Career Development in Research: A Path and a Journey

Eastern-Atlantic Student Research Forum
March 4, 2016

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

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

- Types of Awards
  - Fellowships (F’s), Training grants (T’s), Career Transition Awards, Research grants,

- Planning & Organizing a Research Proposal
Topics to be Discussed

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

- **Types of Awards**
  - Fellowships (F’s), Training grants (T’s), Career Transition Awards, Research grants,

- Planning & Organizing a Research Proposal

U.S. Dept. of Health and Human Services

- Food and Drug Administration
- Centers for Medicare & Medicaid Services
- Centers for Disease Control and Prevention
- Substance Abuse and Mental Health Services Administration
- National Institutes of Health
- Health Resources and Services Administration
- Agency for Healthcare Research and Quality
- Agency for Toxic Substances and Disease Registry

Adapted from: NIH (DRG) - Peer Review of NIH Research Grants Applications

Jaime S. Rubin, Ph.D.: http://grantscourse.columbia.edu
### National Institutes of Health

- National Cancer Institute
- National Eye Institute
- National Heart, Lung, & Blood Institute
- National Human Genome Research Inst
- National Institute on Aging
- National Inst of Alcohol Abuse & Alcoholism
- National Inst of Allergy & Infectious Diseases
- National Inst of Arthritis & Musculoskeletal & Skin Diseases
- National Institute of Child Health & Human Development
- National Inst on Deafness & other Communication Disorders
- National Inst of Dental & Craniofacial Research
- National Institute of Diabetes & Digestive & Kidney Diseases
- National Institute on Drug Abuse
- National Institute of Environmental Health Sciences
- National Institute of General Medical Sciences
- National Institute of Mental Health
- National Institute of Neurological Dis and Stroke
- National Institute of Nursing Research
- National Library of Medicine
- National Ctr for Complementary & Integrative Health
- National Inst on Minority Health & Health Disparities
- National Ctr Adv Translational Sciences
- John E. Fogarty International Center
- Office of the Director
- Center for Scientific Review
- Center for Information Technology
- NIH Clinical Center

Adapted from: NIH (DRG) - Peer Review of NIH Research Grants Applications

Topics to be Discussed

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

- **Types of Awards**
  - Fellowships (F’s), Training grants (T’s), Career Transition Awards, Research grants,

- **Planning & Organizing a Research Proposal**
Types of Awards

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

Not All Funding Opportunities Are the Same

- **Different mission statements**
  - Career development (K’s)/ Scholar awards
  - Research project (R’s)

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

- **Different time frames**
  - Not renewable: 5 years (K’s), 3 years (F’s), 2 years (T’s)
  - Renewable: 4 years - 5 years (R01) each competitive period
# Timeline of Funding for Junior Investigators

<table>
<thead>
<tr>
<th>Medical School</th>
<th>Internship/Residency</th>
<th>Fellowship – Research Years</th>
<th>Instructor/Assistant Professor</th>
</tr>
</thead>
</table>

**Short term Training**

Medical Student: Short Term Training

- **NIH**
  - T35 training grant: Summer between 1st and 2nd years
  - NIH campus: Summer Internship Program
  - NIDDK: Medical Student Research Program in Diabetes

- **AOA Honor Medical Society - Carolyn L. Kuckein Student Research Fellowships**
  - For research in clinical investigation, basic research, epidemiology, and social sciences/health services research

Medical Student: Short Term Training

- **American Heart Association:**
  - Student Scholarships
    - Cardiovascular Disease
    - Cerebrovascular Disease and Stroke

- **American Medical Association Foundation**
  - Seed Grant Research Program
  - Supports research in: Cardiovascular/Pulmonary Diseases and Pancreatic Cancer

Medical Student: Short Term Training

- American Skin Association
  - Medical Student Grant
- Crohn's and Colitis Foundation of America
  - Student Research Fellowship Awards
- Endocrine Society
  - Research Fellowships
- Infectious Diseases Society of America
  - Medical Scholars Program

Medical Student: Short Term Training

- HIV Vaccine Trials Network (HVTN)/Fred Hutchinson Cancer Research Center
  - Research and Mentorship Program (RAMP) Scholars

- Wilderness Medical Society
  - Charles S. Houston Grant
Timeline of Funding for Junior Investigators

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

Short term Training

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

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Medical Student: Year-long Enhancement Programs

