

Department Invited Speakers Do Not Reflect Trainee Diversity

Running title: Invited Speaker Diversity Does Not Reflect Trainee Diversity

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¹ **Abstract**

² **Keywords**

³ inclusion, diversity, invited speakers, academia, graduate programs

4 Background

5 Long-standing systemic bias, sexism, and racism have contributed to the underrepresentation of many
6 racial and ethnic groups, as well as women, in science, technology, engineering, and math (STEM) fields
7 (NIH 2015 report, Measuring DEI 2016, (1)). Organization climate and culture that supports inclusion of
8 all individuals is essential to support the retention of historically underrepresented minorities (HURM) in
9 the U.S., as well as non-Caucasian individuals, and women in STEM fields (Schneider, 2013). Inclusive
10 organization culture will not suffice in retaining HURM, non-Caucasian individuals, and women without
11 organization policy changes that support their values and goals (2).

12 A long-standing issue within STEM fields, specifically within academia, has been a lack of diverse
13 representation of scientists for trainees (graduate students and postdoctoral fellows). In order to maintain
14 retention of HURM, non-Caucasian individuals, and women in STEM fields, it is important for trainees to
15 have visual representations of themselves as scientists. The importance of representation in retaining a
16 diverse group of individuals in STEM fields is supported by social role theory (3). Individuals tend to make
17 inferences about characteristics that are needed to be successful in a given role by examining individuals
18 that most occupy that role (3, 4). Therefore, trainees who do not see representation of themselves in senior
19 scientific positions, or in this case as senior faculty members, may decide that they do not possess the
20 characteristics that are required to succeed. In an attempt to make science a more inclusive environment,
21 many individuals have attempted to address this issue by promoting the inclusion of more women speakers
22 at conferences (5–7). However, no study to date has addressed invited speaker seminar series diversity
23 within their own institution.

24 Within the Department of Microbiology and Immunology at the University of Michigan (Ann Arbor, MI, USA),
25 each year from September to June, faculty members have the opportunity to invite scientists from other
26 institutions to give a one-hour seminar in which all department members attend. The invited seminar
27 speaker also has the opportunity to meet with current department faculty members and trainees. Scientists
28 who are invited to give seminars are widely regarded as successful and the top in their field. Thus, if
29 trainees are constantly being exposed to “the top scientist in their field”, according to social role theory, it is
30 imperative that the selected seminar speakers represent a diverse group of individuals.

31 In this study, we examine and compare the proportion of HURM, non-Caucasian/non-HURM, and women
32 invited speakers to white males in the Department of Microbiology and Immunology. Additionally, we
33 compare invited-speaker demographics to the current trainee demographics as a means to gauge if

trainee demographics are being represented accordingly throughout the seminar series. Following our investigation, we proposed a policy change to the Department of Microbiology and Immunology in how invited speakers are selected as a means to promote inclusion in our department and reduce stereotype threat, microaggressions, and unconscious bias. In order to facilitate inviting a more diverse group of scientists, we developed a set of resources that allow scientists, within the field of microbiology, to self-identify as an HURM, non-Caucasian/non-HURM, or a woman. These resources will promote inclusion and diversity by providing greater representation of all scientists and will provide hosts an opportunity to invite a more diverse group of scientists.

Methods

Each academic year, each faculty member in the Department of Microbiology and Immunology at the University of Michigan has the opportunity to invite one speaker per year for a weekly seminar series. Some of these seminar slots are dedicated to named lectureships, which are decided by committee, and three trainee-invited speakers. We analyzed the demographics of invited speakers and faculty hosts for five academic years (Fall 2014 - Spring 2019), and compared them to the current trainees when the data were analyzed (Spring 2019). Each speaker was only counted once and those listed as departmental faculty members or as a “host” at any point could not also be considered “invited speakers”. The list of faculty hosts was used as a proxy for faculty demographics since as hosts, these faculty members are visible representatives of the department. The trainee lists were obtained from department listservs that included masters students, doctoral students, and post-doctoral fellows.

This is a retrospective study, so individuals were not asked for their identities. Instead we hand-coded proxy demographics using personal knowledge, photos, and CVs. The presenting gender of each individual was assigned using a binary system (man/woman). Due to the low number of individuals in the study, race/ethnicity demographics were split in three groups: Caucasian, Historically Under-represented Minority (HURM), and Non-Caucasian/Non-HURM (NCNH), each with a binary (yes/no) possibility. Caucasian was assigned using the current U.S. Census definition where those of Middle Eastern, European, and Russian descent are included. HURM individuals were restricted to those with African-American, Indigenous, Alaskan/Hawaiian Native, Latinx and/or Hispanic heritage. All others were placed into the NCNH group. We recognize that our proxy demographics are a limitation of the analysis and want to acknowledge that the presenting gender may not reflect the gender(s) that an individual identifies as. We also want to acknowledge that there are many other identities that are not captured in this limited analysis.

