Extramural Support for the Career Development of Physician-Scientists and Best Practices for Competitive Grant Applications

Medical Students: Summer Research

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Dept. of Medicine
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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**
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- **Planning & Organizing a Research Proposal**
National Institutes of Health

<table>
<thead>
<tr>
<th>National Cancer Institute</th>
<th>National Heart, Lung, &amp; Blood Institute</th>
<th>National Human Genome Research Inst</th>
<th>National Institute on Aging</th>
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<tbody>
<tr>
<td>National Inst of Alcohol Abuse &amp; Alcoholism</td>
<td>National Inst of Arthritis &amp; Musculoskeletal &amp; Skin Diseases</td>
<td>National Institute of Child Health &amp; Human Development</td>
<td>National Inst on Deafness &amp; other Communication Disorders</td>
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<td>National Inst of Dental &amp; Craniofacial Research</td>
<td>National Institute of Diabetes &amp; Digestive &amp; Kidney Diseases</td>
<td>National Institute of Environmental Health Sciences</td>
<td>National Inst of Biomedical Imaging and Bioengineering</td>
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<td>National Inst of Neurological Dis and Stroke</td>
<td>National Institute of Nursing Research</td>
<td>National Ctr for Complementary &amp; Integrative Health</td>
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<td>John E. Fogarty International Center</td>
<td>Office of the Director</td>
<td>Center for Scientific Review</td>
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Adapted from: NIH (DRG) - Peer Review of NIH Research Grants Applications

Topics to be Discussed

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  - Federal
    - National Institutes of Health
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  - 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**
  - 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 years–5 years (R01) each competitive period
Timeline of Funding for Junior Investigators

Medical School

Internship/Residency

Fellowship – Research Years

Instructor/Assistant Professor

Short term Training

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Medical Student: Short Term Training

- **NIH**
  - T35 training grant: Usually summer between 1st & 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
    - Cardiovascular Surgery

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

Medical Student: Short Term Training

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

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Medical Student: Short Term Training

- HIV Vaccine Trials Network (HVTN)
  - Research and Mentorship Program (RAMP) Scholar Program for African-American and Latino/a Medical Students

- Wilderness Medical Society
  - Support for “research on topics related to health and medicine in extreme or austere environments”

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Medical Student: Short Term Training

- **New York Academy of Medicine**
  - Glorney-Raisbeck Medical Student Grants in Cardiovascular Research
  - David E. Rogers Fellowship Program
  - Margaret E. Mahoney Fellowships
  - Ferdinand C. Valentine Medical Student Research Grants in Urology
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

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Medical Student:

Year-long Enhancement Programs

- **NIH**
  - Medical Research Scholars Program
    - Mentored basic, clinical, or translational research
  - Fogarty International Center
    - Global Health Training Program
    - Fulbright-Fogarty Fellowships in Public Health
  - National Institute of Diabetes and Digestive and Kidney Diseases
    - Medical Student Research Training Supplement (T32)
  - National Institute of Environmental Health Sciences
    - Medical Student Research Fellowship

Medical Student:
Year-long Enhancement Programs

- Centers for Disease Control & Prevention
  - CDC-Hubert Global Health Fellowship
- Doris Duke Charitable Foundation
  - International Clinical Research Fellowship
- Hughes (Howard) Medical Institute
  - Medical Research Fellows Program
    - Academic or Nonprofit Research Institution
    - Janelia Research Campus (VA)

Medical Student: Year-long Enhancement Programs

- American Heart Association
  - Clinical Health Profession Student Training Program
- Research to Prevent Blindness
  - Medical Student Fellowships
- Sarnoff Cardiovascular Research Foundation
  - Fellowship Program
Timeline of Funding for Junior Investigators

Short term Training

Research Support

Medical School

Internship/Residency

Fellowship – Research Years

Instructor/Assistant Professor

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

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Residents - Research

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

- **American College of Gastroenterology / ACG Institute for Clinical Research & Education**
  - Clinical Research Awards

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

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

- Rheumatology Research Foundation
  - Resident Research Awards

- American Society of Hematology
  - HONORS (Hematology Opportunities for the Next Generation of Research Scientists) - stipend to conduct research and travel support to attend the ASH annual meeting

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

American Heart Association:
Travel Stipends to Scientific Sessions

- Council on:
  - Arteriosclerosis, Thrombosis and Vascular Biology (ATVB)
  - Basic Cardiovascular Sciences (BCVS)
  - Cardiopulmonary, Critical Care, Perioperative and Resuscitation (3CPR)
  - Cardiovascular Disease in the Young (CVDY)
  - Cardiovascular and Stroke Nursing (CVSN)
  - Cardiovascular Radiology and Intervention (CVRI)
  - Cardiovascular Surgery and Anesthesia (CVSA)
  - Clinical Cardiology (CLCD)
  - Functional Genomics and Translational Biology (FGTB)
  - Peripheral Vascular Disease (PVD)
Timeline of Funding for Junior Investigators

Short term Training
Medical School

Research Support
Internship/Residency

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

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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

Do your fellowship programs of interest have a T32?

