Activating a Neural Network

Admission Strategies to Increase Diverse Neuroscience Trainees
R25/T32 Diversity Workshop Summary

April 10-11, 2017

Bethesda, Maryland

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Acronym Definitions

ABRCMS	Annual Biomedical Research Conference for Minority Students
BEST	Broadening Experiences in Scientific Training
BBSP	UNC Biological and Biomedical Sciences Program
BP-ENDURE	Blueprint for Enhancing Neuroscience Diversity through Undergraduate Research Experiences
BUILD	Building Infrastructure Leading to Diversity
CGS	Council of Graduate Schools
CLIMB	Collaborative Learning and Integrated Mentoring in Bioscience
FDA	U.S. Food and Drug Administration
GDO	graduate diversity officer
GPA	grade point average
GRE	Graduate Record Examination
IMSD	Initiative for Maximizing Student Development
MARC USTAR	Maximizing Access to Research Careers Undergraduate Student Training in Academic Research
MBL	Marine Biological Laboratory
MBRS	Minority Biomedical Research Support Program
NINDS	National Institute of Neurological Disorders and Stroke
NRMN	National Research Mentoring Network
OPEN	NINDS Office of Programs to Enhance Neuroscience Workforce Diversity
PI	principal investigator
PREP	Postbaccalaureate Research Education Program
SACNAS	Society for Advancement of Chicanos/Hispanics and Native Americans in Science
SfN	Society for Neuroscience
STEM	science, technology, engineering, and mathematics
UR	underrepresented
URM	underrepresented minority

Executive Summary

Introduction and Overview

On April 10-11, 2017, the National Institute of Neurological Disorders and Stroke (NINDS) held a workshop in which R25 and T32 grantees discussed admission strategies to increase diversity among neuroscience trainees. The workshop began with welcoming remarks by Dr. Walter Koroshetz, MD, NINDS Director, who emphasized the importance of increasing diversity among the neuroscience research workforce. Following his remarks, Dr. Michelle Jones-London, Director of Diversity Training and Workforce Development at NINDS, provided an overview of workshop goals. The remainder of Day 1 involved feature lectures and panel discussions focused on recruitment, admission, and retention of individuals from underrepresented (UR) populations. On Day 2, workshop participants engaged first in training on mentoring, and then in breakout discussions on addressing challenges in recruitment, admissions, retention, and career transitions.

Key Themes and Highlights

Recruitment

- Institutions should include in their mission statements a data-based affirmation of the importance of diversity.
- Representatives of graduate programs should attend conferences and poster sessions, especially those with strong representation from students from UR backgrounds. Personal outreach is more effective than passive outreach.
- Current graduate students can be powerful ambassadors in recruitment.
- Graduate programs can improve prospective student perceptions by discussing their efforts to increase diversity and by using summer research and other research experiences as recruiting tools.
- Students apply to programs that their advisors trust. Graduate programs should build bridges and trust networks with institutions and advisors serving students from UR backgrounds.
- Demonstrating a desire to help students reach their goals and find the school best matched for them sends a powerful positive message.

Admissions

- Although many institutions promote diversity, their admissions screening practices may lead them to select from less diverse applicant pools. This, rather than a lack of talented applicants from diverse backgrounds, is a more likely contributor to the small candidate pools that admissions committees see.
- Undergraduate research experiences are important predictors of success in and beyond graduate school. Admissions committees might benefit from focusing more on these experiences than on credentials such as grade point averages and Graduate Record Examination scores. At the same time, lack of research experience should not necessarily bar a candidate from admission.

- Often admissions committees will consider issues of diversity after they have considered a student's achievement and risk for attrition.
- Admissions committees should define clearly what they mean when they deny a candidate admission because they are "too risky." Too often "risky" means "not like us."
- Efforts to increase diversity should focus more on asset models and leadership opportunities, rather than deficit models and remediation.

Retention

- School climate is an important influence in retention, student productivity, degree completion, and career choice. Surveys can be valuable in obtaining information about school climate.
- Identity and how it aligns with communities of practice play a pivotal role in decisions to pursue scientific careers, even more than confidence in one's ability.
- Face-to-face meetings with other UR graduate students can help combat feelings of isolation.
- Graduate programs should develop positive exit strategies for students who do not complete their PhD. Models could be found in other NIH programs.

Mentoring

- Mentoring should be a bidirectional, collaborative relationship with shared responsibility.
- Mentors can share personal stories, including challenges they faced when they were starting out.

General

- NIH should hold institutions more accountable for improving diversity among their graduate students. Institutional commitment to diversity should involve more than simply "checking a box."
- NIH and institutions should explore ways to improve metrics of success and to distinguish them from metrics of productivity.
- The NIH funding climate and perceptions of principal investigators' stress present a considerable challenge to recruitment and retention in general.
- Data-based approaches should be used to increase understanding among faculty about the need for increased diversity and the challenges associated with overcoming implicit bias.
- Maintaining a sense of community is important, especially for advanced graduate students.
- Additional funding is needed to support training for faculty and students.

Meeting Summary

Day 1: Monday, April 10

Welcome

Walter Koroshetz, MD, Director, National Institute of Neurological Disorders and Stroke (NINDS)

NINDS invests approximately one-quarter of its budget in disease-agnostic basic research, one-quarter in clinical and translational research, and one-half in basic research on disease mechanisms. NINDS provides resources to help researchers bring molecules, biologics, and devices through the processes required for approval by the U.S. Food and Drug Administration (FDA), and it supports some clinical trials. NINDS-supported translational research focuses on disorders in which industry has shown little interest. Thus, the NINDS portfolio complements the research efforts of industry.

Training a talented, highly dedicated workforce is important to NINDS and NIH. Because NIH believes that increased diversity can improve the strength of the U.S. research workforce, it has implemented a working group, with representatives from several institutions, to improve diversity in both the extramural and intramural communities.

Efforts to improve diversity face several challenges. Although NIH supports a generous training program, resources remain limited. What was once a competitive process for funding has now become hypercompetitive, and many talented individuals therefore shy away from research careers. Thus, NIH faces challenges in recruiting talented scientists. Accordingly, NIH has focused most of its efforts on boosting the number of trainees, which is important for maintaining a strong workforce. However, NIH must do a better job of highlighting the benefits of research careers to attract high school and college students to the neuroscience field.

Retention and persistence are just as important as recruitment and training. NIH and other institutions must consider how best to train people to be scientists who will persist and compete for higher-level research positions. The numbers of potential scientists decline at each transition point, from graduate student to postdoctoral fellow to assistant professor. These drop-offs are particularly stark among women and individuals from historically underrepresented (UR) populations. Although trainee populations are fairly representative of the overall population, the level of diversity is low at the assistant professor level and even lower at higher levels. Knowing the benefits of persistence, and paying attention to work-life balance issues, will improve training and retention overall. In turn, the appearance of role models at senior positions can itself be a recruitment tool for others from UR populations. In recruiting and retaining talented individuals, NIH and other institutions must also consider diversity in economic backgrounds and how to encourage individuals to enter careers characterized by financial instability.

Despite the uncertainty regarding the NINDS and NIH budgets, Dr. Koroshetz emphasized that NINDS remains committed to training the best scientists and improving diversity in the

neuroscience workforce. To that end, he asked workshop participants not only to share knowledge and best practices, but also to consider how NIH can address the above challenges to make a difference within 10 years.

Meeting Goals

Michelle Jones-London, PhD, Director of Diversity Training and Workforce Development, NINDS

The NINDS Office of Programs to Enhance Neuroscience Workforce Diversity (OPEN) treats training as a pathway from high school to a faculty position at a research institution. NINDS OPEN Pathways therefore include programs that support scientific training and career opportunities across transition points in the pathways. However, staff understand that factors other than availability of training programs also contribute to decisions about scientific careers. They are also interested in learning from past mistakes.

This workshop brought together representatives from R25 programs for high school and undergraduate students and T32 programs for graduate students and postdoctoral researchers to identify what is needed to prepare undergraduate trainees for successful transition to 21st-century graduate programs. Workshop participants were also asked to consider how T32 programs can attract the 21st-century graduate student.

Dr. Jones-London noted that it is important to discuss not only what works, but also what does not work or how long something takes to work. She encouraged workshop participants to consider the workshop as an open and safe environment to consider common-sense approaches to improving diversity. She also considered the workshop to be an opportunity to foster new partnerships and networks.

Featured Lecture: Inside Graduate Admissions—Merit, Diversity, and Faculty Gatekeeping

Julie R. Posselt, PhD, Assistant Professor, Rossier School of Education, University of Southern California

Women earn almost one-half of all science PhDs, but people of color remain significantly underrepresented among science PhDs relative to their proportions of the U.S. population. The empirical literature has found compelling evidence that while institutions understand the importance of racial, gender, and economic diversity and strive to portray themselves as diverse, their admissions practices do not select diverse populations. Two of the three strongest predictors of admissions—high Graduate Record Examination (GRE) scores and selective college attendance—seem to be unbiased but are associated disproportionately with being white, male, and wealthy. In addition, a 2014 study by Milkman and colleagues found that admissions staff were less likely to respond or took longer to respond to emails from prospective graduate students when their name suggested they were women, Indian, Chinese, African American, or Latino than when their name suggested they were white and male. This evidence of unconscious bias in responding to requests for information suggests that such bias also contributes to admissions decisions.

Dr. Posselt, who has conducted research on graduate admissions since 2003, discussed a study published in her book, *Inside Graduate Admissions: Merit, Diversity, and Faculty Gatekeeping* (Harvard University Press, 2015). This research builds on two theoretical perspectives. The first suggests that individuals evaluating applications to graduate programs and postdoctoral fellowships make decisions based on scripts formed by their own perceived roles in society. The second conceptualizes "merit" as an institutional compromise across different individual, committee, department, academic discipline, and overall academic priorities.

Dr. Posselt and her colleagues conducted 85 interviews in 10 programs across 3 public and private universities. They included programs in the humanities and in the natural and social sciences. In each domain, they aimed for a balance between high-consensus fields, such as philosophy, economics, or physics; moderate-consensus fields such as classics, sociology, or astrophysics; and low-consensus fields such as linguistics, political science, or biology. Dr. Posselt and her colleagues also observed admissions committee meetings in six of the programs. Their sample included 67 faculty members and several graduate students. The proportion of women ranged from 18% to 33%, and the proportion of international students ranged from 26% to 46%. The proportion of scholars of color ranged from 7% to 21%—of these, no greater than 4% were born in the United States.

Consistent with the literature, the study found that departments operate based on evaluative cultures that turn preferences into institutional inequalities. Individuals' preferences for specific criteria were rooted in beliefs about what those criteria signal, and those beliefs were linked to individuals' identities as scholars in highly ranked programs. Individuals on admissions committees also preferred collegial, efficient processes that quantified quality and minimized conflict. In high-consensus fields, shared discipline norms shaped how merit was defined, what intelligence meant, and what counted as legitimate admissions processes. In low-consensus fields, individuals' preferences played a stronger role, with clear patterns of "like preferring like." Admissions processes also reflected ambivalence about organizational change in general and diversity in particular, because they force individuals to confront underlying assumptions about race, themselves, and opportunities in the United States.

Although admissions committees professed the importance of diversity, they evaluated applications in such a way that they selected from a pool in which most diversity had been eliminated. During initial screens, most faculty saw "merit" as "achievement," defined by GRE scores and grades. They then looked at the rigor of the programs in which students made those grades. Faculty associated GRE scores and grades with intelligence, then associated intelligence with where the applicant belonged in the elite community and with whether that applicant was at risk for attrition. Only after applicants had passed these two hurdles did faculty consider their research experience and how they could contribute to the future of the department and the discipline. Thus, despite the outward emphasis on diversity, committees did not consider diversity as an important contributor to merit.

