Confronting the barriers to representation in the biomedical research workforce

Alison Gammie
Director of Training, Workforce Development and Diversity
March 22, 2021
The opinions expressed in this talk are the author's own and do not reflect the view of the National Institutes of Health, the Department of Health and Human Services, or the United States government.
**Structural Elements in Academia Contributing to Racism and Sexism**

**Student Level**
- Admissions
- Pedagogical Methods
- Financial Burden and Student Debt
- Time to Independence

**Postdoctoral and Faculty Level**
- Hiring Practices
- Resource Allocation
- Tenure and Promotion

**All Levels**
- Mentoring and Networking
- Climate and Culture
- Research Incentive Structure
Admissions: standardized tests have race/ethnicity, gender and socio-economic biases and are not predictive of success

A test that fails

Casey Miller & Keivan Stassun

The GRE over the entire range of scores lacks predictive ability for PhD outcomes in the biomedical sciences

The GRE fails to identify students that will graduate and hurts diversity

Date: January 29, 2019
Source: Rochester Institute of Technology
Summary: A team of researchers discovered that traditional admissions metrics for physics Ph.D. programs such as the Graduate Record Examination (GRE) do not predict completion and hurt the growth of diversity in physics.
Focusing on grades and standardized tests for admissions ignores the biases in our educational system.

- In 2015, NIH dropped the GRE from the Training Data Tables.
- In 2017, NIGMS’ training FOAs requested information about the application process and encouraged approaches that go beyond GPA and standardized tests.
- In 2020, NIGMS began the process of removing from all FOAs the NIH Training Table requiring the GPA average of the applicants and matriculants.
Grad School Without the GRE

Brown follows Princeton in letting departments decide whether to require the admissions test. Twenty-four of them opt out.

By Scott Jaschik // October 7, 2019

GRExit snapshot

Percent of programs at 50 top-ranked U.S. research universities that didn’t require GRE general scores in 2018. (Programs in some disciplines weren’t offered at all universities.)

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular biology</td>
<td>44%</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>35%</td>
</tr>
<tr>
<td>Ecology</td>
<td>29%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>8%</td>
</tr>
<tr>
<td>Computer science</td>
<td>8%</td>
</tr>
<tr>
<td>Psychology</td>
<td>4%</td>
</tr>
<tr>
<td>Physics</td>
<td>2%</td>
</tr>
<tr>
<td>Geology</td>
<td>0%</td>
</tr>
</tbody>
</table>

A wave of graduate programs drops the GRE application requirement

By Katie Largen // May 29, 2019, 4:25 PM
Pedagogical Methods Need to Be Evidence-Informed
All NIGMS FOAs encourage the use of evidence-informed methods
NIGMS provides authentic research experiences early across a range of institution types
Undergraduate Diversity Programs may apply for supplements to develop evidence-informed courses
Financial burden and student debt – differs across racial/ethnic groups

- NIGMS provides stipends and tuition remission through a broad range of programs
- NIGMS is developing a diversity enhancing Loan Repayment NOSI
Insufficient role models
In 2017, NIGMS made diversity at all levels, including the faculty level, part of the scored review criteria.

Study Sections are taking this seriously.

**Preceptors/Mentors (Participating Faculty)**
When building a training team, programs should include faculty who are committed to training, mentoring, and providing inclusive, safe and supportive research environments. Programs are encouraged to build a diverse team of preceptors/mentors that includes, for example, faculty from underrepresented groups (see Notice of NIH's Interest in Diversity) and at different career stages (i.e., early-career as well as established faculty).

**Preceptors/Mentors (Participating faculty)**
Describe how the program has or will assemble a diverse team of participating faculty (e.g., individuals from underrepresented backgrounds (see Notice of NIH's Interest in Diversity) and at different career stages) to provide potential role models within the training program and to enhance the excellence of the training environment.
The advancement structure within academic biomedical research environments

- Research groups with a single principal investigator, whose endorsement is essential for the advancement of a large number of individuals can contribute to unhealthy competition and power dynamics.
- Mentoring and accessing prestigious opportunities (e.g., presenting at national meetings, authorships, introduction to leaders in the field) occur informally with little oversight to ensure equity.