Post-doc: Individual Fellowship

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

Review criteria:
- Individual fellow
- Mentor
- Research project
- Research environment
Post-doc Fellowships (F32’s) Applications, awards, and success rates

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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
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

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

- Instructor/Assistant Professor
  - Career Transition Awards

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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
  - 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

5. NIH should establish a new physician-scientist-specific granting mechanism to facilitate the transition from training to independence. This program should be similar to the K99/R00 program whose funding currently goes almost exclusively to individuals holding a PhD degree. This new grant program could serve either as a replacement or transition from existing K Awards for physician scientists, and should provide a longer period of support, potentially lengthening the R00 phase to 5 years (with an interim staff review at year 3). This new grant series, as well as K and all other training awards, should rigorously enforce protected time of at least 75 percent effort and provide sufficient salary support to make that possible.
The purpose of the NIH Pathway to Independence Award (K99/R00) program is to increase and maintain a strong cohort of new and talented, NIH-supported, independent investigators. This program is designed to facilitate a timely transition of outstanding postdoctoral researchers with a research and/or clinical doctorate degree from mentored, postdoctoral research positions to independent, tenure-track or equivalent faculty positions. The program will provide independent NIH research support during this transition in order to help awardees to launch competitive, independent research careers.

Prospective candidates are encouraged to contact the relevant NIH staff for IC-specific programmatic and budgetary information: Table of IC-Specific Information, Requirements and Staff Contacts.
Additional Information for Physician-Scientists

For the purposes of this program, physician-scientists include individuals with an MD, DO, DDS/DMD, DVM/VMD, or nurses with research doctoral degrees who devote the majority of their time to biomedical research. The K99/R00 is intended for those physician-scientists who already have substantial research training and are dedicated to initiating a strong, research-intensive career as physician-scientists. The K99/R00 program is designed to facilitate a timely transition of outstanding physician-scientists from mentored, research positions to independent, tenure-track or equivalent faculty positions, and to provide independent NIH research support during the transition. **Individuals who need a longer period of mentored career development before they are prepared to begin the transition to research independence should consider the K08 or K23 program (see: K Kiosk).**
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.O., 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:** Years 3-5
    Annual Total: $170,000

Career Transition Awards

- **American Heart Association**

**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**
  - Supports full-time research training and 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 6 years before application
  - No citizenship requirements
  - $95,000 per year for up to 3 years
  - **Transition Award**: “Optional transition year in which the awardee may request funding support in their first year as a faculty member” (up to $110,000 for one year)


Timeline of Funding for Junior Investigators

- Medical School
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Short term Training

Research Support

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

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

Career Transition Awards

Individual Mentored K Career Development Award

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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

- **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

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Mentored Research Scientist Development Awards (K01)

- **NIMH:**
  - Supports “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”

- **NINDS:**
  - Supports “postdoctoral researchers… Candidates are encouraged to apply for support… between the second through fourth year of cumulative mentored postdoctoral research experience…”

- **NCI, NHLBI, NINDS:** Promote Faculty Diversity
Mentored Research Scientist Development Awards (K01)

- **NIDDK:**
  - For “experienced postdoctoral (two years minimum) and/or recently appointed junior faculty (usually with a Ph.D. degree) in biomedical, behavioral, or clinical sciences”

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

- **NLM:** Biomedical Informatics and Data Science

Mentored Research Scientist Development Awards (K01)

- **NINR:**
  - Supports “research in the areas of 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 Research Scientist Development Awards (K01)

- **NHGRI:**
  - (a) Genomic Sciences
  - (b) Ethical, legal and social issues (ELSI)

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

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 (NIDCD)
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 (NIEHS)
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


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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

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Research Career Development Awards

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<thead>
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<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</th>
<th>Total Funding</th>
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<td><strong>K23</strong></td>
<td><strong>Activity Total</strong></td>
<td><strong>575</strong></td>
<td><strong>207</strong></td>
<td><strong>36.0%</strong></td>
<td><strong>$35,665,755</strong></td>
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</table>
Agency for Healthcare Research and Quality (AHRQ)

“Mission is to produce evidence to make health care safer, higher quality, more accessible, equitable and affordable…”

- “invests in research on the Nation's health delivery system that goes beyond the "what" of health care to understand "how" to make health care safer and improve quality…
- creates materials to teach and train health care systems and professionals to put the results of research into practice…
- generates measures and data used by providers and policymakers.”