Risk aversion and whether to challenge it were also pronounced themes in admissions decisions. In one discussion, for example, a faculty member saw an applicant's low GRE score as

a risk for failure because that applicant had not attended a top-rated university. Another faculty member agreed that the student might present a risk, but she characterized that students as a "good bet" and one to consider seriously to increase diversity.

The study also found that faculty thought about diversity in three ways. First, they saw diversity as an obligation to address underrepresentation and achieve balance across concentrations, but only after other academic outcomes have been considered. Second, they considered diversity to be an opportunity to improve students' life chances (persona), to enrich the culture of their department and future of the discipline (intellectual), and to admit students through institutional fellowships (pragmatic). Third, they viewed diversity as a competition with other universities to recruit a top-notch URM candidate.

Considering this and other findings, holistic review with rich deliberation may be a potential best practice. Holistic review considers many student qualities, beyond the conventional achievement criteria that might privilege applicants from well-represented backgrounds. Such an approach places the student's academic credentials in the context of his or her background and potential opportunities. However, holistic review also introduces its own challenges, including cognitive biases, difficulties in comparing "apples to oranges," inference, and individuals' preferences for self-similarity. Applicant details that are subjected to inference and judgment can work for or against a candidate. For example, while observing admissions committee discussions, Dr. Posselt and her colleagues heard comments about candidates' hairstyles or hometowns. Thus, holistic review demands careful implementation, with attention to committee composition, opportunities for committee members to make their implicit assumptions explicit, and considerations of transparency, accountability, and how applicant disclosures are structured by their applications and publicly available information.

Dr. Posselt highlighted the implications of these findings for practice:

- Best practices do not exist apart from an awareness of how those practices interact with other factors.
- Departments should revisit admissions routines and make them explicit by clarifying language, goals, and measures; considering how to align admissions with program missions; and assessing whether the sequence and approach to key criteria create disparate impacts.
- Admissions committees should implement rubric-based evaluation, which systematizes holistic review, reduces time and effort per application, enhances transparency and accountability, and can be used in a flexible manner.
- Departments should strengthen recruitment by involving students as ambassadors, coordinating recruitment and admissions work, developing bridge programs, and considering improvements to school culture and faculty hiring as recruitment strategies. Departments should not assume that all students will be attracted to the same things, assume that money or prestige will draw students, or wait to recruit until after admissions offers have been made.

- Admissions committees should stop misusing GRE scores. For example, they should avoid adding scores together, using only GRE scores, using arbitrary cutoff scores, and comparing percentile ranks of different admissions tests.
- Departments should consider using larger and more diverse committees to reduce the effort per person and the risks for groupthink and homophily. Committees should set discussion norms that address the relevance of race and gender, encourage trust so that friendly debate and challenging assumptions is less threatening, and provide reasons for admissions decisions.

Discussion

Speaker 1 understood why Dr. Posselt and her colleagues had restricted their study to the top 15% of programs, but she pointed out that they might find that diversity is much greater among the other 85% of programs. She noted that in those programs, admissions committees use many of the same criteria, but their discussions of whether applicants could persist through graduate study might be different. Dr. Posselt responded that some of her colleagues are now studying admissions in less selective programs. She also explained that a chapter in her book assesses how faculty discuss international applicants differently.

One workshop participant commented that many departments now place less emphasis on GRE scores, but they cannot eliminate their use because NIH considers them when reviewing T32 grant applications. Dr. Posselt responded that in any social system, changes in the powerful organization providing resources to the rest of the system defines the extent to which a change in values perpetuates throughout that system. She believes that the GRE will eventually disappear, but no time soon. Dr. Posselt also noted that it is not yet clear whether test-optional admissions increase diversity; in fact, test-optional undergraduate admissions appears to have become more selective.

Dr. Posselt reiterated that diversity is often seen as additive, once achievement is used to determine whether an applicant will persist. In response to questions about pedigree and outcome, Dr. Posselt noted that faculty consider pedigree in the context of institutions and colleagues they trust. She therefore suggested that institutions consider how to expand the networks that faculty consult when making admissions decisions.

Dr. Posselt also noted that the admissions committees for the two philosophy programs studied were highly balanced in terms of gender, which affected admissions in key ways. However, she cautioned that the effect did not always improve diversity among graduate students. In some cases, women on the admissions committees were just as critical of female applicants, or even more so, compared to their male counterparts. Dr. Posselt therefore suggested that admissions committees focus instead on developing a critical mass of students from UR populations. Admissions committees tend to think differently about diversity when they perceive that a critical mass has been reached.

In response to questions from Dr. Jones-London about resilience, Dr. Posselt noted that even before resilience became a buzzword, departments wanted determined students who would push through challenges. She challenged committees to reconsider how they assess resilience

and whether they do so in systematic or thoughtful ways. Dr. Posselt also noted that some investigators are developing measures for resilience and that she is interested in developing short questions or other approaches, such as mining information from the personal statement, to assess student characteristics.

Dr. Posselt also noted that she and her colleagues did not observe most student visits to departments. However, based on the visits they did observe, they concluded that face-to-face interactions influenced how these applicants were discussed in admission committee meetings. She cautioned that on-campus interviews be incorporated carefully—adding that short, structured interviews might be more effective than weekend-long events for gathering information that is pertinent to the admissions decision.

One workshop participant who has been involved in NIH-supported high school programs explained that her institution has found it more helpful to focus on students' questions than on their answers. Dr. Posselt concurred, stating that she and her colleagues observed that applicants' questions during interviews demonstrated another way for admissions committees to distinguish applicants who were serious about graduate study from those who were interviewing for other reasons.

The discussion closed with Dr. Posselt noting that the recruitment aspects of her recommendations were relevant to other admissions models such as matchmaking. She also emphasized the importance of understanding the necessary steps to systematically engage the people involved in admissions to help them understand the risks of evaluation.

Panel 1: Interconnected Nodes—Where Do I Find the Talent, and How Do I Make Connections?

Moderator and Background: Edgardo Falcon-Morales, PhD, NINDS

As defined by NINDS, UR racial and ethnic groups include Black, Hispanic or Latino, Alaska Native, American Indian, and Pacific Islander individuals. According to the National Center for Education Statistics, approximately 19% of the students who earned degrees in biological or biomedical sciences in 2014-2015 were members of these groups. In 2015, the Annual Biomedical Research Conference for Minority Students (ABRCMS) received more than 2,000 abstracts, and 70% of attendees were from UR backgrounds. Thus, the talent pool exists. Dr. Falcon highlighted ways in which training programs could connect with that pool.

Institutions can conduct outreach at conferences, such as those of the ABRCMS or the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS). Representatives can personalize that outreach by attending or judging poster sessions at these conferences or the diversity poster session at the Society for Neuroscience (SfN) annual conference. In addition, they can bring current graduate students to talk with prospective students. Institutions can also connect with talent through established groups such as the National Research Mentoring Network (NRMN) and The Leadership Alliance or other institutions with umbrella programs such as Maximizing Access to Research Careers Undergraduate Student Training in Academic Research (MARC U-STAR), Building Infrastructure

Leading to Diversity (BUILD), or the Initiative for Maximizing Student Development (IMSD). They can send graduate students from UR backgrounds to their undergraduate institution with a faculty representative for a recruitment visit, and they can invite students from UR backgrounds to campus visits. Dr. Falcon noted a 2010 study by Lei and Chuang that emphasized that prospective students are impressed by positive interactions with friendly faculty.

Connecting smaller undergraduate institutions with graduate programs requires a basic understanding that both entities are committed to student development and that students should be prepared to meet their professional and personal goals. Strategies include using personal and professional networks, inviting faculty from host graduate institutions to give a talk and encourage prospective students, encouraging undergraduate students to apply to visitors' programs, and maintaining contacts.

As institutions make these connections, they should pay attention to their institutional culture and environment. For many students from UR backgrounds, a major factor in their decision to attend an institution may be whether that institution is sensitive to the needs of women and people of color. Institutions can ask current graduate students from UR backgrounds to interact with prospective students to foster confidence that their needs will be met.

Institutions should also consider why they want a diverse student body in their programs. Several institutions have developed diversity statements and have taken actions to fulfill those commitments.

Comments from Discussants

Discussants provided introductory comments in response to the following guiding questions:

- How can R25s connect with graduate programs?
- What are successful recruitment strategies for T32s? Where can they find resources or make connections with diverse students and programs?
- How do students choose graduate programs to apply to and attend?

As encouraged by Dr. Jones-London, discussants also commented on what did and did not work in their respective programs.

Rochelle Smith, PhD, Assistant Provost for Diversity Initiatives, Washington University in St. Louis

Dr. Smith noted that because Washington University is a historically and predominantly white institution, increasing faculty diversity and related efforts may have a significant impact on student recruitment. She also acknowledged that the unrest in Ferguson, Missouri, has made Washington University less attractive for some students from UR backgrounds. However, she also pointed out that once prospective students arrive on campus, they often fall in love with it.

About 12 years ago, when Dr. Smith served as Director of Diversity for the university's Division of Biological and Biomedical Sciences, a small number of students from UR backgrounds

participated in the division's PhD programs. To increase these numbers, the university implemented campus revisits, during which admitted students from UR backgrounds are invited to the university for the weekend to talk with the dean or provost and department leadership, build relationships with each other, and tour local housing options. The weekend costs approximately $1,200 per student and results in a matriculation rate of 60% to 100%. Overall, about 15% to 22% of students in each class now come from UR backgrounds.

To connect R25 summer programs with graduate programs, Washington University faculty from T32 programs sit on selection committees for its summer research programs and conduct interviews during the summer. Both activities allow faculty to identify and get to know prospective students they might want to train. The university is also developing an early admissions program for summer students. Other successful recruitment strategies include a virtual fair for students who cannot attend the university during the summer. For this fair, Dr. Smith's office and the university's recruitment office invite students from institutions that serve large numbers of students of color or students with disabilities to ask questions about university programs. Through its membership in the National Name Exchange, a 60-member consortium that shares information about talented students from UR backgrounds, the university acquired a list of students to recruit to summer and postdoctoral programs in different disciplines. Dr. Smith also described a Diversity Advisor Visit, which invited advisors from several institutions serving students from UR backgrounds to discuss the university, its programs, and its faculty. Washington University is still seeing the benefits from this program, because students often choose to attend institutions that their advisors trust.

Dr. Smith emphasized that students choose to attend graduate programs that are suggested by their parents and advisors. She also emphasized the power of students' knowledge of an institution's desire to increase diversity. Dr. Smith closed by suggesting that even though its faculty may not be very diverse, an institution can impress students by discussing its current level of diversity and its plans to recruit and retain diverse faculty and students.

During the discussion, Dr. Smith added that Washington University encourages its faculty to serve as mentors and that she and a colleague are developing a robust mentoring program to provide foundational training to faculty.

Vanya Quiñones-Jenab, PhD, Hunter College of the City University of New York

Dr. Quiñones-Jenab has served 23 years at Hunter College, first as an assistant professor and now as associate provost and director of the college's Blueprint for Enhancing Neuroscience Diversity through Undergraduate Research Experiences (BP-ENDURE) program. She noted that although recruitment is difficult at every level, it is possible if institutions are creative and build bridges.

Most institutions in the City University of New York system have training programs designed specifically for students from UR backgrounds. These programs include summer placement, in which three to four students visit other institutions to conduct research. Hunter College and other institutions within the system offer courses where students can present their research

and develop critical thinking skills. Hunter College also sends students on field trips to other institutions, and it holds Science Days and Science, Technology, Engineering, and Mathematics (STEM) Days to identify prospective students. All students who participate in the BP-ENDURE program at Hunter College attend graduate school.