The ad hoc nature of mentoring

“Mentorship has rarely received the focused attention, evaluation, and recognition of other professional responsibilities associated with academic STEMM, such as teaching or research.”
NIGMS training grants
• Require sustained oversight of trainees
• Require mentor training
• Require a plan for removing faculty displaying unacceptable mentorship qualities from the training program
• Request information on measures of success for trainees from well-represented and underrepresented groups
• Require faculty to include a statement of commitment to training, mentoring, and promoting inclusive, safe and supportive research environments.

All of the above listed areas are score driving for the training grant applications.

NRMN
National Research Mentoring Network

• Fund the National Research Mentoring Network and the science of mentoring, networking, and navigating critical transition points.
• NIGMS released a supplement opportunity to training programs to enhance mentoring
Biases in Hiring

- Postdoctoral hiring has no oversight – depends on networking
- Targeted hiring notices discourage applicants from underrepresented groups
- Hiring focuses on the “pedigree” - institution prestige, training lab status, and prominent papers in elite journals
- Unconscious bias

Tackling Unconscious Bias in the Recruitment Process

Have you ever eliminated a candidate based on tardiness or for wearing the wrong clothes? Have you bumped a candidate up the list because they went to a reputable school? While we like to think we’re objective, the truth is that we recruiters are only human and as such we’re subject to the same unconscious biases as every other person on the planet.
This overarching goal is to train the mentors of students about the concepts of implicit or unconscious bias, the effects of these biases on underrepresented minority students in training, and the strategies and means to mitigate bias within labs, departments, and institutions.
Resource Allocation

Research Letter

September 15, 2015

Sex Differences in Institutional Support for Junior Biomedical Researchers

Robert Sege, MD, PhD¹; Linley Nykiel-Bub, BA¹; Sabrina Selk, ScD²

Start up packages, laboratory and office space, salaries

MOSAIC Program - The scholars will have a cohort and additional oversight and mentoring when negotiating salary and start up packages.
Maximizing Opportunities for Scientific and Academic Independent Careers (MOSAIC)

Postdoctoral Career Transition Award to Promote Diversity (K99/R00) – [PAR-19-343](https://www.nigms.nih.gov/training/careerdev/Pages/MOSAIC.aspx)
Institutionally Focused Research Education Cooperative Agreement to Promote Diversity (UE5) – [PAR-19-342](https://www.nigms.nih.gov/training/careerdev/Pages/MOSAIC.aspx)

Awards to scientific societies (UE5) and time to stand up the program

MOSAIC K99/R00 Applicants Compete

MOSAIC K99/R00 Scholars Participate in Cohorts Organized by UE5

https://www.nigms.nih.gov/training/careerdev/Pages/MOSAIC.aspx
The Inequities of the Tenure-Track System

As faculty are expected to publish more, nonwhite faculty suffer the consequences, argues Zawadi Rucks-Ahidiana.

By Zawadi Rucks-Ahidiana  // June 7, 2019
Applications from African American / Black scientists are statistically less likely to receive an NIH R01 award.

2011 Ginther et al. Science 333:1015 Funding Disparities 2020
NIH launched the Diversity Program Consortium ~$500 M over 10 years

- Three levels of simultaneous impact: student, faculty and institution
- Integration of social science research and psychosocial interventions into the process of training and mentoring students and faculty
- Rigorous assessment and evaluation of the training and mentoring interventions implemented across the program
  - Hallmarks of Success
  - Common Measures
NIGMS Partnering with the Office of Scientific Workforce Diversity to implement Implicit Bias training

What is bias?
Bias consists of attitudes, behaviors, and actions that are prejudiced in favor of or against one person or group compared to another.

What is implicit bias?
Implicit bias is a form of bias that occurs automatically and unintentionally, that nevertheless affects judgments, decisions, and behaviors. Research has shown implicit bias can pose a barrier to recruiting and retaining a diverse scientific workforce.

Research Shows
The good news is that implicit bias can be mitigated with awareness and effective bias-reduction strategies. We provide a few examples of these strategies that you can use to reduce implicit bias.

Think of counter-stereotypic examples: Identify scientists of diverse backgrounds in your field (Blair et al).

