THE ROAD AHEAD:
MY JOURNEY IN SCIENCE & YOURS

Kenneth D. Gibbs, Jr., Ph.D., M.P.H.
Program Director
Division of Training, Workforce Development & Diversity
National Institute of General Medical Sciences
National Institutes of Health*
@KennyGibbsPhD @STEMPhDCareers

*Views are my own, not those of NIH (unless specified)
Disclaimers

- Views of my own journey—not meant to imply endorsement by government

- N = 1
Today’s Talk

- Why science? & the next 10 years
- Key career milestones
  - AAAS Science & Technology Policy Fellowships
  - NCI Cancer Prevention Fellowship
- NIGMS: Science, Diversity, Systemic Reform
- Parting advice for the road ahead
Why Science?

Family

Importance of education and service
(“To whom much is given, much is required”)

Opportunity
Why Science?

“If you’re a medical doctor, you’ll treat at most 10,000 patients in your lifetime. The guy who discovered penicillin has treated billions of people on every continent for the past six decades.” -speaker at high school science program

Because science is awesome!!

-and-

Potential to make broad, positive contributions to the human condition
The Next 10 Years

B.S., Biochemistry & Molecular Biology

Ph.D., Immunology

The further my training progressed, the farther I felt from the reasons I went into science

Advice:
“Stay the course”
“Help when you get tenure”
Mission: To connect science with policy and foster a network of science and engineering leaders who understand government and policymaking, and are prepared to develop and execute solutions to address societal challenges.

http://www.aaas.org/program/science-technology-policy-fellowships
My Fellowship Experience

- National Science Foundation, Directorate for Education and Human Resources, Division of Human Resource Development (NSF/EHR/HRD)
- Drafted section for the federal coordinated STEM Education Strategic Plan
  - Learning & synthesizing social science research on STEM career attainment for high level officials (i.e. OSTP)
- Day-to-Day Programmatic Activities
- Conference travel & speaking engagements
- I missed research!!!
Understanding Ph.D. and Postdoc Career Development

What Do I Want to Be with My PhD? The Roles of Personal Values and Structural Dynamics in Shaping the Career Interests of Recent Biomedical Science PhD Graduates

Kenneth D. Gibbs, Jr.*,†‡ and Kimberly A. Griffin†§

RESEARCH ARTICLE

Biomedical Science Ph.D. Career Interest Patterns by Race/Ethnicity and Gender

Kenneth D. Gibbs Jr.¹,²*, John McGready³, Jessica C. Bennett⁴, Kimberly Griffin⁴*

Career Development among American Biomedical Postdocs

Kenneth D. Gibbs, Jr.,*‡‡ John McGready,§ and Kimberly Griffin‡¶

• US Citizen and Permanent Resident Ph.D.s. who received Ph.D. between 2006-2012
• National survey (PLOS ONE, 2014; CBE LSE, 2015)
  N=1890 recent STEM Ph.D.s. (n=335 from URM backgrounds)
• Qualitative Data (CBE LSE, 2013, and forthcoming)
  • Focus groups (n=38), and in-depth interviews (n=70)

Kimberly Griffin, Ph.D., Associate Professor of Education, University of Maryland
Career Pathway for Ph.D. Scientists

Research Questions

- What is the process of career interest formation for recent biomedical Ph.D. graduates?
- To what extent does this process differ based on social identity (i.e. race/ethnicity, gender, and their intersection)?

Gibbs & Griffin, CBE Life Science Education (2013)
Where are We Now? (Biomedical Snapshot)

Well Represented Groups (WR)
White, Asian, Non-Resident

Underrepresented Minority (URM)
Black, Hispanic/Latin@, American Indian, or Alaska Native

WR Men
URM Men
WR Women
URM Women
What happens to career goal clarity and career knowledge as training progresses?

(A) I had/have a clear career goal

Starting Level
High: > 70%
Mid: 30-70%
Low: <30%

(B) I was/am knowledgable about the various career options available to a person with a Ph.D. in my discipline

Change
Increase
Stay the same
Decrease

Gibbs et al, CBE Life Sciences Education (2015)
Postdocs Report Greater Knowledge of Career Options & Less Career Goal Clarity Relative to Ph.D. Entry

(A) I had/have a clear career goal

(B) I was/am knowledgable about the various career options available to a person with a Ph.D. in my discipline

** p< 0.001 relative to Ph.D. Entry

Gibbs et al, CBE Life Sciences Education (2015)
What Explains Career Pathway Interest at Ph.D. Completion?