Dr. Quiñones-Jenab emphasized the importance of building bridges with other institutions, particularly those with research training programs such as Minority Biomedical Research Support (MBRS) programs, National Science Foundation (NSF) grants, Mellon Foundation grants, and McNair grants from the U.S. Department of Education. She cautioned institutions against simply mailing brochures about their programs. Institutions should invest time in prospective students, because students attend schools where they have direct experience and can see themselves as students.

Diane Lipscombe, PhD, Brown University

Dr. Lipscombe, a principal investigator (PI) for the T32 program at Brown University and Director of the Brown Institute for Brain Science, shared that no one in her family had attended college and that she had initially thought that college was not in her future. However, she wanted a career in science and received excellent mentoring, and she now works to give back the mentorship she received.

Dr. Lipscombe noted the considerable influence of BP-ENDURE on recruitment. Brown University works with individuals such as Dr. Quiñones-Jenab to identify students, and its BP-ENDURE program receives three to four students each summer. The BP-ENDURE program is part of a larger, vibrant summer research community, where faculty handpick the students who will work in their laboratories. Brown University provides intense training for faculty who are passionate about mentoring and research support for the students.

Students in Brown's BP-ENDURE program also participate in The Leadership Alliance, an organization of universities that generates a pool of prospective graduate students. Through the Alliance, Brown's BP-ENDURE students can engage in a community with other students. Encouraging such participation is part of the BP-ENDURE faculty's overall effort to promote the welfare of their students.

Regarding what did not work, Dr. Lipscombe mentioned situations when students submitted their applications after faculty had already made other commitments or were interested in a summer research experience to boost their medical school applications. Like Dr. Quiñones-Jenab, she emphasized the importance of building connections and relationships. She also noted the importance of understanding the culture at the institutions building the bridge. She also cautioned against making assumptions about what students know when they enter these programs. She cited an example in which one student, when asked about what she learned during the summer, replied that she learned the meaning of office hours.

Brown University has developed a diversity inclusion action plan, which is available online. The university also surveys students each year about school culture and provides feedback to its

programs. These surveys are conducted by external parties, and students can respond anonymously.

Discussion

In response to Dr. Falcon's questions about partnerships, Dr. Quiñones-Jenab noted that she and her colleagues contacted seven institutions while writing their proposal for the BP-ENDURE program. Dr. Quiñones-Jenab and Dr. Lipscombe wrote a grant together, but Hunter College has also formed partnerships with four other institutions and for its MBRS and McNair programs. Dr. Smith shared that T32 programs at Washington University have formed partnerships with other institutions in St. Louis, the University of Maryland-Baltimore County, and other BP-ENDURE institutions.

Speaker 4, who serves on the graduate school diversity committee at her university, commented that perceptions of the safety and satisfaction of current students from UR backgrounds had undermined the university's ability to recruit more students from those backgrounds. She shared that the university made several changes based on its survey of black graduate and professional students, including establishment of a new diversity office, a forum where students can report instances of bias, and a counseling center. Speaker 4 agreed that current students have a considerable influence on the decisions of prospective students and emphasized the need for institutions to address issues on their campuses.

In response to questions from Speaker 10, Dr. Smith noted that outreach to and recruitment of Native American students has been difficult. Institutions must conduct outreach to not only individual students, but also the entire community, and they must address differences in cultural norms and expectations. Despite these challenges, Washington University has established the Kathryn M. Buder Center for American Indian Studies. Dr. Lipscombe responded that Brown University renamed Columbus Day Weekend as Indigenous Peoples Weekend after a discussion with faculty. The university has also engaged the campus and community in broader discussions of inclusion. Dr. Lipscombe also mentioned a strong program at Harvard University to recruit Native American students. Dr. Smith suggested that institutions can also conduct outreach during the American Indian Science and Engineering Society conference. Speaker 7 suggested that institutions directly recruit from Native American reservations.

Speaker 7 brought up alignment of recruitment efforts with students' motivations and professional goals. Speaker 7 noted that most students interviewed by her university are interested in health professions. She suggested that although these students might eventually attend medical school, they will continue in research as long as they remain interested in the career pipeline. Dr. Lipscombe agreed that many students who are motivated to help society consider medical school to be an entry into research. However, she also acknowledged the potential friction when an institution has worked to ensure a good match and experience for a summer student, only for that student to admit he or she is not interested in research. The goal of the BP-ENDURE program is to recruit students from UR backgrounds into neuroscience PhD programs.

Speaker 8 noted that Georgetown representatives recruit students from the BP-ENDURE fair and sometimes encounter advanced undergraduates who are seeking additional research experiences. She asked what her institution could do to connect with these students, given that the university itself does not have a formal summer research program. Dr. Jones-London suggested that some institutions might have diversity supplements to bring in additional summer students or postbaccalaureate students who do not go directly to graduate school.

Dr. Lipscombe stated that most summer research students subsequently attend graduate school at a different institution. However, she noted that institutions hosting summer research students are still contributing to the scientific research community by making these students competitive. She said that although institutions might want to retain the students they have invested in, they should remain flexible. Dr. Smith agreed, stating that one of the most important recruitment messages an institution can share is that the institution wants to help students find the best place for them. Dr. Quiñones-Jenab added that Hunter College encourages its students to diversify their background and go elsewhere for summer research and graduate training. Speaker 9 added that his institution's BP-ENDURE program encourages its students to spend their summers at institutions they are considering for graduate school, so that they can get an idea of the school culture.

Speaker 10 noted that some admissions committees consider whether applicants have co-authored a publication and that such a requirement might argue for students to stay where they are to acquire deeper research experiences. Dr. Lipscombe suggested that such a criterion might represent front-end filtering. Speaker 11 added that some summer work can lead to publication and that the assumption that summer experiences lack depth is not necessarily true. Discussants suggested that institutions might need to connect students who aim to publish with summer programs that allow them to continue their work when they return to their home institutions.

Dr. Smith noted that Washington University also engages parents by holding information sessions where they discuss what it takes to earn a PhD and the career choices available for PhDs. She concluded the discussion by suggesting that institutions consider removing as many barriers as possible in their programs, their campuses, and the opportunities they offer to encourage students to attend their schools.

Featured Lecture: Biomedical Graduate Admissions—Who Should We Admit?

Anna O'Connell, Director, Biological and Biomedical Sciences Program, University of North Carolina at Chapel Hill

The Biological and Biomedical Sciences Program (BBSP) serves 14 PhD programs. It receives 1,200 to 1,400 applications each year. Four admissions committees review these applications and interview approximately 300 applicants, each of whom undergoes five one-on-one interviews with faculty. From that pool of 300, 80 to 90 applicants are admitted each year. First-year students are unaffiliated; at the end of that year, they leave BBSP and move on to 1 of the 14 PhD programs. As part of the larger Office of Graduate Education at the University of North Carolina (UNC) at Chapel Hill, BBSP has a well-developed professional development staff and

several programs to recruit students into the research pipeline. These programs include an Initiative for Maximizing Student Achievement (IMSD), the UNC Summer of Learning and Research (SOLAR) program, the UNC Postbaccalaureate Research Education Program (PREP), and DNA Day.

Ms. O'Connell described a study in which BBSP objectively assessed whether application metrics differed between highly productive and less productive biomedical PhD students at UNC-Chapel Hill. This study was motivated by an observation that GRE scores had an outsized influence on whether UNC PREP scholars were invited to interviews, despite their letters of recommendation or their performance in the laboratory. The study was also motivated by a 2014 study in which the University of California, San Francisco (UCSF) found that subject GRE scores and years of research experience were more important than general GRE scores, grade point averages (GPAs), and undergraduate institution ranks in predicting how well students would perform in graduate school. The study has been published in *PLOS One*.

The study sample included approximately 280 students who applied to and matriculated in BBSP between 2008 and 2010. Application data included general GRE scores, undergraduate GPA, months of prior research experience, interview scores, and letters of recommendation. Outcomes included degree attainment and time to degree, as well as number of first-author publications. Ms. O'Connell noted that at least one first-author publication is a degree requirement for most BBSP PhD programs. BBSP used a custom Python script to mine PubMed for first-author and total publications. All first-author publications were considered equal; BBSP did not attempt to assess journal quality or impact factor. Likewise, all non-first-author publications were considered equal.

Consistent with the UCSF study, BBSP found that general GRE scores did not predict student productivity. These findings were also consistent with a Vanderbilt University study, published at the same time as the BBSP study, showing that GRE scores moderately predicted students' grades in their first-year coursework but did not predict PhD completion, time to degree, whether students would pass their qualifying examinations, or numbers of publications, conference presentations, or fellowships or grants. Ms. O'Connell echoed Dr. Posselt's remarks regarding the outsized influence of the GRE score in admissions decisions and noted the *Atlantic* article suggesting that the GRE score only determines whether a student is white, male, and wealthy. Ms. O'Connell showed data indicating that GRE scores vary by demographic group, and she stated that if departments set the bar at the 70th percentile, they could eliminate some groups altogether.

The BBSP study also found that undergraduate GPA and number of months of research experience did not predict productivity. Nor did faculty interview ratings. BBSP asks individuals who write letters of recommendation to rank the applicant relative to other students they have worked with, and these rankings were consistently higher among applicants who became become highly productive graduate students. BBSP also found a significant difference in the number of first-author publications between students with high letter-writer rankings and

those with low ones. Letter-writer rankings also predicted time to degree and degree attainment.

Based on these findings and other research, Ms. O'Connell made the following recommendations:

- De-emphasize or eliminate the GRE score in admissions decisions.
- Continue to prioritize research experience, with a greater focus on the applicant's potential as described in letters of recommendation and less of a focus on institutional quality and amount of past research.
- Define admissions criteria in advance.
- Consider ways to assess noncognitive qualities such as motivation, perseverance, self-awareness, and adaptability.
- Work toward holistic review.

Ms. O'Connell discussed the use of data to guide admissions. She noted that the UCSF study was published while UNC-Chapel Hill was considering changes to its admissions process for its biomedical programs. New practices implemented in 2015 included admissions committee education on implicit bias, new application criteria and a rubric-based evaluation process, and an online workflow for application review. Before these changes, applicants from UR backgrounds accounted for 17% of interviewees and 16% of those who were admitted. Since the changes, these percentages have increased to between 20% and 25%.

The admissions process changes have also brought some challenges. Application review workload is the biggest challenge, with 80 to 90 faculty members each reading 50 to 60 applications in a short time period. Educating interviewers, ensuring consistency in applying review criteria, and determining how best to evaluate academic preparation when GPA and GRE scores are not predictive of success are other challenges. Moreover, the changes in admissions process may require cultural changes with respect to the role of the committee chair, the power of anecdotal evidence, and the search for well-suited as opposed to perfect candidates.

Ms. O'Connell closed her presentation with a quote from the *Harvard Business Review*: "Diversity doesn't stick without inclusion." She challenged institutions to think about the environment diverse students would face and how they, the institutions, could support them. She reported a BBSP graduation rate of 85% for students from UR backgrounds and 88% overall.

Discussion

Dr. Jones-London asked how BBSP has handled discussions of implicit bias. She noted that such discussions have been challenging even at NIH, because some individuals do not think the issue is "about science." Ms. O'Connell responded that BBSP has a speaker present data on implicit bias, rather than ask admissions committee members to take a specific test. She also noted that UNC has discussed implicit bias for some time so that admissions committee members have been primed. Although Ms. O'Connell acknowledged that some people will always be

uncomfortable discussing issues such as implicit bias, she also noted that the committees' conversations has changed because of increased awareness.