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**AHRQ K08**: Mentored *Clinical Scientist* Research Career Development Award for individuals with a clinical doctoral degree or Ph.D./other doctoral degree in a clinical discipline

**AHRQ K01**: Mentored *Research Scientist* Research Career Development Award - for individuals with a research doctoral degree

- Health Services Research -
- Quality,
- Safety,
- Efficiency, and
- Effectiveness of health care
Centers for Disease Control and Prevention (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”

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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

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

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

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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:
    - Child health
    - Pediatric scientists
    - Women’s reproductive health

Mentored Clinical Scientist
Development Program Award (K12)

- Institute specific
  - NHLBI: Late stage (T4) translation research
  - NIDCR: Temporomandibular joint disorders and orofacial pain
  - NIDA: Drug abuse and addiction
  - NINDS: Child Neurologists

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

Clinical Research Ethics
Biomedical Informatics
Clinical Resources
Biostatistics
Regulatory Support
Advanced Degree-Granting Programs
Participant & Community Involvement
Trial Design

NIH
Industry
Other Institutions

Source: Zerhouni (NIH) [9/06]
Mentored Clinical Scientist Development Program Award (KL2)

- CTSA – Clinical and Translational Science Award

- CUMC: TRANSFORM (Training and Nurturing Scientists for Research that is Multidisciplinary)

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Research-Oriented Masters Degree Programs

- Comprehensive courses in clinical research/
  “Patient-Oriented Research”
  - Biostatistics, epidemiology, study design,
    bioethics, legal and regulatory issues

- For the career development of clinical investigators

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

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

**Medical School**

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

**Internship/Residency**

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

**Fellowship – Research Years**

- NIH Loan Repayment Program

**Instructor/Assistant Professor**

- Individual Mentored K Career Development Award

Jaime S. Rubin, Ph.D., [http://grantscourse.columbia.edu](http://grantscourse.columbia.edu)
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
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></th>
<th>All LRPss</th>
<th>New</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Applications</td>
<td>1,554</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Awards</td>
<td>608</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Success Rate</td>
<td></td>
<td>39%</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Mean Award</td>
<td>$67,680</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Age of Awardees</td>
<td>35 Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Funding</td>
<td>$41,149,389</td>
<td></td>
<td></td>
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</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

- “Pursuing a career as a faculty member at a health professions school…”
- Loan payment assistance up to $40,000…
- From a disadvantaged background, based on environmental and/or economic factors”

https://bhw.hrsa.gov/loansscholarships/flrp

Jaime S. Rubin, Ph.D.: http://grantscourse.columbia.edu
National Health Service Corps (NHSC)

- “Primary care medical, dental and mental/behavioral health clinicians…”
- Up to $50,000 to repay their health profession student loans…
- Two-year commitment to work at an approved NHSC site in a high-need, underserved area”

https://nhsc.hrsa.gov/loanrepayment/loanrepaymentprogram.html
Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Career Development (K) Support to Research Grant (R01)

K01/K08/K23 → R01
K12/K23 → R01
K12/K23 → R01
K01/K08/K23 → R01

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

R01 Research Award

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)
Research Grant (NIH R01)

- Supports a discrete, specified project
  - Specific Aims
- “Comprehensive” funding
- Modular budgets up to $250,000/year
- Multi-year
- Flexibility
- Most NIH-supported investigator-initiated research is through this funding mechanism

Research Grant (NIH R01)

- Funds research project
  - Salaries of PI and other research personnel
  - Supplies, reagents, etc
  - Animal costs
  - Patient care costs
  - Core facilities
  - Travel to national meetings

- Multi-Year (4yrs – 5yrs)

- Renewable
  - e.g. original grant + 2 renewals = 15yrs
Research Project Grants: Applications, Awards, and Success Rates
### 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>

*RO1 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

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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)]
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
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>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
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
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
Approaches for Competitive Applications

- Identify Funding
- Prepare to Write 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?
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

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?

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Approaches for Competitive Applications

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

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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

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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
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>
</tr>
<tr>
<td>Summary of Specific Aim 2a</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Summary of Specific Aim 2b</td>
<td></td>
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<tr>
<td>Summary of Specific Aim 3</td>
<td></td>
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</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

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 Possible Problems Specific for Mentored Fellowship 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 Fellowship 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
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

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
All Components of the Application are as Strong as Possible
Good Luck!