- **Multiple Logistic Regression**
  - **Outcome:** high career pathway interest at Ph.D. completion (i.e. 4 or 5 on the interest scale)

- **Covariates:**
  - **Personal:** Interest & intentions at Ph.D. entry, confidence in research ability
  - **Objective:** first-author publication rate, time-to-degree, h-index, institution type (Top50 yes/no)
  - **Graduate training:** sense of belonging (intellectually or socially), advisor interactions, and career development measures
Disparate Career Interests at Ph.D. Completion

(A) Likelihood of high interest in career path at Ph.D. completion

Controls
- Career interests at Ph.D. entry (+)
- Advisor relationship (+)
- Publication record (+)
- Ph.D. at “Top 50” university (-)
- Time-to-degree
- H-index
- Research self-efficacy (+)
- Departmental support for career development (+)
- Sense of belonging


WR Men (n=375)  URM Men (n=87)
WR Women (n=808)  URM Women (n=189)
Disparate Career Interests at Ph.D. Completion

(A) Likelihood of high interest in career path at Ph.D. completion

(i) Faculty, Research-intensive

(ii) Faculty, Teaching-intensive

(iii) Research, Non-Academic

(iv) Non-Research Career

Gibbs et al, PLOS ONE (2014)

WR Men (n=375)  URM Men (n=87)
WR Women (n=808)  URM Women (n=189)
(For Me) Both research and policy application are necessary to feel fulfilled, and neither is sufficient.

Is there a way to bridge the two?
NCI Cancer Prevention Fellowship Program

- Post-doctoral Fellowship with 30 year history; for early career scientists

- Multidisciplinary

- Independent, mentored-research in cancer prevention

- 10-15 Fellows selected annually through competitive process; support for 4 years
Career Vision: Policy Scientist

- Macro-scale translational research
  - Science education
  - Science workforce development and diversity
  - Research evaluation
  - Public health

- Physician-scientist: “Bench to bedside”

- Policy scientist: “Bench to society”
The Road to NIGMS

Advisory Council

NETWORK, NETWORK, NETWORK
Roles at NIGMS: Science, Diversity, Systemic Reform

- Program Analyst, Office of Program Planning, Analysis and Evaluation
  - Research on workforce development and diversity
  - Strategic planning for NIGMS training and diversity programs
  - Trans-NIH initiatives (funding disparities for black investigators)

- Program Director, Divisions of Training, Workforce Development and Diversity; Genetics and Developmental Biology
Distinct Faculty Hiring Dynamics for URM and WR Ph.D. Scientists

(A) URM Faculty Hiring Dynamics

(i) Pool of Potential Candidates

(ii) Number of Faculty Hired
\[ r^2 = 0.12 \]

(iii) Percent of Candidate Pool Hired
\[ \beta = -0.14^{**} \]

(B) WR Faculty Hiring Dynamics

(i) Pool of Potential Candidates

(ii) Number of Faculty Hired
\[ r^2 = 0.48^{**} \]

(iii) Percent of Candidate Pool Hired
\[ \beta = 0.004 \]

Gibbs et al, eLife (2016)
## Distinct Faculty Hiring Dynamics for URM and WR Ph.D. Scientists

### Table: Biomedical Ph.Ds. and Assistant Professors

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Biomedical Ph.Ds.</th>
<th>Assistant Professors</th>
</tr>
</thead>
<tbody>
<tr>
<td>URM</td>
<td>6,633</td>
<td>347</td>
</tr>
<tr>
<td>WR</td>
<td>81,002</td>
<td>5122</td>
</tr>
</tbody>
</table>

### Percentage Change

- **URM**: \(-1.70\%\)
- **WR**: \(+8.60\%\)

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**Gibbs et al, eLife (2016) **
The number of Ph.D. graduates from underrepresented groups grew by nine times since 1980. The number of assistant professors from those groups grew by just 2.6 times.
Reforming Graduate Education

Meeting Showcases Innovations in Biomedical Graduate Education
Posted by Dr. Jessica Faupe-Badger and Dr. Kenneth Gibbs on May 2, 2016
Post a Comment | View Comments (4) ↓

Your Perspectives: Catalyzing the Modernization of Biomedical Graduate Education
Posted by Dr. Alison Gammie, Dr. Kenneth Gibbs and Dr. Shiva Singh on November 2, 2016
Post a Comment | No Comments ↓

Early Notice: New NIGMS Institutional Predoctoral Training Grant Funding Opportunity Announcement
Posted by Dr. Alison Gammie, Dr. Kenneth Gibbs and Dr. Shiva Singh on March 1, 2017
Post a Comment | No Comments ↓

https://loop.nigms.nih.gov/author/dr-kenneth-gibbs/
“Create a set of national goals for graduate STEM education that can be used by research universities, Congress, federal agencies, state governments and the private sector to guide graduate level programs, policies and investments over the next decade, and ensure that this “blueprint” for graduate education reform is revisited and updated on a periodic basis to reflect changing realities.”

http://sites.nationalacademies.org/PGA/bhew/graded/index.htm
Dear Science Twitter, if you were giving a talk to ~150 URM college students interested in Ph.D., what would you say?
The Road Ahead: To Grad School or Not?