One workshop participant noted that, based on experience, his institution only reviews letters of recommendation from writers with whom the applicant had conducted research. This comment was echoed by Speaker 14; her institution has also found reference letters from research mentors to be the most valuable guide in admissions decisions. However, Speaker 14 cautioned that sometimes the numbers do not match the glowing recommendation or that the writer is unable to communicate their high opinion of the applicant in writing. Speaker 15 shared that he prompts letter writers to think about how the applicant compares with other students they have trained. Another workshop participant commented that applicants with a research failure stand out despite significant research experience. In response to questions from Speaker 16 about applicants who have worked only with junior faculty members, Ms. O'Connell suggested that the committee bring in those applicants for interviews.

Speaker 17 noted Ms. O'Connell's data showing that, on average, students with more research experience tend to fare better. Speaker 17 asked how that can be applied in an admissions decision. Ms. O'Connell acknowledged that UNC-Chapel Hill experiences a higher number of qualified individuals than it can interview and admit. She called for a mechanism to track how applicants who matriculate elsewhere fare in the long run. In a related discussion, Speaker 18 asked whether BBSP would review career outcomes for its graduates. Ms. O'Connell responded that BBSP does collect information about where its graduates go, and most proceed to postdoctoral fellowships. Speaker 15 cautioned against making value judgments regarding one career path or another. He suggested instead that BBSP and others look at correlates and identify predictors of students moving into various careers.

Workshop participants emphasized the influence of institutional environments on student productivity, degree completion, and career path. Ms. O'Connell suggested that departments build a culture where students can feel supported. For example, BBSP informs first-year students of available supports, and the IMSD program at UNC has a mediated process in which students and faculty advisors rate student progress. Ms. O'Connell also suggested that departments understand the laboratory environment when considering the number of an applicant's publications. For example, someone might work in a laboratory where one publication in 4 years is the norm. Ms. O'Connell also acknowledged that more work is needed to distinguish between authorship and contribution to research studies, especially in the context of increasing opportunities for team science and collaborative research.

In response to questions about the effect of international applications on the BBSP study and conclusions about the GRE, Ms. O'Connell noted that the number of international applications have been limited because UNC-Chapel Hill is a state-supported institution. However, she suggested that consideration of international applications would not affect conclusions about the GRE scores, because most reviewers disregard GRE scores for international students.

Panel 2: Input, Hidden, and Output Layers—Defining and Solving Challenges in Graduate Admissions

Moderator: Steve Korn, PhD, NINDS
Background: Julia Kent, PhD, Council of Graduate Schools

Dr. Kent observed that the health sciences are in a strong position to shift the conversation about diversity in graduate education from a focus on "warm and fuzzy" to a focus on the importance of diversity both to practitioners and to research itself. She noted that the American Association of Medical Colleges has addressed both foci with its work on holistic review and its highlights of a diversifying population and its needs. Dr. Kent then focused her remarks on a survey conducted by the Council of Graduate Schools (CGS) in 2015-2016. This survey asked faculty and staff from within and outside of graduate schools to determine whether these groups differed in their views on holistic review. The survey focused on a variety of topics, including practices currently associated with the term "holistic review," the current landscape of graduate admissions, and practices that U.S. graduate schools consider promising for improving diversity in graduate programs.

CGS defined "holistic review" as "a process by which programs consider a broad range of characteristics, including noncognitive and personal attributes, when reviewing applicants for admission." However, almost 70% of respondents considered holistic review as a process that considered applicant characteristics other than past academic performance and test scores, and almost 40% thought that additional applicant characteristics were considered only after an initial screening based on academic metrics. Dr. Kent therefore noted the need for reflection on how holistic review is defined and for caution when programs discuss holistic review. She also called for new data associating specific admissions criteria with specific outcomes.

The Urban Universities for Health model, a partnership that includes the National Institute of Minority Health and Health Disparities, surveyed a group of programs meeting a pre-established threshold for model practices and estimated that the use of these practices together improves diversity outcomes. Survey results about graduate admissions were not surprising. Programs tend to consider academic credentials first; only later do they review letters of recommendation and personal or research statements. As noted earlier by Dr. Posselt, these practices raise questions about the notion that only a small number of applicants come from diverse backgrounds.

The CGS survey asked respondents to select up to 4 out of 14 applicant characteristics that deserve more attention in admissions to master's and PhD programs. For master's programs, respondents in both groups ranked past academic performance most highly as a characteristic needing more attention in admissions decisions. Only 13% thought creativity needed more attention, and only 18% thought resilience or grit needed more attention. For doctoral programs, respondents ranked critical thinking and research and work experience highly, but noncognitive characteristics were not ranked among the top four.

Based on the survey findings, CGS published a report in 2016 that highlighted several promising practices. Among those practices was "demonstrating a clear commitment to excellence through diversity throughout the graduate education system." Dr. Posselt's presentations and other comments at the workshop highlighted the importance of mission statements in establishing standards for which administrations can justify admissions practices in both a cultural and legal context. Considerations of race and ethnicity should be tied to a commitment to diversity as it relates to the mission of a program or university. Other promising practices include providing faculty members who make admissions decisions with the context needed to evaluate students appropriately and with information on the appropriate use of GRE scores.

Comments from Discussants

Dr. Steve Korn stated that this panel aimed to generate discussion between T32 and R25 programs about the types of students that graduate programs seek and the types of students that R25 programs produce. Specifically, discussants were asked:

- What are the challenges in graduate admissions from the perspectives of graduate programs, R25s, and institutions?
- How do you successfully employ holistic graduate admissions? What solutions have you employed? How can institutions be prepared to find talent in all forms?
- What are graduate programs seeking in a student? Who do they invite for interview? For admission? How can students best be prepared to succeed?

Dr. Korn cautioned against an overemphasis on "real research experience" and expressed the hope that admissions will not evolve to the point where students must publish before they are admitted to graduate school.

Gary Westbrook, MD, Oregon Health & Science University

Dr. Westbrook noted that his institution does not have undergraduate students or preparatory programs. Oregon Health & Science University seeks students who will fit into its programs. It also focuses on personal characteristics and research experience. This year, the university admitted two students who did not have substantial research experience but presented qualities that stood out. For example, they had sought research experiences away from their home institutions, which showed initiative.

Dr. Westbrook explained that the university's emphasis on research experience provides a way to assess risk. In today's environment, with limited resources, his programs want to ensure that applicants are truly interested in research. Thus, experiences beyond the classroom are vital components of an application.

Marion Buckwalter, MD, PhD, Stanford University

Dr. Buckwalter addressed Dr. Korn's concerns about the potential overemphasis of research experience. She noted that Stanford does not require candidates to have published, but it does value students who have had ownership of a project, for example design of an experiment.

Evaluators are instructed to identify evidence of such ownership from research statements, letters of recommendation, and interviews. Dr. Buckwalter noted that such ownership counts even if the project failed. However, she explained that Stanford recognizes that not all students will have research experience, for example because a student might not have the financial means to take an unpaid science internship.

Kathryn Saatman, PhD, University of Kentucky

Dr. Saatman noted that the University of Kentucky does not have a neuroscience program per se. Instead, the university accepts between 20 and 25 students per year into an umbrella program in medicine, and these students enter one of six basic science programs following a first year of coursework. Dr. Saatman also noted that the university's admissions process is not as competitive as others described during this workshop. The university receives 60 to 70 applications each year. Many applicants are from smaller colleges and universities, and some do not have research experience. Dr. Saatman acknowledged that admissions committees place more weight on GPA if an applicant does not have research experience. However, the most weight is placed on personal statements, letters of recommendation, and comments from faculty interviewers.

Jose García-Arrarás, PhD, University of Puerto Rico

Dr. García-Arrarás noted that the University of Puerto Rico has 10 campuses and that the level of research experience among its students varies by campus. Thus, expecting students from the smaller campuses to have research experience upon application to graduate school is difficult. The T32 programs at the University of Puerto Rico do not necessarily require research experience because they know the quality of most student applicants.

Discussion

Speaker 19 noted his institution's struggle with extending its mission to cover students from smaller universities with less research-intensive programs. In response to his question about viable substitutes for research experience, Dr. Saatman noted that the admissions committee at the University of Kentucky focuses on the GPA to assess whether the candidate can handle graduate coursework. The committee will also review the candidate's statement and letters of recommendation to ascertain whether the candidate understands what a research career entails and has expressed a commitment to such a career. Dr. García-Arrarás added that participation in summer research programs can inform students about the qualities necessary for a successful research career. Speaker 7 noted that her university asks applicants to write an essay about why they love science. Speaker 13 noted that her institution has incorporated the self-efficacy model from the National Research Mentoring Network in its admissions criteria to assess the potential for success.

In response to a question from a workshop participant, Dr. Saatman noted that it is not clear whether students with less research experience are more likely to drop out of graduate study. She suggested that better tracking is needed to answer that question. Dr. Westbrook noted that students admitted to Oregon Health & Science University directly from undergraduate

study—which does not necessarily mean they have no research experience—might lag others during the first 6 months of study. However, these students become indistinguishable from their counterparts as they gain research experience.

Participants also discussed processes in place for graduate students who are at risk for not completing doctoral study. Dr. Westbrook emphasized the need for institutional supports to help students who must change direction. Dr. Korn noted one strategy employed by the NIH Broadening Experiences in Scientific Training (BEST) program in which institutions develop positive exit strategies for students who do not complete PhDs, rather than consider these students as failures. Dr. Korn and Speaker 13 suggested that graduate programs might be willing to assume more risk if they implement positive exit strategies. These strategies could be described on program websites to inform applicants' expectations. Speaker 22 highlighted the importance of institutional environments; for example, a student who would succeed in one program might not succeed at another program. Workshop participants agreed that once students are admitted, programs have an obligation to manage students who do not complete doctoral study.

Speaker 23 expressed concern about the concept of risk aversion, because it is poorly defined and because there is little to no evidence that admissions criteria mitigate risk. Dr. Westbrook defined risk aversion as determining not only whether the candidate can handle graduate school, but also whether the program is the best program for the candidate. Dr. Westbrook considered it to be dangerous if the program cannot address student needs. Dr. Buckwalter also acknowledged the danger that admissions committees might say, "This student is not like us," when they say that student is risky. She suggested guarding against such danger by re-framing the question to ask whether candidates understand and are committed to a research career. This might be demonstrated, for example, by having past research experience.

Based on her experience with her institution's summer programs, Speaker 5 noted that curiosity and confidence can predict which students will fare well in graduate study. She suggested that institutions consider ways to build confidence and persistence in graduate and summer students. The application instructions for her institution's summer programs and graduate school emphasize curiosity, openness, and flexibility as desirable characteristics. Another workshop participant agreed that confidence is an important characteristic; she described efforts at her institution to increase peer mentoring.

Speaker 5 also noted the need for admissions committees to dig deeper when they consider noncognitive metrics or attributes. For example, committees can look at whether and how the candidate worked in college or contributed to their church or reservation. Otherwise, Dr. Smith continued, admissions committees would limit themselves to discussing what makes majority students competitive. Dr. Saatman agreed, noting that the University of Kentucky has many applicants from Appalachia. These applicants and applicants from diverse racial and ethnic backgrounds might be the first in their families to attend college and might be penalized by graduate admissions committees that emphasize the 4-year GPA. Dr. Westbrook noted that the first pass at Oregon Health & Science University is not based solely on numbers. However, he

routinely interviews students who did not make it through the first pass but often become the best graduate students.