- NIH
  - Medical Research Scholars Program
    - Mentored basic, clinical, or translational research
  - Fogarty International Center
    - Global Health Program for Fellows and Scholars
    - Fulbright-Fogarty Fellowships in Public Health
  - National Institute of Diabetes and Digestive and Kidney Diseases
    - Medical Student Research Training Program
  - National Institute of Environmental Health Sciences
    - Fellowships in Environmental Medicine for Medical Students

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Medical Student: Year-long Enhancement Programs

- Centers for Disease Control & Prevention
  - CDC-Hubert Global Health Fellowship
- Doris Duke Charitable Foundation
  - International/Global Health
- Hughes (Howard) Medical Institute
  - Medical Research Fellows Program
    - Academic or Nonprofit Research Institution
    - Janelia Research Campus (VA)
    - KwaZulu-Natal Research Institute for Tuberculosis and HIV (K-RITH) (Durban, South Africa)
Medical Student: Year-long Enhancement Programs

- **American Diabetes Association**
  - Clinical Scholars Award

- **American Heart Association**
  - Medical Student Research Program (Founders Affiliate)

- **Research to Prevent Blindness**
  - Medical Student Fellowships

- **Sarnoff Endowment for Cardiovascular Science**
  - Fellowship Training Program

## Timeline of Funding for Junior Investigators

<table>
<thead>
<tr>
<th>Short term Training</th>
<th>Research Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical School</td>
<td>Internship/Residency</td>
</tr>
<tr>
<td></td>
<td>Fellowship – Research Years</td>
</tr>
<tr>
<td></td>
<td>Instructor/Assistant Professor</td>
</tr>
</tbody>
</table>

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

Residents

- **American Academy of Otolaryngology - Head and Neck Surgery Foundation**
  - Resident Research Grant

- **American Academy of Pediatrics**
  - Resident Research Grant

- **American College of Gastroenterology**
  - Clinical Research Awards

- **American College of Surgeons**
  - Resident Research Scholarship

Timeline of Funding for Junior Investigators

- Short term Training
- Research Support
- Fellowship – Research Years
- Instructor/Assistant Professor

Medical School
Internship/Residency

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

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

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Timeline of Funding for Junior Investigators

Graduate School

Individual Fellowship Training Grant
Mentor’s Research Grant

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

Post-doctoral Years

Instructor/Assistant Professor

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

Do your fellowship programs of interest have a T32?

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Post-doc: Individual Fellowship

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

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

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Post-doc Fellowships (F32s)
Applications, awards, and success rates

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Post-doc: Individual Fellowship
- Voluntary Health Organizations, Foundations, Professional Societies -

- American Cancer Society
- American Heart Association (Founders)
- American Kidney Fund
- American Liver Foundation
- Daland Fellowships in Clinical Investigation
- Helen Hay Whitney Foundation

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Timeline of Funding for Junior Investigators

Short term Training

Medical School

Research Support

Internship/Residency

Fellowship – Research Years

Instructor/Assistant Professor

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

Career Transition Awards

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

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Timeline of Funding for Junior Investigators

Graduate School
- Individual Fellowship Training Grant
- Mentor’s Research Grant

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

Instructor/Assistant Professor
- Career Transition Awards

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

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
1-2 years as a mentored K award for “post-docs”
- Funding level is Institute-specific
  - Salary and Research Support
- 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
Implementation

In response to the Physician Scientist Workforce Working Group recommendations, NIH is reissuing the K99/R00 FOA to provide additional information for physician-scientists who may wish to apply for this program. Specifically:

- **Section I. Funding Opportunity Description:** A separate section has been added under "Additional Information for Physician-Scientists" to further clarify features of K99/R00 program suited to physician scientists, and to provide guidance to applicants with respect to career stage and timing of the application.

- **Section III. Eligibility Information:** A separate section has been added under "Physician-Scientists in positions not designated as postdoctoral positions" to provide additional guidance on the differences between independence in clinical responsibilities and independence in research. In addition, more specific guidance is provided under "Level of Effort" and "Mentor(s)" sections.

- **Section VI. Award Administration Information:** Under the section "Transition to the Independent Phase" additional guidance is provided regarding institutional commitment to the awardee during the R00 phase of the award and beyond.