Perspective-taking: Imagine what it is like to be a person who experiences people questioning your ability or skills because of your social identity (Galinsky & Moskowitz).

Interrupt automatic biased thoughts: Identify when you may be most influenced by implicit bias (e.g., evaluating performance) and create an action plan (e.g., review evaluation criteria before assessing each person's performance in the form of IF and THEN statements) to increase mindfulness of, or mitigate the influence of, implicit bias (Stewart & Payne).

Education: Join or set up an implicit-bias workshop in your community to raise awareness (Carnes et al., Girod et al.).

✓ Reviewers
✓ Scientific Review Officers
✓ Program Officials

“The Science of Diversity and the Impact of Implicit Bias” (PDF, 3.3MB)
NIGMS Partnering with the Center for Scientific Review to Enhance the Diversity of the Reviewer Pool
Publication Inequities

Differences in STEM doctoral publication by ethnicity, gender and academic field at a large public research university

Rodolfo Mendoza-Denton 1, Colette Patt, Aaron Fisher, Andrew Eppig, Ira Young, Andrew Smith, Mark A. Richards

Published: April 5, 2017 ● https://doi.org/10.1371/journal.pone.0174296

Topic choice contributes to the lower rate of NIH awards to African-American/black scientists

Travis A. Hoppe 1,2, Avira Litovitz 1,2, Kristine A. Willis 3,4, Rebecca A. Mesaroli 1,2, Matthew J. Perkins 1,2, Ian Hulten 1

Published: November 14, 2018 ● https://doi.org/10.1371/journal.pone.0205929

Publications as predictors of racial and ethnic differences in NIH research awards

Donna K. Cinther 1, Jodi Basner 3, Unni Janson 1, Joshua Schnell 1, Raynard Kington 2, Walter T. Schafer 1

Published: November 14, 2018 ● https://doi.org/10.1371/journal.pone.0205929

Structure and belonging: Pathways to success for underrepresented minority and women PhD students in STEM fields

Aaron J. Fisher 1, Rodolfo Mendoza-Denton, Colette Patt, Ira Young, Andrew Eppig, Robin L. Garrell, Douglas C. Rees, Tanea W. Nelson, Mark A. Richards

Published: January 9, 2019 ● https://doi.org/10.1371/journal.pone.0209279
Addressing the Minority Tax: Perspectives From Two Diversity Leaders on Building Minority Faculty Success in Academic Medicine

MOSAIC

The time tax put on scientists of colour

The pressure on researchers from ethnic minority groups to participate in campus diversity issues comes at a cost.

Addressing disparities in academic medicine: what of the minority tax?

When the minority tax is doubled: being Black and female in academic medicine

MOSAIC
Sexual Harassment of Women
Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine
• NIGMS incorporated language in all training FOAs requiring a description of the policies and practices to address harassment and discrimination.
• NIH incorporated similar language for all NIH training programs
Microassaults, Microinsults, and Microinvalidations
Status Leveling

- Are you the new diversity hire?
- You're lucky to be black... so easy to get into college.
- Old classmate

I got into Princeton because I'm Black? Do I get As because I'm Black, too?
Tokenism

Isolation
Imposter Phenomenon

Stereotype Threat

whistling vivaldi
how stereotypes affect us
and what we can do

CLAUDE M. STEELE

*This is an intellectual odyssey of the first order—a true must do for.*

—WILLIAM G. BOWEN
Research on Interventions to Enhance Persistence in Biomedical Research

Increase the evidence base for effective, high-impact, scalable interventions, and to improve our understanding of the factors contributing to the advancement of individuals pursuing biomedical research careers.

Contact: Sydella Blatch
http://understanding-interventions.org/lead-consortium/

PAR-19-295
Interventions that increase persistence

- Forming supportive cohorts and learning communities
- Mentoring with cultural awareness
- Reducing stereotype threat
- Diminishing imposter phenomenon
- Overcoming microaggressions
- Mitigating unconscious bias
- Increasing cultural awareness and sensitivity
- Emphasizing cultural assets
- Affirming kindness
- Engaging family and support systems

- Research on Interventions
- IPERT
- Diversity Enhancing Training Programs
- BUILD
- NRMN
• **Training Modules PAR-20-296 (R25)** for Creating Safe, Inclusive, and Supportive Research Environments (NOT-GM-20-047)
  - Applications due: June 18, 2021
  
