described
Career Development/Research Training Plan not Comprehensive

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Figure Caption Font too Small
All Components of the Application are as Strong as Possible
Good Luck!