One workshop participant cautioned that holistic review does not necessarily result in a more diverse student body. In fact, one group found that holistic review led to less diversity. In response to his question about what programs look for in terms of diversity, Dr. Buckwalter noted that Stanford seeks applicants from all backgrounds. The application includes a section where applicants describe what makes them diverse. As a director, Dr. Buckwalter reminds reviewers that diversity can be a positive factor. However, Dr. Buckwalter acknowledged that ensuring diversity requires effort. Speaker 10 emphasized that departments should push for diversity not only to support the students, but also to bolster their programs and the field of neuroscience overall. Speaker 10 further noted that framing the question of diversity in this manner helps committees use the proper criteria to attain the diversity they need.

Speaker 25 asked whether discussants create additional slots for students from UR backgrounds and what support they provide to help those students feel included. Dr. Buckwalter emphasized Stanford's commitment to include students of UR races and ethnicities. She noted that Stanford encourages programs to admit as many URM candidates as they want and then recommend those who do not receive offers for additional slots that the University might provide, which are based on non-NIH-specific review criteria. Dr. Buckwalter added that the students are not identified as "additional slots" and do not differ in quality or performance from others in the program. A summer program at Stanford offers URM students with the opportunity to arrive at school a quarter early. During this time, students are provided with social structure, professional development, and laboratory rotations.

Speaker 26 noted that over the past 10 years, which included a recession, domestic enrollment in graduate programs overall has stayed flat or even decreased. She also noted the rising levels of undergraduate student debt. Speaker 26 suggested that these factors might disproportionately discourage students from UR backgrounds.

Workshop participants acknowledged that graduate admissions is a competitive process and that, no matter what metrics are used, some students will not be admitted to a particular program. However, workshop participants noted that many of the students who are not admitted are competitive students. Considering the large number of competitive applicants, programs must think carefully about the metrics they use to define merit and select students. Several workshop participants suggested that criteria should account for the influence of diversity on a program, but acknowledged that more information about this influence is needed.

Speaker 27 promoted the high-quality and immersive nature of the summer undergraduate research experiences offered by Marine Biological Laboratories, Cold Spring Harbor, and Jackson Laboratories. She noted that these experiences help students build confidence and learn how to work with other researchers.

Featured Lecture: Reconsidering Climate in Graduate Education—Student Experiences and Institutional Strategies to Improve Student Outcomes

Kimberly A. Griffin, PhD, Associate Professor, Higher Education, Student Affairs, and International Education Policy Program, University of Maryland

As programs continue to strive for increased diversity among their graduate students, continued attention to admissions policies is vital. Equally important, however, is a focus on retention. Retention is a challenge in general; only 57% of all doctoral students complete their degree. However, among women and students of color, graduation rates are even lower. The enrollment and retention of graduate students from diverse backgrounds are also tied to the diversity of faculty. Unfortunately, this diversity has changed little during the past 30 years.

Climate could be one contributor to challenges in enrolling and retaining individuals from UR backgrounds in neuroscience, particularly in faculty careers. Defined by Hurtado and colleagues as the attitudes, behaviors, and beliefs among a campus community around issues of diversity, climate can be influenced by external factors such as current government policy or geographic region and by several internal factors such as compositional diversity (the number of individuals from each group), historical level of inclusivity, and the psychological, organizational, and behavioral climate. Climate has been linked to retention and achievement, habits of mind and lifelong learning, and competencies and the ability to navigate a multicultural world. However, climate models have focused primarily on undergraduate experiences and center around the general campus climate. Graduate experiences of climate are more likely to center around the overall scientific climate.

Dr. Griffin described two studies exploring the influence of climate on the retention of individuals from UR backgrounds in the scientific career pipeline. In the STEM PhD Careers Project, Dr. Griffin and her colleagues used qualitative research to design a survey exploring respondents' interest at specific time points throughout their graduate study. All respondents, who had completed their PhDs, reported declining interest in academic research careers, but this decline was pronounced among individuals—and particularly women—from URM groups. The third study in this project therefore engaged a subset of respondents in structured interviews and used team analysis to determine how black PhDs described and navigated the racial climate in their laboratories, graduate programs, and the broader scientific community. This study also assessed how those experiences affected respondents' career development and commitment to faculty careers.

Of the 21 respondents interviewed, 13 reported a declining level of interest and 3 maintained an already low level of interest. Although most respondents echoed general reservations about the competitive job market and low pay in faculty research careers, respondents' decisions about career paths were more often influenced by their perceptions of climate. Respondents rarely discussed overt acts or hostile environments. Instead, they were more likely to notice differences in how their peers interacted with each other and their advisors, compared with how those peers and advisors interacted with them (the respondents). For example, one respondent observed that his peers were encouraged to publish, but he was not, whereas

another reported that she was more diligent in her work but treated less favorably than a peer who was always arriving late. These differences, though subtle, made the respondents feel unwelcome. In addition, many respondents reported that the norms and values of science overall did not feel inclusive. One respondent noted professors' lack of a work-life balance and the number of black female professors who developed stress-related illnesses as reasons she left academia. Other respondents expressed a love of research, but they also expressed a desire to teach, conduct practical research, or increase diversity in the field, and they believed that faculty research careers left no room for these goals.

Based on these findings, Dr. Griffin suggested that programs rethink how they view inclusion and promote a sense of belonging. Rather than focusing on "horrible events," respondents believed that they were not excluded but not fully included. Dr. Griffin also concluded that the values of science, while appearing to be neutral, are related to identity in several ways. She suggested that climate frameworks can address this issue by considering ways to accommodate multiple routes of impact.

The second project explored how institutions address climate. The Lovitts model suggests that academic and social integration are important to foster retention. Interrelated with integration are global and local cognitive maps—that is, inside knowledge of how to navigate the department, what one needs to do to graduate, or how to handle departmental politics. Although this model provides a useful framework, it does not address identity and climate. The project discussed by Dr. Griffin focused specifically on the work of graduate diversity officers (GDOs). She and her colleagues conducted qualitative multi-case studies and interviews among a national sample of 14 GDOs representing 11 doctorate-granting institutions.

When asked what they perceived as challenges for retaining students from UR backgrounds, the GDOs noted problems with compositional diversity, including a lack of diversity, a sense of isolation, a lack of faculty diversity, and perceptions that institutions were not committed to faculty diversity. The GDOs also cited behavioral and psychological climate factors, such as strained relationships between PIs and their students and a failure to perceive that women and people of color face acclimation issues separate from those faced by the majority. When asked how they fostered retention, the GDOs described a three-pronged approach:

- They developed relationships with and provided direct support to individual students.
- They served as intermediaries between students and faculty, for example by implementing programs for mentoring coaches or by opening and translating conversations between students and faculty.
- They supported community development and efforts to help dispel a sense of isolation. For example, a GDO might couple a grant-writing workshop with social activities to foster relationships and help students get information and insight.

GDOs also cited inconsistent institutional commitment, a lack of financial resources, and being overworked as barriers to their work. Some GDOs summarized their comments by saying that the job of fostering retention was too big to be theirs alone.

Dr. Griffin closed her presentation by suggesting that graduate programs address climate by "re-centering" social engagement and relationships. Programs focus on academic performance, but they must understand that personal relationships will affect the quality of students' work. They should consider how to engage faculty, impress upon them their roles in fostering student development, and work toward a climate that actively includes and engages students from diverse backgrounds, rather than one that simply does not exclude them. Dr. Griffin also suggested that institutions explore ways to create campus-wide communities that provide opportunities for both social interaction and the development of cognitive maps.

Discussion

Workshop participants discussed the importance of institutional commitment as evidenced by both actions and resources. One participant shared the story of a friend who was a social scientist at a major state university and the only person of color in his department. He became chair of a committee to increase diversity, but when he received a job offer from another institution, his current institution did not express an interest in retaining him. Dr. Griffin emphasized that the inclusion of diversity and equity in the mission of the institution or department should mean more than simply checking a box. She suggested that programs and institutions explore ways to increase awareness of problems in retention and commitment to improving it. Dr. Griffin also reiterated that efforts to improve diversity should focus both on increasing admissions and on improving retention.

Dr. Griffin and Speaker 13 further described instances where a GDO might have a good idea but believed that it would be better received if shared by someone in the majority or someone on the inside. For example, Dr. Griffin believed that some ideas would have sounded differently coming from faculty, who had a better understanding of the department's approach to admissions and recruitment, than they would coming from "an outsider." Likewise, Dr. Jones-London described instances where women discussed an idea and decided that they needed to engage men as well.

Participants also shared steps that their departments or institutions had taken to improve their climate. One shared that students in his institution's science programs, including students from UR backgrounds, are heavily involved in program leadership, which is transparent and collegial. One participant described a climate team composed student volunteers. This committee surveys graduate students and postdoctoral fellows annually, develops a list of hot topics based on that survey, and works with faculty to organize workshops on two of those topics. The workshops bring together program faculty, students, and postdoctoral fellows. Dr. Griffin agreed that opportunities that everyone can participate in, ranging from journal clubs to social outings, are important in fostering community. She stated that many students and faculty of color are automatically assigned to diversity work. She added that while that work continues to be important, these assignments places an unfair burden on those individuals. She also suggested that students and faculty from UR backgrounds be included on other committees of importance to the department or institution.

Speaker 23 stated that she saw herself in the quotes that Dr. Griffin shared. She explained that one of her reasons for not pursuing a faculty research career was the perception that she would always be the only person of color in a department and that she would not know what type of institutional climate she might enter at each transition in her career. Speaker 7 noted increasing efforts at her university to combat isolation, for example by ensuring that no one from an UR background is the only one person from a UR background in a laboratory.

Workshop participants noted that everyone at the workshop cared about diversity on some level, but they wondered how they could share this message with their colleagues who might believe that issues of diversity are distracting or unimportant. Dr. Griffin and others noted that several research studies have shown that diversity can improve science. One participant observed that, when seatbelts were initially designed, all the engineers were men and therefore the crash test dummies simulated men. Thus, for years, more women died in car accidents because the seatbelts were at the wrong height. The participant noted this as an example of how research groups can miss obvious things without diversity.

Participants also noted the need to better reward individuals who engage in efforts to improve diversity while training the next generation of scientists. For example, Speaker 10 described an instance in which several committee members had to advocate for diversity work to be included in a promotion decision, because one faculty member had dismissed it as service.

Panel 3: Long-term Potentiation—Inclusion and Successful Advancement of Graduate Students

Moderator: Letitia Weigand, PhD, NINDS
Background: Rick McGee, PhD, Northwestern University

Dr. McGee emphasized that his research focused not on a deficit model, but on students who are capable of and interested in scientific research. He then discussed identity as a pivotal factor in students' decisions to pursue scientific careers. Identity consists of internal recognition, or sense of self, and external recognition, or how that individual might be perceived by others. It is fluid, dynamic, and influenced by social interactions. Dr. McGee noted that students place more emphasis on whether they see themselves in such a career than on whether they can do the work.

All individuals have multiple identities; in science, they must balance their social identities with their science identities. A major influence in this balance is a sense of recognition, which can affect the sense of belonging. The balance is influenced by alignments between external and internal recognition, for example the affirmation one might receive from acceptance into a program, laboratory, or fellowship. External messages can have large impacts; thus, imposter syndrome, stereotype threat, and conscious bias all impact identity. Students who feel different tend to be concerned about "being better than the best" to fend off stereotypes, devote extra time to finding places where they can be themselves and receive support, and can feel discouraged by being "the only one." On the other hand, these students can also feel positively

about being different, for example by seeing themselves as role models or individuals who can help change the culture.

Lave and Wenger defined communities of practice as groups who share a concern or passion about something they do and improve in their practice as they interact regularly. Communities of practice emphasize shared interests, competence, and unique practices that often are unwritten and draw on the power structures of the group and wider society. Thus, newcomers might be perceived as legitimate or be marginalized depending on their conformity to these shared practices. In addition, different rules might apply to different "types" of group members. The concept of communities of practice can be applied to the neuroscience field overall, to doctoral programs, and to laboratories. Practices and rules are often invisible and inconsistent among subgroups. This presents a challenge to all newcomers, for example first-year students engaged in laboratory rotations. If a newcomer is perceived as different, however, then the risk for marginalization increases.