Career Transition Awards

- **BWF: Career Awards for Medical Scientists**
  - To support physician-scientists during the last years of a mentored postdoctoral/fellowship position and the beginning years of an independent faculty position.
  - Candidates must hold an M.D., D.D.S., or D.V.M. degree.
  - 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

Career Transition Awards

- American Heart Association (National) Fellow-to-Faculty Transition Award
  - Provides funding for the “period of career development that spans the completion of research training through the early years of the first faculty/staff position”
  - **Training stage:** Maximum of $65,000 per year
  - **Faculty stage:** Maximum of $132,000 per year
  - Award Duration: 5 years

Career Transition Awards

- **JDRF: Advanced Postdoctoral Fellowships**
  - Provides an opportunity to receive full-time research training and to assist awardees in transitioning from a fellowship to an independent (faculty-level) position
  - First degree (PhD, MD, DMD, DVM, or equivalent) received no more than 5 years before the fellowship
  - $90,000 per year for up to 3 years
  - **Transition Award**: Optional transition year in which awardees may request funding support for their first year as a faculty member (up to $110,000 for one year)

Timeline of Funding for Junior Investigators

Short term Training
Medical School
- Year-long Enhancement Programs
- MD/PhD Fellowship or Institutional T32

Research Support
Internship/Residency
- Individual Post-doc Fellowship or Institutional T32 Post-doc Training Grant slot

Fellowship – Research Years

Instructor/Assistant Professor
- Career Transition Awards
- Individual Mentored K Career Development Award

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

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

- **Research areas:** (1) Mechanisms of human disease, (2) Therapeutic interventions, (3) Clinical trials, and (4) Development of new technologies

Mentored Research Scientist Development Award (K01)

Not all NIH Institutes participate in program. Participating Institutes may use for different purposes.

- Train in a new field
- Specific research areas
- Hiatus in research career
- Increase research workforce diversity

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Mentored Research Scientist Development Awards (K01)

- **NIMH:**
  - Broad spectrum of basic and translational research, including basic neuroscience, human genetics, adult and developmental translational research, services and intervention research, and AIDS-related research

- **NCI, NHLBI, NINDS:** Underrepresented faculty

- **NIAID:**
  - (a) Epidemiology
  - (b) Modeling Techniques
  - (c) Outcomes Research

- **NLM:** Biomedical Informatics

Mentored Research Scientist Development Awards (K01)

- **NIDDK:**
  - Advanced postdoctoral/recently appointed junior faculty (usually with a Ph.D. degree)

- **NHLBI:**
  - (a) Epidemiology
  - (b) Biostatistics
  - (c) Outcomes Research
  - (d) Implementation Research

- **NHGRI:**
  - (a) Genomics
  - (b) Ethical, legal and social issues (ELSI)
Mentored Research Scientist Development Awards (K01)

- **NINR:**
  - Symptom Management, Pulmonary, Critical Care, Trauma, Reproductive Health, Genetics, Epigenetics, Behavioral Research, Incorporation of Advanced Technology and End-of-Life and Palliative Care

- **NICHD:**
  - (a) Medical Rehabilitation Research
  - (b) Child Abuse and Neglect
  - (c) Population Research

- **FIC:**
  - International Research Scientist Development Award (IRSDA)
Mentored Career Development Award in Biomedical Big Data Science for Clinicians and Doctorally Prepared Scientists (K01)

National Human Genome Research Institute (NHGRI)
National Cancer Institute (NCI)
National Eye Institute (NEI)
National Heart, Lung, and Blood Institute (NHLBI)
National Institute on Aging (NIA)
National Institute on Alcohol Abuse and Alcoholism (NIAAA)
National Institute of Allergy and Infectious Diseases (NIAID)
National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)
National Institute of Biomedical Imaging and Bioengineering (NIBIB)

Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD)
National Institute on Deafness and Other Communication Disorders (NICCD)
National Institute of Dental and Craniofacial Research (NIDCR)
National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)
National Institute on Drug Abuse (NIDA)
National Institute of Environmental Health Sciences (NEIHS)
National Institute of General Medical Sciences (NIGMS)
National Institute of Mental Health (NIMH)
National Institute of Neurological Disorders and Stroke (NINDS)
National Institute of Nursing Research (NINR)
National Institute on Minority Health and Health Disparities (NIMHD)
National Library of Medicine (NLM)
National Center for Complementary and Alternative Medicine (NCCAM)
Office of Behavioral and Social Sciences Research (OBSSR)
Office of Strategic Coordination (Common Fund)

RFA-HG-14-007


Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Mentored Quantitative Research Career Development Award (K25)

- Investigators with quantitative scientific and engineering backgrounds outside of biology or medicine
- Focus their research on behavioral and/or biomedical research (basic or clinical)
Research Career Development Awards

