NIGMS Support of Biomedical Research & Training: Challenges & Opportunities

Shiva P. Singh, Ph.D., Chief
Undergraduate & Pre-Doctoral Training
National Institute of General Medical Sciences, NIH
Key Points

• NIGMS support of biomedical research

• NIGMS support of training, workforce development & diversity programs
  o Some current challenges & opportunities
  o How can we do better?
NIGMS Mission

• Promote fundamental research on living systems to lay the foundation for advances in disease diagnosis, treatment and prevention.

• Enable the development of the best trained, most innovative and productive biomedical research workforce possible.
2015 NIGMS Budget: $2.37 Billion

- Cell Biology & Biophysics: 23%
- Genetics & Developmental Biology: 20%
- Pharmacology, Physiology & Biological Chemistry: 17%
- Biomed Technol, Bioinformatics & Comp Biol: 10%
- Training, Workforce Development & Diversity: 26%
- RMS: 3%
- R & D Contracts: 1%
- IR: 0%
NIGMS Support of Microbiological Research

• FY 14: R01, R21, U24, P50 & R15: ~ $70 Million

• Genetics and Physiology of Phenotypic Plasticity; Symbiotic Relationships and Community Ecology; Center for Excellence in Systems Biology; Scientific Databases; Models of Infectious Disease Agent Study; Ecology and Evolution of Infectious Disease (w/ NSF), etc.

NIGMS RPG Success Rate: 2002-2014

https://loop.nigms.nih.gov/2015/02/
NIGMS R01s
# Received & Funded vs Percentiles: 2014

https://loop.nigms.nih.gov/2015/02/
A New Approach To Research Funding

Maximizing Investigators' Research Award (MIRA) (R35)

MIRA provides support for all of the research in an investigator's laboratory that falls within the mission of NIGMS. The goal of MIRA is to increase the efficiency and efficacy of NIGMS funding by providing investigators with greater stability and flexibility, thereby enhancing scientific productivity and the chances for important breakthroughs. The program will also help distribute funding more widely among the nation's highly talented and promising investigators.

MIRA grants are for 5 years rather than the NIGMS average of 4 years. The program is currently in a pilot testing phase, with eligibility initially restricted to established investigators who have received two or more R01-equivalent awards or a single award of $400,000 or more in direct costs from NIGMS in Fiscal Year 2013 or 2014, and who have at least one grant expected to end in Fiscal Year 2016 or 2017.

Training & Workforce: Some Important Issues

• NIGMS Training, Workforce Dev & Diversity Programs
  o Building Diversity: from research questions to regions to people

• Undergraduate Education
  o Student Engagement & Persistence; Integrated Curriculum

• PhD Education
  o Changing Landscape of Ph.D. Training Outcomes
  o Promoting Innovation to improve Outcomes
  o Evaluation and Outcomes Assessment
  o Career Development

• Postdoctoral Training
  o What is Postdoctoral Training for and Who should do it?
  o Improving Postdoctoral Training
Developing an outstanding and diverse biomedical research workforce
How Can We Do Better?

• Assessment of program outcomes
• Modifications to existing programs? New programs?
• What works and what doesn’t? Where and when?
• Do we even understand what is happening?


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Student Engagement and Persistence

SCIENCE EDUCATION

Increasing Persistence of College Students in STEM
Mark J. Graham,1,2 Jennifer Frederick,1 Angela Eyars-Winston,3 Anne-Barrie Hunter,4 Jo Handelsman5

Persistence framework

Confidence ---- Motivation
Learn science ---- Early research
Active learning ---- Identify as a scientist
Learning communities

The Persistence Framework. Confidence is belief in one’s own ability; motivation is intention to take action in pursuit of goals; learning is acquiring knowledge and skills; and professional identification is feeling like a scientist.
Integrated Quantitative Science Curriculum

• Breaks down traditional disciplinary barriers.
• Central role of mathematics as a universal language of science is emphasized throughout.
• Collaborative problem solving is stressed over memorization and regurgitation of facts.
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Where will a biology PhD take you?

A faculty job is an “alternative” career.