Beginning in 2008, the National Longitudinal Study of Young Life Scientists enrolled and interviewed more than 500 students, including 270 biomedical PhD students. A substudy further interviewed a sample of 47 black women—28 from the National Longitudinal Study of Young Life Scientists and 19 from the Academy of Future Science Faculty experimental coaching intervention. Each woman was interviewed three times. A group of two black women and one white woman analyzed the data from these interviews, using a framework that assumed that:

- Black women have unique, shared experiences as members of a group characterized by gender and race.
- The experiences of black women in the creation of knowledge are inherently valid and valuable.
- Black women are agents of change.
- It is critical to examine the intersection of gender and race.

The study found that gender alone did not affect the way respondents were treated. In fact, 81% of them reported that they seldom felt that being a woman affected the way they were perceived. However, race was at the forefront of their concerns. Most of the respondents, 77%, spoke about "being the only" in at least one interview, and these feelings declined only minimally from the first to the third interview. Concerns about being the only black person influenced the respondents' choice of graduate school. Respondents also believed that being the only black person influenced their career interactions and created pressure to counter stereotypes and reflect positively on their race. Respondents who were first-generation immigrants were less likely to speak of being the only one and less likely to be influenced by race in their career decisions, probably because they came from nations where they were in the majority. However, these respondents were more likely to see gender as a barrier. The study therefore highlights the importance of not treating black women as a monolithic group. The study also revealed several coping strategies, including engagement in formal or informal race-based support systems. Less productive was a sense that they had to work harder to compensate for being the only one.

Dr. McGee also discussed a study that focused on the transition from R25 to T32 programs and asked why PREP scholars did not go on to earn PhDs. Among 48 PREP scholars from seven sites, the study identified distinct types of entrants, including PI aspirants, interest testers, discipline changers, credential seekers, and path builders. All moved on to PhD and MD/PhD programs at the same rate. The study also found that while in PREP, scholars developed their readiness for research and academics, as well as to present themselves as scientists. PREP effectively trains students by expressing high expectations for their future success as graduate students, providing student-centered mentoring from PIs and PREP personnel, and allowing time for development and reflection. The scholars therefore developed a comfort level with not only science but also their identity.

In summarizing these studies, Dr. McGee emphasized the importance of acknowledging and validating the complexity in managing identity, both in mentoring and in efforts to improve diversity. He noted, for example, that at his institution, students from URM groups did not want a "highly minority" experience in a program because of concerns on how that program would be perceived. As a result, the Northwestern University IMSD, branded as Collaborative Learning and Integrated Mentoring in Bioscience (CLIMB), is open to all beginning students in five life science PhD programs. Designed based on the concept of entry into communities of practices, CLIMB complements the regular PhD curriculum, anticipates transitions, and provides social support.

Dr. McGee also noted efforts at Northwestern to reform mentoring relationships. Northwestern is helping mentors develop the skills to create effective relationships with their mentees, with an emphasis on mentoring as a shared responsibility to meet mutual needs. In addition, based on work by Dr. Angela Byars-Winston at the University of Wisconsin, Northwestern, along with three other institutions and NRMN, has developed and disseminated Culturally Award Mentorship (CAM). CAM trains mentors to help their mentees feel included and to foster relationships where their mentees—and even their colleagues—feel comfortable discussing issues of race and ethnicity.

Comments from Discussants

Discussants in this panel were asked to address the following questions and to share student outcomes:

- How can programs, departments, and institutions ensure an inclusive environment for all?
- How can we support, mentor, and promote successful future transitions for diverse students? Are there strategies to support students through transitions employed by R24 programs that T32 programs can adopt, and vice versa?
- How can R25s best prepare students for a smooth transition to graduate school and beyond?

Kathleen Maguire-Zeiss, PhD, Georgetown University

Dr. Maguire-Zeiss shared that as a student she was happy in her laboratory and assumed that anyone could do it if she could. Only after she became involved in her T32 program as a Director of the Student Advisory Committee for PhD Programs did she think about the challenges other students might face. When she was hired, Georgetown's T32 was well established, and about 25% of its students were from URM groups. The T32 program has made important changes to retain such students and to help them feel at home.

Although Dr. Maguire-Zeiss is Director, the students on the Advisory Committee assume much of the responsibility for how the committee is run. All students from the interdisciplinary neuroscience program who have served on the T32 Committee are part of the group. The Committee holds monthly meetings on chosen topics, plans seminars, and incorporate topics in professional development even as they focus on the science. Social integration is particularly important; because of this group of peers, students from diverse backgrounds feel comfortable asking questions and seeking support. All students who have participated on the committee have gone on to postdoctoral fellowships.

Dr. Maguire-Zeiss explained that one-third of faculty in the neuroscience program at Georgetown are enthusiastic about efforts to improve diversity, another one-third do not care, and the remaining one-third must be convinced. Her most important role involves convincing and engaging faculty to assure buy-in for diversity efforts. The overall Biomedical Graduate Education department at Georgetown also supports the T32 program and provides additional slots, allowing Dr. Maguire-Zeiss to further increase diversity. At a higher level, the Dean of Diversity in the School of Medicine has begun several conversations surrounding race/ethnicity, gender, sexuality, and faith. The university itself has engaged in similar discussions and implemented a scholarship that provides 5 years of support for doctoral students from URM groups. The Provost's Committee for Diversity includes students, faculty, and administrators. These efforts have made it easier for students and faculty on the T32 to engage in difficult conversations about diversity and social issues.

Dr. Maguire-Zeiss noted that students appreciate hearing faculty members' personal stories. Thus, she uses her story to encourage other students to pursue careers in science. Dr. Maguire-Zeiss also encourages mentors to discuss the challenges they faced throughout their careers, so that students are less anxious about failing. She closed by noting her joint appointment in the Department of Biology, which has enhanced her ability to counsel students about the different paths open to them.

Farah Lubin, PhD, University of Alabama at Birmingham

Drs. Lubin and McMahon co-direct the Roadmap Scholar Program, an R25 program that focuses on graduate students throughout their tenure. Because it considers neuroscience to be organ based, the program includes students who work in neuroscience laboratories but not in neuroscience departments. All students in the Roadmap Scholar Program begin with a week-long workshop focused on working in neuroscience laboratories.

The Program also holds luncheons, where faculty from across campus speak about the science and offer their services as career coaches. These coaches are not the students' PIs and do not serve on the students' dissertation committees. Instead, they meet with the students two or three times each year to provide career advice and offer a safe space for students to discuss challenges. Dr. Lubin noted that the Program recognizes the importance of training the coaches and distinguishing the differences between serving as a career coach and a PI mentor.

Another unique aspect of the Roadmap Scholar Program is its transition-specific schools. The Postdoctoral School helps students visualize what it means to obtain a PhD and be a postdoctoral fellow. The school addresses real-world issues such as what PIs expect of their postdoctoral fellows, how to prepare research statements, and how to interview. In addition, current postdocs share their stories with senior graduate students. Likewise, the Assistant Professor School demystifies what it means to be an assistant professor and addresses everything a postdoc would want to know, such as starting and managing an independent laboratory and budgeting. Faculty speak with postdocs about what it was like to get their first R01s or nontraditional routes to assistant faculty positions. The Program also encourages team-building, encouraging students and postdocs to help others who follow behind them once they have succeeded.

The Roadmap Scholar Program also holds a National Neural Conference, which brings together leaders from UR groups in a scientifically rigorous meeting. Approximately 50 students from outside the university participate, and established neuroscientists give keynote presentations and discuss the challenges they have overcome. The meeting includes professional development workshops, including on professionalism and students' online profiles.

Yoland Smith, PhD, Emory University

Dr. Yoland Smith directs the T32 that supports the neuroscience program at Emory. Like other programs described during this workshop, the neuroscience program is part of a large umbrella program in the Graduate Division of Biological Sciences. It has about 80 students, 23% of whom are from URM groups. Dr. Smith noted that this percentage marks a significant increase over the past few years. He also noted that the pool of qualified applicants from URM groups has increased and that many more of the students that Emory admits matriculate.

Dr. Smith noted that this increased diversity has likely resulted from combined efforts between the neuroscience and umbrella programs, the graduate division, the graduate school, and the overall university. He shared that after applicants' interviews, Emory sends a survey to learn what they liked and disliked. Almost all applicants respond that the program was warm, welcoming, and collegial and that they felt as though they could find a home there. The neuroscience program also has a BEST program and emphasizes, for example during interview weekends, the many paths that a PhD in a biomedical science opens for students.

Dr. Smith also highlighted other programs, including an R25 that involves faculty from Emory and Georgia State University and IMSD programs that train undergraduate and graduate students. A STEM research symposium brings together 100 students from diverse backgrounds

to present posters, give talks, and interact with each other and faculty mentors. Program coordinators and graduate students from the neuroscience program also attend ABRCMS every year.

To retain students, Emory works early on to ensure that all students are on the right track. First-year students take a career development class, where they learn about what they will experience during graduate school and begin to consider their career plans. The Director of Graduate Studies also meets with graduate students annually. To help promote inclusion, students from all backgrounds are included in leadership committees so that they feel as though they contribute to the program's advances.

Discussion

Workshop participants discussed the value of in-person meetings to address the sense of isolation that students from UR backgrounds might feel. Dr. Jones-London noted the "homecoming feel" of the diversity poster session and reception at SfN. Dr. Lubin suggested a smaller, Gordon-type conference focused on professional development and inclusion. Speaker 29 shared that his institution is working on bringing its coaching models to various meetings to foster connections.

Speaker 27 noted that most of the students participating in summer research at her institution a positive and highly transformative experience. More than one-half of these students go on to have successful scientific careers. However, she expressed frustration that despite these successes, they have not yet achieved a critical mass of URM students in its summer program. At present, representation hovers as 20% to 30%, which is less than their goal. Speaker 27 also noted that more than one-half of the students of color are foreign born. The program's expense and duration (8 weeks) and perceptions of competitiveness are possible barriers. Dr. Lubin emphasized the importance of mentor buy-in for training opportunities such as those at MBL; otherwise, the PI or mentor only sees his or her workforce leaving for 8 weeks. Speaker 27 agreed on the need for mentor buy-in and noted that students often work harder and seem even more excited about science after returning to their mentor. In response to questions from Dr. Lubin about follow-up and ensuring long-term success, Speaker 27 reported that these summer programs provide a lot of mentoring, peer-to-peer networking, and networking opportunities with a vast array of scientists who visit the institution each year. She also noted that they have used Google and LinkedIn to identify 85% of its alumni from as far back as the 1970s.

Day 1 Wrap-Up

Michelle Jones-London, PhD, NINDS

Dr. Jones-London highlighted themes she had heard throughout the day:

- The need for stronger levers for institutional commitment to diversity. Participants want NIH to hold institutions more accountable for diversity.
- The importance of real research experiences, and the need for recommenders to describe these experiences in their letters of recommendation.

- Asset versus deficit models for trainees. Dr. Jones-London noted Dr. McGee's emphasis on leadership opportunities and not just remediation.
- The need for admissions committees to define clearly what they mean by risk-taking versus risk aversion when selecting candidates.
- The need for positive exit strategies for students who do not complete the PhD. Dr. Jones-London noted that models could be found in other NIH programs.
- The value of surveys in obtaining information about institutional climate.
- The need for mission statements to make a case for the importance of diversity.