**AHRQ K08: Mentored Clinical Scientist Research Career Development Award**

- Quality,
- Safety,
- Efficiency,
- Effectiveness of health care

**AHRQ K08: Patient-Centered Outcomes Research (PCOR) Mentored Clinical Investigator Award**

**AHRQ K01: Patient-Centered Outcomes Research (PCOR) Mentored Research Scientist Development Award**
CDC K01:

National Institute for Occupational Safety and Health

Mentored Research Scientist Development Award

“career development experience in occupational health and safety research leading to research independence”
Research Career Development/Scholar Programs

- AGA Research Foundation
  - Research Scholar Awards
- American Heart Association
  - Scientist Development Grant
- Robert Wood Johnson Foundation
  - Harold Amos Medical Faculty Development Program
- Damon Runyon Cancer Research Foundation
  - Clinical Investigator Award
- Doris Duke Charitable Foundation
  - Clinical Scientist Development Grant
Timeline of Funding for Junior Investigators

- Short term Training
- Medical School
  - Year-long Enhancement Programs
    - MD/PhD Fellowship or Institutional T32
- Research Support
- Internship/Residency
  - Individual Post-doc Fellowship or Institutional T32 Post-doc Training Grant slot
- Fellowship – Research Years
  - Institutional K12 Career Development Slot
- Instructor/Assistant Professor
  - Career Transition Awards
  - Individual Mentored K Career Development Award

Mentored Clinical Scientist Development Program Award (K12)

- Support to an institution for career development experiences for junior investigators 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**

Mentored Clinical Scientist Development Program Award (K12)

- **Multi-Institute**: Women’s Health
- **Institute specific**
  - NCI: Clinical oncology
  - NEI: Clinical vision scientists
  - NIDDK: Pediatric diabetes research
  - NICHD:
    - Pediatric scientist/Child health
    - Pediatric critical care/trauma surgery
    - Women’s reproductive health
Mentored Clinical Scientist Development Program Award (K12)

- Institute specific
  - NIDCR: Temporomandibular joint disorders and orofacial pain
  - NIDA: Drug abuse and addiction
  - NINDS: Child Neurologists

- AHRQ: Patient Centered Outcomes Research

- CTSA - Clinical and Translational Scientist Award: KL2
NIH CTSA Awards: A Home for Clinical and Translational Science

Source: Zerhouni (NIH) [9/06]
Timeline of Funding for Junior Investigators

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

- **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
  - Career Transition Awards
    - Individual Mentored K Career Development Award
  - NIH Loan Repayment Program

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

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
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
- Pediatric Research
- Health Disparities Research
- Clinical Researchers from Disadvantaged Backgrounds
- Contraception and Infertility Research
<table>
<thead>
<tr>
<th>LRP</th>
<th>New + Renewal</th>
<th></th>
<th></th>
<th>New</th>
<th></th>
<th></th>
<th>Renewal</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Applications N</td>
<td>Awards n</td>
<td>Success Rate %</td>
<td>Applications N</td>
<td>Awards n</td>
<td>Success Rate %</td>
<td>Applications N</td>
<td>Awards n</td>
<td>Success Rate %</td>
</tr>
<tr>
<td>Clinical Research</td>
<td>1,529</td>
<td>866</td>
<td>57</td>
<td>874</td>
<td>400</td>
<td>46</td>
<td>655</td>
<td>466</td>
<td>71</td>
</tr>
<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>
</tr>
<tr>
<td>Health Disparities Research</td>
<td>486</td>
<td>125</td>
<td>26</td>
<td>303</td>
<td>55</td>
<td>18</td>
<td>183</td>
<td>70</td>
<td>38</td>
</tr>
<tr>
<td>Clinical Research for Individuals from Dis advantaged Backgrounds</td>
<td>50</td>
<td>25</td>
<td>50</td>
<td>32</td>
<td>11</td>
<td>34</td>
<td>18</td>
<td>14</td>
<td>78</td>
</tr>
<tr>
<td>Contraception and Infertility Research</td>
<td>41</td>
<td>23</td>
<td>56</td>
<td>28</td>
<td>12</td>
<td>43</td>
<td>13</td>
<td>11</td>
<td>85</td>
</tr>
<tr>
<td>Total</td>
<td>2,736</td>
<td>1,351</td>
<td>49</td>
<td>1,641</td>
<td>635</td>
<td>39</td>
<td>1,095</td>
<td>716</td>
<td>65</td>
</tr>
<tr>
<td>LRP</td>
<td>Awards</td>
<td>Funding</td>
<td>Mean Award</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------</td>
<td>---------------</td>
<td>------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Research</td>
<td>866</td>
<td>$43,757,421</td>
<td>$50,528</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pediatric Research</td>
<td>312</td>
<td>$16,891,639</td>
<td>$54,140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Disparities Research</td>
<td>125</td>
<td>$6,224,388</td>
<td>$49,795</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Research for Individuals from Disadvantaged Backgrounds</td>
<td>25</td>
<td>$1,517,710</td>
<td>$60,708</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contraception and Infertility Research</td>
<td>23</td>
<td>$977,528</td>
<td>$42,501</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,351</td>
<td>$69,368,686</td>
<td>$51,346</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.
Health Resources and Services Administration
Loan Repayment Programs