  • **Administrative supplements to NIGMS training grants - topics**
  - Rigor & Reproducibility
  - Career Development
  - Skills Development – technical, operational, professional
  - **Safe and Inclusive Research Environments**
  - Laboratory, Chemical, and Physical Safety in the Research Environment
  - Undergraduate Curriculum Development
  - Evaluation
  - **Mentoring**
  - **Wellness and Resiliency**

Coming soon – structural racism and discrimination
NIGMS supported diversity-focused meetings

Fostering Diversity in Biostatistics
March 22, 2020
10:30 am - 6:30 pm
JW Marriott Nashville
201 8th Avenue South
Nashville, TN 37203

Understanding Interventions

Visualizing a Better Future in STEM

2019 SACNAS
National Diversity in STEM Conference

TWD 2021
The Biomedical Research Incentive Structure

- Push for large labs
- Publish or perish!
- Impact factor
- Life pressures
- Tenure and promotion
- Unstable funding
- Soft money positions
- “Innovation”
- “Novelty”
Graduate School Can Have Terrible Effects on People's Mental Health
Ph.D. candidates suffer from anxiety, depression, and suicidal ideation at astonishingly high rates.

Alia Wong  November 27, 2016

The Emotional Toll of Graduate School
Mental health disorders and depression are far more likely for grad students than they are for the average American

By Prateek Puri on January 31, 2019
• OITE providing resources and training on wellness

• NIGMS partnering with OITE to provide “train the trainer” series on becoming a resilient scientist.

• NIGMS offers supplements to training programs to develop modules on wellness and resiliency as well as safe and inclusive research environments.

• NIGMS FOAs request through an institutional letter of support information regarding practices to promote student well-being.
Science of Science Policy Approach to Analyzing and Innovating the Biomedical Research Enterprise (SCISIPBIO) (R01)

Supports research to provide scientific analyses of important aspects of the biomedical research enterprise and efforts to foster a diverse, innovative, productive, and efficient scientific workforce, from which future scientific leaders will emerge.

Contact: Kenny Gibbs

NSF 19-547
NIH NOT-19-011
**Major Themes in NIGMS Training Programs – Score Driving**

- **Trainee skills development** – use evidence-informed approaches to provide technical, operational and professional skills
- **Specific Objectives** - obtainable and measurable training objectives
- **Rigor & transparency, responsible & safe conduct** of research throughout the training experience
- **Commitment to diversity & inclusion** at all levels
- **Promote a culture of safety**, including safe and inclusive research training environments
- **Mentor training and oversight** throughout the trainees' time in the program
- **Career preparedness** – provide knowledge of and skills to transition into the range of careers in the biomedical research workforce
- **Strong institutional support** for research training
- **Holistic approach to admissions**
- **Evaluation and responsiveness to data** - the collection and dissemination of data on the success/failure of educational aims
Institutional Support Letter (10-page maximum). Signed by President, Provost, Dean – DEI areas:

- Fostering and rewarding excellence in training (e.g., through institutional polices such as tenure and promotion);
- Supporting the remediation or removal of Participating Faculty from the program who are poorly performing mentors;
- Promoting diversity and inclusion at all levels of the research training environment (trainees, staff, faculty, and leadership);
- Ensuring a positive, supportive and inclusive research and training environment for individuals from all backgrounds;
- Ensuring that proper policies, procedures, and oversight are in place to prevent discriminatory harassment and other discriminatory practices and to appropriately respond to allegations of such discriminatory practices, including providing any required notifications to NIH (e.g., requesting a change of PD/PI status; see NOT-OD-19-056);
- Providing trainees access to student support services, such as healthcare, counseling services, and housing;
- Ensuring that trainees will continue to be supported when they transition from the training grant to other sources of support.
Questions? Comments?
NIGMS Administers ~1,900 Training, Workforce Development, Diversity and Capacity Building Awards at ~400 institutions ~$900 million per year
Underrepresentation across the stages of the biomedical academic pathway

2018 NSF Data

Underrepresented: Hispanic, African American/Black, Native American, Alaska Native, Pacific Islander
Well represented: White, Asian