Workshop participants also discussed the need for better measures of success and productivity. One speaker suggested that positive exit strategies and metrics are needed not only for students who do not complete the PhD, but also for those who complete the PhD but do not pursue academic research careers. Dr. Jones-London suggested the development of measures be developed in terms of what graduate programs can offer to trainees.

Participants also emphasized the importance of a bidirectional relationship between mentors and mentees, and the benefits of peer mentoring. Workshop discussions made clear that both mentoring and training of mentors are important at each stage in the career pipeline.

Day 2: Tuesday, April 11, 2017

Small Group Training: Entering Mentoring Curriculum and Implementation Plans

Introduction

Christine Pfund, PhD, National Research Mentoring Network Master Facilitator and Associate Scientist, University of Wisconsin-Madison

As defined by Dr. Pfund and her colleagues in a 2016 paper, mentoring involves a collaborative learning relationship with shared responsibilities, purposeful goals, and opportunities for both intellectual and personal growth and development. Research mentoring, career coaching, peer mentoring, virtual mentoring, and even advising can be considered mentoring if they involve a collaborative relationship.

Research has consistently shown a correlation between a strong mentoring relationship and positive outcomes, such as enhancements in science identity, persistence, research productivity, career satisfaction, and recruitment of individuals from UR backgrounds. At its best, mentoring can be transformative. Yet the mentoring landscape remains uneven. As discussed by Ginther and colleagues in a 2011 publication, white investigators are significantly more likely than their black or Hispanic counterparts to obtain R01s, most likely because of mentoring. Science faculty are more likely to rate male applicants as competent, and they are more likely to ignore mentorship requests from white women and individuals from URM groups. Male biologists are less likely to hire and train women, and individuals from URM groups typically receive less mentoring.

Mentoring has received a large nationwide focus, with mentoring initiatives implemented by NIH, the National Science Foundation, the National Academies, the American Association for the Advancement of Science, the Sloan Foundation, and the Howard Hughes Medical Institute. Among the NIH-supported initiatives is NRMN, a nationwide consortium of biomedical professionals and institutions working to increase the size, quality, diversity, and productivity of the biomedical research workforce. Specifically, NRMN aims to improve mentoring relationships, increase access to research resources and opportunities for career development, and increase awareness of the value of career mentoring. Among its tools is NRMNet, a platform that fosters social and professional interactions; matches mentors and mentees in virtual, online, guided mentoring relationships; and links users to training materials that promote mentoring. In this capacity, NRM serves as a national training hub to improve mentoring relationships.

Several skill-building tools are available to foster effective research mentoring relationships. For example, the Entering Mentoring curriculum builds on more than a decade of work by several institutions and organizations. It is an evidence- and process-based curriculum designed to raise awareness and link trainees to resources to build their mentoring skills. The curriculum includes standardized competencies addressing various aspects of mentoring. These competencies have been adapted for different disciplines and career stages.

Although several curricula have been developed, their effectiveness has not been studied systematically. Several studies, including a randomized controlled trial among a sample of senior faculty mentoring junior faculty, have shown Entering Mentoring to be effective. In the randomized trial, most of the senior faculty, about 90%, believed that the training was worth their time and were likely to recommend it. Those engaged in the Entering Mentoring intervention also reported a significant change in their effectiveness as mentors, and 87% reported implementing at least one change in their mentoring style. Likewise, mentees in the intervention group rated their mentors as more effective than before the intervention.

Polling and Small-Group Work

Throughout Dr. Pfund's introduction and the training, workshop participants participated in a poll through a mobile app. Participants answered questions about their roles and the greatest challenges they or their colleagues face in mentoring, and they were asked whether they agreed with statements such as, "Science is a meritocracy."

Workshop participants were assigned to small groups, where they applied their own mentoring experiences to discussions of two case studies. These case studies focused on two competencies: promoting effective communication and aligning mentor-mentee expectations, and cultural context. Dr. Pfund suggested that participants write about mentoring challenges they face in their own workplaces as case studies and try to approach them from an outsider's perspective.

Case 1: Promoting Effective Communication and Alignment of Expectations—The Slow Writer
Facilitator: Marguerite Matthews, PhD, NIH

The Case

A third-year student in the mentor's group does well at conducting experiments but will not submit reports and manuscripts on time. She has missed several deadlines. The mentor had to delay her preliminary examination because she submitted her draft proposal too late, and the mentor has taken the lead in writing manuscripts based on her work. Setting deadlines, offering encouragement, and communicating the importance of manuscripts to science have not worked.

Small Group Response

Small groups discussed the need for better communication, for example with respect to expectations and how to address the problem. They made the following suggestions:

- Refer the student to another member of the faculty or program staff.
- Use the student's dissertation committee to reinforce the mentor's suggestions.
- Ask directly whether the student is facing any challenges.
- Ensure that both the mentor and the mentee are aware of writing expectations and deadlines.

One small group discussed mentoring compacts, or a contract between faculty members and students, that outline both individuals' expectations and address potential concerns at the outset.

Small groups also suggested that the writing delays might arise from anxiety or a lack of confidence in her writing skills. One group member noted the possibility of stereotype threat: "The student might not let her lack of confidence show; students will let things go for a long time before asking for help." The small groups' suggestions focused on structured tasks or even additional training in writing:

- Emphasize that the key to writing is rewriting.
- Suggest that the student take a writing class or workshop.
- Break each task into individual pieces to help build confidence.
- Share an outline to guide the student in writing.
- Set aside writing time for the student while she is in the laboratory.
- Pair the student with a senior student or postdoc who can review drafts and provide feedback.

One small group noted that the mentor should not have waited so long to address the problem. One participant in the group suggested that the mentor could have referred the student to writing courses when the problem first arose. Other participants suggested referring the student to a counselor, if needed, to help the student through potential larger problems.

What We Can Learn

A mentoring compact, or a written document articulating expectations between mentors and mentees, focuses on the expectations for the working relationship. It differs from the individualized development plan, which focuses more on short- and long-term career goals. The mentoring compact can serve as a living document that is revisited and revised over time. It also can serve as a shared reference for progress reviews. Development of the compact should be a collaborative effort. Dr. Matthews presented a sample compact and highlighted examples of issues to address. Participants can find additional resources regarding mentoring compacts on NRMNet (https://mentoringresources.ictr.wisc.edu).

Case 2: Cultural Context—A Question of Mentoring Bias
Facilitator: Chinonye Nnakwe, PhD, National Science Foundation

The Case

A native-born American student with parents from another country starts work with an advisor who is a naturalized citizen. The advisor's country of origin has had longstanding hostilities with the country from which the student's parents emigrated. Although the student is on track and enjoying the research, the student notices subtle differences in the way the advisor interacts with him compared to other students, who happen to come from the advisor's home country. The American student suspects that he is treated differently because he is the only one in the laboratory with ties to the hostile country.

Small Group Responses

One group suggested that this situation might be a simple case of personality differences, although members acknowledged that more information was needed. Some members in the group noted that mentors can have a visceral reaction to such a conversation; some shared that they would have been offended if the student had approached them with his suspicion. Small groups made the following suggestions:

- The student can frame the question, for example asking why the advisor does not introduce him to others, as he does with the student's colleagues. One participant said she tells students, "Your boss is not a mind reader and might not be aware of the problem."
- The student can inject humor or irony into the conversation to diffuse tension.
- The mentor can pay attention and watch for opportunities offered by the mentee to address issues of diversity.
- The mentor can ask a blanket question, such as "How is the lab environment working for you?" Mentees often offer "tidbits" suggesting that they might not find the environment as inclusive as it could be.
- In some cases, mentors can share their own stories.

What We Can Learn

Cultural context represents an area where a collaborative learning experience between the mentor and mentee can be useful. A recent study has found that mentees want their mentors to address cultural diversity in the mentoring relationship. However, mentors are more hesitant. Talking about underrepresentation is difficult. Individuals of UR groups are experienced in talking about it, but those who do not share that background are not.

Although most participants agreed in initial polling that science is a meritocracy, they also agreed that science is not color-blind. Cultural diversity is important in all aspects of human life, including scientific training. Recent studies have shown that gender, race, and ethnicity influence how mentees perceive their mentored research experience. Thus, ignoring cultural diversity can lead to miscommunication, privilege toward dominant cultural norms, and mismatched expectations.

Mentors can consider how to obtain additional information that will help them to start such conversations. Mentors also could open discussions of diversity by mentioning fellowship opportunities designed to increase diversity.

Conclusion

Dr. Pfund expressed the hope that participants would leave the training with concrete ideas to implement in their own mentoring. Participants could consider recruitment strategies to help other mentors implement the same tactics. Strategies might include, for example, identifying who would be amenable, how to draw them in, and how much time would be needed for training. Participants could also consider the details of providing training: the format, the number of participants, and who will facilitate. Workshop participants completed an implementation worksheet.

Dr. Pfund concluded by noting the availability of several programs to help mentors guide their mentees, for example in research skills such as grant writing, scientific writing, and presentations. Modules are also available to help mentors navigate their mentoring relationships proactively and effectively. For example, training modules can help with navigating stereotype threat. She shared several links to resources on NRMNet and invited participants to undergo Entering Mentoring facilitator training.

Group Breakout Sessions

Workshop participants broke into four groups to process and discuss the information presented on the previous day. They also were asked to address the following questions:

- How can programs make the case for the value of diversity to all faculty in a department or institution?
- What kind of resources, training, etc., are needed and available for this?
- What can NIH, NINDS, institutions, program directors, admissions personnel, and students do to meet these challenges?

Group A

The group identified awareness of the current NIH funding climate as a major challenge in increasing diversity. Some participants noted low morale in the field overall. Graduate students in general see the struggles that PIs face in securing funding, and they question not only whether there will be an academic position available for them, but also what the future holds for neuroscience. Students are initially enthusiastic about research, but they become discouraged because of the difficulties and failures inherent in research and reach a point when they question their goals. In addition, students see any path other than a faculty position as a failure. For many students from UR backgrounds, there is also a tension between a strong commitment to give back to the community and a PI's perception that they are not fully committed to research. Some members noted efforts in their departments to discuss the many career opportunities available to students. Others who entered different careers cited the PhD as an essential credential for their chosen fields.

Group A also discussed the need to address implicit bias and overcome faculty skepticism. Group members noted that some faculty consider themselves unbiased and dismiss implicit bias as "something that applies to old white men." Group members called meetings such as this one "preaching to the choir," and one described private conversations she had overheard, where faculty members disparaged the background, pedigrees, and abilities of certain students. Some members also noted that students and junior faculty are often reluctant to approach their mentors when such issues arise. Others pointed out that there are few consequences for faculty who clearly overstep boundaries. The group suggested training for faculty and students on conflict resolution.

Group members pointed out that many students struggle with mental health issues, and the number is increasing. The group noted that this problem compounds others they had discussed. Two group members described efforts to train mentors how to recognize students exhibiting early warning signs, interact with these students, and refer students to needed services. One member described a site at his institution that is dedicated to graduate students. Another described an initiative in which faculty members share with students how they manage stress and wellbeing during their down time. The group suggested that departments provide information about mental health resources during orientation.

The group also emphasized the importance of maintaining community, particularly for advanced students who are no longer part of the general student corps but are working alone in their laboratories. Efforts to address this challenge include fourth-year seminars, annual retreats, and having advanced students serve as mentors for junior students. One member also described a video her department developed to explain to families what it means to attend graduate school.

Group B

The group suggested that making the case for the value of diversity depends on increasing understanding among faculty. Group members offered the seat belt story recounted on Day 1

as an example of how diversity can drive innovation and discovery. The group also noted that diversity is important because science is global and because scientists interact with colleagues from around the world. The group noted the need for faculty to become familiar with studies and data showing how diversity improves outcomes. They also called for more intentional conversations and coordinated diversity plans. Group members noted that the term "diversity" might put people off; they suggested terms such as "excellence" and "inclusivity" instead.