Faculty Loan Repayment Program

- Health professions educators from disadvantaged backgrounds
- $40,000 for a two-year service as a faculty member of an accredited health professions college or university

National Health Service Corps (NHSC)

- $50,000 toward student loans in exchange for a two-year commitment at an NHSC-approved site
- Primary care medical, dental, or mental/behavioral health clinicians

Students to Service Loan Repayment Program

- Up to $120,000 for medical students in their final year of school
- Commit to serving either 3 years full-time or 6 years part-time at an NHSC-approved site

Health Resources and Services Administration/NURSE Corps Loan Repayment Program

For registered nurses and advance practice nurses working at Critical Shortage facilities and nurse faculty employed at accredited schools of nursing.

- 60% of qualifying student loans in exchange for a 2-year service commitment
- An additional 25% of the original loan balance for an optional third year
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
- "Comprehensive" funding
- 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

Research Project Grants: Applications, Awards, and Success Rates

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
### 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 Ro1s* 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

http://www.brokenpipeline.org/brokenpipeline.pdf

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)]
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
Preliminary Projection of Age Distribution of NIH RPG Investigators: 2020

Sources: IMPAC II Current and History Files and Preliminary Demographic Projection Model

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

Percent of All Principal Investigators

Fiscal Year

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.

Comments

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
HOT SPOT

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>Percentile</th>
<th>Priority Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R01</td>
<td>14</td>
<td></td>
<td>Research Project Grant</td>
</tr>
<tr>
<td>ESI</td>
<td>24*</td>
<td></td>
<td>Early Stage Investigators</td>
</tr>
</tbody>
</table>

*Summary Statement issues must be satisfactorily resolved on applications >19 percentile.

FY16

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

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
R01-Equivalent grants, New (Type 1)
Success rates, by career stage of investigator

[Graph showing success rates by fiscal year for first-time and established investigators]
Topics to be Discussed

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

- **Types of Awards**
  - Fellowships (F’s), Training grants (T’s), Career Transition Awards, Research grants,

- **Planning & Organizing a Research Proposal**

Approaches for Competitive Applications

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

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

- Speak with Program Officer
- Speak with colleagues who are/were awardees
- Review funded applications if possible
- Identify what will make the application more competitive (e.g. research arrangements)
- Strengthen “Preliminary Work/Data”
- Who will write confidential letters of reference?
Research and Career Development Arrangements

- Multiple Principle Investigators (research awards)
  - Now permitted by NIH
- Multiple Mentors (mentored awards)
- Advisors (mentored awards)
- Co-investigators/Collaborations
- Subcontracts
- Multidisciplinary/Interdisciplinary
Complete the Grant Application

- Review the application instructions
- Identify the different components
- Create a checklist
- Identify and delegate responsibilities for the different components
  - Technical/Scientific
  - Administrative – e.g. budget
  - Regulatory
  - Draft letters of collaboration/support
When Preparing an 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
- Discuss “challenges” and how these will be addressed (e.g., alternate approaches)
- Include well-designed tables and figures
- Present an organized, lucid write-up
- Ask colleagues to review and comment
## 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>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary of Specific Aim 1a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary of Specific Aim 1b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary of Specific Aim 2a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary of Specific Aim 2b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary of Specific Aim 3a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary of Specific Aim 3b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Anticipate Questions and Answer them before they are asked
Elements of a Good Proposal

- Feasible
- Relevant
- Unique
- Innovative
- Clear
- Brief
- Consistent

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

- Competent
- Enthusiastic
- Thorough
- Professional
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
NIH: one round of applications
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
Figure Caption Font too Small
All Components of the Application are as Strong as Possible
Good Luck!