E J Sacho @ejsacho · 16m
Make sure you need the degree for the career path you want to be on. Don’t go just to avoid making career decisions.

Dr. Katiesci @katiesci
Replying to @KennyGibbsPhD and @ThePurplePage
Explore science careers before deciding to do a PhD because you might not need a PhD for the job you end up wanting once you know more.

Bridges to the Doctorate Program

Postbaccalaureate Research Education Program (PREP)

BE INTENTIONAL IN YOUR CAREER DECISIONS
Picking the Right Graduate School

- Good science, good community & **good for you!**

**M. Matthews, PhD @PhDeez · 7m**

I advice undergrads to prioritize their needs/wants & pick a prog that suits those priorities. It's OK to be "picky".

**Dr Ben Britton @BMatB**

Replying to @KennyGibbsPhD

Build a support network - mentors, friends, family life outside work (sport, books, culture), and ensure good self-care.

**Jonathan Jackson @egaly**

Tell them to find their people, whomever they are, whatever they look like, and to hold on for dear life. #SCIENCE
Find Community: IMSD Institutions

Initiative for Maximizing Student Development

https://www.nigms.nih.gov/Training/IMSD/Pages/default.aspx
Find Community: Social Media

#BLACKandSTEM

Vanguard STEM

CienciaPR.org

@BerondaM @BerondaM
@_ChristineOrtiz
@dacolon
@SherilynnBlack
@DNLee5

@blacksciblog @ThePurplePage
@moefeliu
@NLouissaint_PhD
@HeyDrWilson
Mentors Matter: Choose Your PI Wisely

Vanessa Yanez
@vanesque89

Replying to @KennyGibbsPhD and @StemPhDCareers

Tell them to focus on finding a great mentor--that should be a priority.

Kyle Sousa
@DrBiochemistry

Replying to @KennyGibbsPhD

Find a mentor who is invested in you! One who will stand by you through a failed set of experiments and let u run with cool ideas
Believe in Yourself + Ask for Help

Beronda Montgomery @BerondaM · 44m
Replying to @KennyGibbsPhD @moefeliu and 3 others
Encourage each of them that they have MUCH more to offer than they have to PROVE & they can refuse to be pushed into the servitude of proof!

Pinar Gurel @pinar_gurel · 49m
Replying to @pinar_gurel @KennyGibbsPhD
There will always be obstacles, but if you are confident in yourself and keep fighting, you will be able to tackle and overcome them.

Michael D L Johnson @blacksciblog · 22m
Replying to @moefeliu @KennyGibbsPhD and 3 others
I would add that asking for help is not a weakness, but expecting help is.
Use Your Science to Improve Our Communities

Mónica Feliú-Mójер @moefeliu · 35m
Replying to @BerondaM @KennyGibbsPhD and 3 others
Also remind them that they CAN serve their communities by pursuing PhDs and doing research, in many ways

SalasRamirez,PhD @SaveCPE1
Replying to @KennyGibbsPhD and @brainlayman
As a PhD you can change the way the world sees something, how they interpret it and use it for improving society. Find support, but shine
Science Needs You!

Dwayne Godwin @BrainyActs
We need you, welcome you, and value your contribution.

Dai Shizuka @ShizukaLab
We need you.

Mica Estrada @MicaPhD_growjoy
We need you!

Richard Prather @PratherLab
good luck.
References

Peer-Reviewed

- Gibbs KD Jr., Basson JJ, Xierali I, Broniatowski DA. “Decoupling of the Minority Ph.D. Talent Pool & Assistant Professor Hiring in Basic Science Departments.” eLife 2016 Nov 17;5. pii: e21393

Popular Press

- Gibbs, KD Jr. “Planning a Career in Today’s Landscape” Science Careers (January 2014)
- Callier V. “From Bench Science to Analyzing Scientific Careers” (Chronicle of Higher Education, March 2016)
- Kuo M. “Skills Beyond the Bench” (Science Careers, March 2017)