At this rate, <8% of entering PhD students will become tenure-track faculty. Yet, 53% rank research professorships as their most desired career.¹

http://ascb.org/where-will-a-biology-phd-take-you/
Rescuing US biomedical research from its systemic flaws

Bruce Alberts\textsuperscript{a}, Marc W. Kirschner\textsuperscript{b}, Shirley Tilghman\textsuperscript{c,1}, and Harold Varmus\textsuperscript{d}

\textsuperscript{a}Department of Biophysics and Biochemistry, University of California, San Francisco, CA 94158; \textsuperscript{b}Department of Systems Biology, Harvard Medical School, Boston, MA 02115; \textsuperscript{c}Department of Molecular Biology, Princeton University, Princeton, NJ 08540; and \textsuperscript{d}National Cancer Institute, Bethesda, MD 20892

A generation at risk: Young investigators and the future of the biomedical workforce

Ronald J. Daniels\textsuperscript{1}

President, Johns Hopkins University, Baltimore, MD 21287

A Note on PhD Population Growth in Biomedical Sciences

Navid Ghaffarzadegan\textsuperscript{1*}, Joshua Hawley\textsuperscript{2}, Richard Larson\textsuperscript{3} and Yi X

\textsuperscript{1} Virginia Tech, Industrial and Systems Engineering, Blacksburg, VA United States
\textsuperscript{2} Ohio State University, John Glenn School of Public Affairs, Columbus, OH United States
\textsuperscript{3} MIT, Engineering Systems Division, Cambridge, MA United States

Change in number of tenure-track faculty members and PhD graduation rate in biological and medical sciences
NIGMS NRSA Training Grant Program Areas

- Behavioral-Biomedical Sciences Interface 6
- Bioinformatics & Computational Biology 12
- Biostatistics 7
- Biotechnology 18
- Cellular, Biochemical, and Molecular Sciences 45
- Chemistry-Biology Interface 26
- Genetics 26
- Medical Scientist (M.D./Ph.D.) Training Program (MSTP) 47
- Molecular Biophysics 23
- Molecular Medicine 7
- Pharmacological Sciences 30
- Systems and Integrative Biology 23
How Can We Do Better?

• Why do we have 11 different areas for T32s?
  o Should we have more? Fewer?
  o Why do we specify areas at all?
• How can we promote experiments to improve PhD education?
• How can we enhance mentoring and relevant career exposure?
• How can we better measure outcomes?
  o Long- and short-term metrics?
  o Better tracking methods?
Science’s Reproducibility Problem

A recent roundtable discussion identifies challenges facing the scientific community regarding a lack of reproducible results in the literature.

By Bob Grant | December 18, 2012

The gold standard for science is reproducibility. Ideally, research results are only worthy of attention, publication, and citation based if independent researchers can replicate them using a particular study’s methods and materials. But for
Initiatives to Improve Career Development

• Broadening Experiences in Scientific Training (BEST)
  o To enhance training opportunities for early career scientists to prepare them for a variety of career options in the dynamic biomedical workforce landscape.

• Administrative Supplements to NIGMS Predoctoral Training Grants (PA-15-136): Curricular activities designed to:
  o Provide graduate students with a strong foundation in research design and methods in areas related to conducting reproducible and rigorous research
  o Broaden training to better prepare students for research careers in a variety of venues.
“Any approach to the collection of career pathways information must be planned with the ultimate goal of improving programs rather than meeting minimum requirements.”
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What About Postdocs?
Why look at postdocs again in 2014?

- Are people training too long?
- Is there appropriate recognition and compensation?
- Who oversees training?
- Is there a balance of PhD-trained researchers to the number of jobs available?
- What happens to postdocs who do not get the jobs they aspired to?
- Domestic & foreign postdocs
- Lack of data collection on demographics and career
NIGMS IRACDA: Mentored Research & Teaching

Tufts University
TEACRS – Training in Education and Critical Research Skills

UNC
SPIRE POSTDOCTORAL FELLOWSHIP PROGRAM
SPIRE – SEEDING POSTDOCTORAL INNOVATORS in RESEARCH and EDUCATION

University of Pennsylvania
Postdoctoral Opportunities in Research and Teaching (PENN-PORT)

University of Kansas/Haskell Indian Nations University
IRACDA Project

VCU Institutional Research and Academic Career Development Award (VCU-IRACDA)

Baylor College of Medicine
REACH-UP IRACDA

San Diego
IRACDA
Professors for the future
Institutional Research and Academic Career Development Award

Wake Forest™ School of Medicine
Postdoctoral Research, Instruction and Mentoring Experience (PRIME) Program

Rutgers Robert Wood Johnson Medical School
INSPIRE

Stanford University
IRACDA
Institutional Research and Academic Career Development Award
How Can We Do Better?

• What are the goals of a postdoc?
• Who should become a postdoc?
• Should there be more formal training?
• How long should a postdoc last?
• Should we increase the number of staff scientists relative to postdocs? How?
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Questions?

singhs@nigms.nih.gov