In considering the types of resources and training needed to increase diversity, the group called for more funding. Additional funding could support more workshops and training for faculty, "catch up" efforts for URM students who have the potential but not the credentials, and efforts to instill self-confidence and self-efficacy among all students.

The group noted that efforts by NINDS have contributed to advancements in diversity training in neuroscience. They specifically cited investments in R25s and T32s and NINDS' push for diverse student populations in the T32s.They encouraged NINDS to continue these efforts. Participants believed that NIH could do more to increase institutional accountability, including tying funding to institutional commitments.

Group C

This group also cited the need to increase awareness of existing data about the positive effects of increased diversity. The group encouraged admissions committees to employ more holistic approaches and interview applicants who might not present as well on paper. The group also suggested that institutions and departments look more closely at their faculty recruitment processes. For example, a recent study showed that PIs from UR backgrounds take longer to obtain their first R01s, but some departments require incoming faculty to have an R01.

With respect to resources and training, the group pointed out that laboratories with a lot of funding might not have as much time to spend on mentoring. The group suggested a closer examination of this issue. The group also suggested that institutions provide matching funds for training programs and more support for transition into and out of postdoctoral fellowships. Group members called for NIH to improve training for study section reviewers and suggested that PIs and faculty show more enthusiasm about their science and careers. Faculty members should not hide the downside, but they should highlight more positive aspects.

Group D

This group discussed how to be more successful in creating diversity. Although group members might have argued for increasing diversity, none had used a fact- or data-based argument. Instead, they focused on increasing diversity as being the right thing to do. Group members also acknowledged that efforts to improve diversity were about "individuals making a difference."

The group also discussed the disconnect between feeder institutions and graduate programs. Feeder institutions say they have a lot of talented minority students who are not admitted into graduate school, while graduate programs say they do not get applicants from these

backgrounds. Geographic limitations or students' unwillingness to attend school too far away was cited as one reason for this disconnect. Another was lack of perseverance; group members stated that building bridges and facilitating the feed required constant and consistent dedication. The group suggested that dedication and perseverance be built into institutions' or departments' mission statements.

The group also noted that when students consider a program, they look at the faculty, staff, and students and try to see themselves in that program. Thus, group members suggested that departments invite students to spend 3 months in their graduate programs to decide whether the climate is a good fit. They also noted that graduate students themselves can play an important role. At one institution, graduate students evaluate the climate and report their findings to the faculty.

The group also suggested that when evaluating candidates, summer programs should first identify all qualified candidates to generate a larger and broader pool. The programs can then decide who to accept from that pool. With this slight change, programs can move from accepting "the best" by standards that privilege a certain group to accepting qualified candidates.

Concluding Remarks

Dr. Jones-London referred workshop participants to their program books for diversity data compiled by OPEN. She and Dr. Korn also invited participants to contact NIH with their ideas. Dr. Jones-London closed by reiterating Dr. Koroshetz's commitment to improving diversity in neuroscience, even in this time of budgetary uncertainty.

Appendix 1: Participant List

Nicquet Blake, PhD, UT Health San Antonio
Marion S. Buckwalter, MD, PhD, Stanford Medical School
Roger Chalkley, PhD, Vanderbilt University
Cynthia Cheatham, Society for Neuroscience
Debbie Chung, MS, New York University (NYU) School of Medicine
Ed Clayton, PhD, Princeton University
Carrie Cowan, PhD, The Jackson Laboratory
Michael Edward Dailey, PhD, University of Iowa
Aniruddha Das, PhD, Columbia University
Michael Robert Deans, PhD, University of Utah
Dan Feldman, PhD, University of California, Berkeley
Patrick Forcelli, PhD, Georgetown University
Karen L. Gamble, PhD, University of Alabama at Birmingham
José E. García-Arrarás, PhD, University of Puerto Rico, Rio Piedras
Nace Golding, PhD, The University of Texas at Austin
Chris Goode, PhD, Georgia State University
Charles A. Greer, PhD, Yale University
Kimberly Griffin, PhD, University of Maryland College of Education
John J. Hablitz, PhD, University of Alabama at Birmingham
Edward D. Hall, PhD, University of Kentucky College of Medicine
Melissa A. Harrington, PhD, Delaware State University
John R. Hepler, PhD, Emory University School of Medicine
Peter Hitchcock, PhD, University of Michigan
Marshall Hussain Shuler, PhD, The Johns Hopkins University
Diane Jaworski, PhD, University of Vermont
Girardin Jean-Louis, PhD, NYU School of Medicine
Diana Silva José-Edwards, PhD, Washington University in St. Louis
Kiesa Kelly, PhD, Tennessee State University
Julia Kent, PhD, Council of Graduate Schools
Diane Lipscombe, PhD, Brown University
Erica Littlejohn, BS, University of Kentucky
Farah Lubin, PhD, University of Alabama at Birmingham
Barbara Lyons, PhD, New Mexico State University
Kathleen Maguire-Zeiss, PhD, Georgetown University Medical Center
Ludise Malkova, PhD, Georgetown University Medical Center
Richard McGee, Jr., PhD, Northwestern University Feinberg School of Medicine
Sally McIver, PhD, Northwestern University
Lori McMahon, PhD, University of Alabama at Birmingham
Robert L. Meisel, PhD, University of Minnesota
Paul G. Mermelstein, PhD, University of Minnesota
Carol Milligan, PhD, Wake Forest School of Medicine
Sheri Mizumori, PhD, BRAINS
Jessica Aurora Mong, PhD, University of Maryland, School of Medicine
Christopher Moore, PhD, Brown Institute for Brain Sciences
Alycia Mosley Austin, PhD, University of Rhode Island

Rae Nishi, PhD, Marine Biological Laboratory
Chinonye Nnakwe, PhD, National Science Foundation
Anna Ballew O'Connell, MS, University of North Carolina, Chapel Hill
Christine Pfund, PhD, University of Wisconsin-Madison
Gina Poe, PhD, University of California, Los Angeles (UCLA)
Julie Posselt, PhD, University of Southern California
James Pridgeon, MHA, University of Washington
Vanya Quiñones-Jenab, PhD, Hunter College of the City University of New York
G. William Rebeck, PhD, Georgetown University
Eduardo Rosa-Molinar, PhD, University of Kansas
Kathryn Saatman, PhD, University of Kentucky
Felix Erich Schweizer, PhD, UCLA
Linda Sealy, PhD, Vanderbilt University
Rosalind Segal, MD, PhD, Dana Farber Cancer Institute
Cheryl L. Sisk, PhD, Michigan State University
Rochelle D. Smith, MS, Washington University in St. Louis
Yoland Smith, PhD, Emory University
Alan Sved, PhD, University of Pittsburgh
Gianluca Tosini, PhD, Morehouse School of Medicine
David Edward Vaillancourt, PhD, University of Florida
Sukumar Vijayaraghavan, PhD, University of Colorado, School of Medicine
Gary Westbrook, MD, Vollum Institute
Marlys Hearst Witte, MD, University of Arizona College of Medicine
Russell S. Witte, PhD, University of Arizona College of Medicine
Ferdinand Zizi, MBA, New York University School Medicine

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Letitia Weigand, PhD

National Institute on Alcohol Abuse and Alcoholism
Lynn Morin, PhD

Appendix 2: Agenda

Day One

7:30 am **Registration**

8:00 am **Welcome**
Walter Koroshetz, MD, Director
National Institute of Neurological Disorders and Stroke (NINDS)

8:15 am **Meeting Goals**
Michelle Jones-London, PhD, NINDS

8:30 am **Featured Lecture**
Julie R. Posselt, PhD, University of Southern California
Assistant Professor, Rossier School of Education
Fellow, National Academy of Education/Spencer Foundation

9:15 am **Q & A Session**

9:35 am **BREAK**

9:50 am **Panel 1: *Interconnected Nodes*: Where do I find the talent and how do I make connections?**
Moderator: Edgardo Falcon, PhD, NINDS
Background: Gayle Slaughter, PhD, Baylor College of Medicine
Discussants: Vanya Quiñones-Jenab, PhD, Hunter College of the City University of New York
Diane Lipscombe, PhD, Brown University
Rochelle Smith, PhD, Washington University in St. Louis

- How can R25s connect with graduate programs?
- What are successful recruitment strategies for T32s? Where can they find resources or make connections with diverse students and programs?
- How do students choose graduate programs to apply to and attend?

11:10 am **BREAK**

11:25 pm **Featured Lecture**
Anna O'Connell, University of North Carolina at Chapel Hill
Director, Biological & Biomedical Sciences Program

12:10 pm **Q & A Session**

12:30 pm **LUNCH BREAK**

1:40 pm **Panel 2: *Input, Hidden, and Output Layers*: Defining and solving challenges in graduate admissions**
Moderator: Steve Korn, PhD, NINDS
Background: Julia Kent, PhD, Council of Graduate Schools
Discussants: Kathryn Saatman, PhD, University of Kentucky
Marion Buckwalter, MD, PhD, Stanford University
Gary Westbrook, MD, Oregon Health & Science University
Jose Garcia, PhD, University of Puerto Rico

- What are the challenges in graduate admissions from the perspective of graduate programs, R25s, and institutions? How do you successfully employ holistic graduate admissions? What solutions have you employed? How can institutions be prepared to find talent in all forms?
- What are graduate programs looking for in a student? Who do they invite for interview? For admission? How can students be best prepared to succeed?

3:00 pm **BREAK**

3:15 pm **Featured Lecture**
Kimberly Griffin, PhD, University of Maryland
Associate Professor, Higher Education, Student Affairs, and International Education Policy Program

4:00 pm **Q & A Session**

4:20 pm **BREAK**

4:30 pm **Panel 3: *Long-term Potentiation*: Inclusion and successful advancement of graduate students**
Moderator: Letitia Weigand, PhD, NINDS
Background: Rick McGee, PhD, Northwestern University
Discussants: Farah Lubin, PhD, University of Alabama at Birmingham
Kathleen Maguire-Zeiss, PhD, Georgetown University
Yoland Smith, PhD, Emory University

- How can programs, departments and institutions ensure an inclusive environment for all?
- How to support, mentor and promote successful future transitions for diverse students? Are there strategies to support students through transitions employed by R25 programs that T32 programs can adopt and vice-versa?
- How can R25s best prepare students for smooth transition to grad school and beyond?
- Student outcomes from example programs

5:50 pm **Day One Wrap-up**
Michelle Jones-London, PhD, NINDS

6:00 pm **ADJOURN**

Day Two

8:30 am **Welcome and Introduction of Activity**
Lauren Ullrich, PhD, NINDS

8:40 am **Small Group Training: Entering Mentoring Curriculum and Implementation Plans**
Facilitators: Christine Pfund, PhD, Associate Scientist, University of Wisconsin-Madison, NRMN Master Facilitator; Lauren Ullrich, PhD, NINDS; Chinonye Nnakwe, PhD, National Science Foundation; and Marguerite Matthews, PhD, NIH

10:30 am **BREAK**

10:40 am **Group Breakout Session**
Three breakouts to discuss recruitment, admissions, and transitions and facilitate connections between programs.

- How can programs make the case for the value of diversity to all faculty in department/institution?
- What kind of resources, training, etc. are needed and available for this?
- What can NIH, NINDS, institutions, Program Directors, admissions personnel, and students do to meet these challenges?

11:40 pm **Report out, concluding remarks**

Michelle Jones-London, PhD, and Steve Korn, PhD, NINDS

12:00 pm **ADJOURN**