Data were analyzed and figures generated in R Statistical Software, using relevant packages (8–20).

Results

To understand the representation of women, we compared the proportion of women in each academic role. At the trainee level, more than half of students and postdoctoral fellows were women. That dropped to 46.77% of faculty hosts and 38.73% of the invited speakers (Fig. 1A). Of 27 lectureships over the five year period, 37.04% were awarded to women. The proportion of women as faculty hosts and speakers is equivalent to global estimates that 40% of microbiologists are women, with a slightly lower representation of women in lectureships (21).

Our analysis identified an over-representation of Caucasian individuals as hosting faculty and invited speakers (80% each), relative to the proportion of Caucasian trainees, which was 55% (Fig. 1B). We also observed declines in the representation of HURM and NCNH faculty and speakers relative to the trainees (Fig 1B). HURM trainees made up 11% of the department, on track with the 11% of microbiology and immunology doctorates awarded in 2017 (22). However, only 8.5% of invited speakers, and none of the hosting faculty, were HURM scientists. NCNH trainees were 34% of department students and postdocs (22% of microbiology and immunology doctorates in 2017), but only 19% of hosting faculty and 10.5% of invited speakers (22).

The more prestigious invited speaker lectureships were also dominated by caucasian scientists, who comprised 81.48% of those awarded (Fig. 1C). HURM and NCNH scientists were awarded 3 and 2 lectureships, respectively. Because the intersection of identities can compound biases and outcomes, we further examined the lectureships by gender and race/ethnicity status. Caucasian men and women accounted for 44.44% and 37.04% of the lectureships, respectively. Just 18.52% of lectureships were held by non-Caucasian men while none were held by non-Caucasian women (Fig. 1D).

Discussion

Several papers have investigated the representation of women at scientific conferences, however, we have only identified one that focused on invited speakers at universities (23). In their study, Nittrouer et al, examined 3,652 talks at 50 U.S. institutions in 2013 - 2014 and found that women faculty are less likely to be invited speakers, despite similar acceptance rates. These results suggest that women faculty are less

often invited as speakers, a decision that may be negatively impacted by assumptions about competency and dedication. The dedication of women who have children to their work is perceived to be less than that of their colleagues, i.e., men who also have children. The perceived prioritization and commitments of women to family over work may cause faculty to doubt their acceptance of a speaking invitation (despite the prestigious nature of these invitations and evidence to the contrary)(???, 23). As a result, the faculty member invites a different colleague who they feel is more likely to agree (and is a man). Departments have different processes and criteria for selecting invited speakers, but it is a matter of pride to bring the best scientists possible. It may be that the definition of “best” poses a problem to women, who need three-times as many publications as their men colleagues to be considered equally competent. Some departments only invite tenured faculty, which severely limits the number of potential women speakers. Another scenario is that pre-tenure faculty members invite prestigious, tenured faculty in their field to network and secure letters for their own tenure package. The increased burden of women to prove competency decreases their likelihood to be considered for either tenure or as possible source of tenure letters.

The desire to invite the “best” scientist to these seminar series also poses a problem for HURM and NCNH scientists. A large portion of the NCNH cohort in our sample are Asian/Asian American individuals. Although Asian scientists are well-represented in the US scientific workforce, they face significant bias and barriers to inclusion in society and academia (24, 25). Both men and women who identify as HURM and Asian reported having to work harder than white men to be perceived as legitimate scholars (26). This expectation of higher productivity may result in fewer HURM and NCNH individuals being invited as seminar speakers. This is particularly striking in the low number of NCNH individuals in the more prestigious lectureships of our sample despite the higher employment rate of Asian scientists.

While HURM and NCNH share some experiences, differences including varying rates of hiring and tenure promotion mean unique considerations are important for inclusion of each group (doi:10.1001/jama.284.9.1085). For instance, the proportion of HURM faculty at the Assistant and Associate Professor level is currently higher than the Full Professor level so it will be difficult to increase speaker diversity if early-career researchers are not being considered (27). Increased performance expectations and patterns of exclusions are consistent themes in studies characterizing the HURM faculty experience (28, 29). Therefore, inclusion of HURM faculty in seminar series is likely essential to increasing the number of HURM Associate and Full Professors. More significantly, a major barrier to inclusion of HURM faculty at similar proportions to HURM trainees is the low transition rate of scientists from HURM backgrounds to faculty positions and the associated low proportion of HURM faculty (30). Even when HURM speaker rates match the proportion of HURM faculty employment, HURM trainees will be represented at a significantly higher proportion. Inclusion

of HURM faculty in these seminarseries is just one aspect of larger institutional change that is needed (31).

We have not been able to identify any other publications examining scientific speaker diversity beyond gender. This seems to be the first. This is concerning since conclusions drawn from gender-based studies are often framed, and considered, to be applicable to other marginalized groups (e.g., HURM). This is a flawed assumption. While there is no doubt some overlap, each group remains marginalized due to a unique complex set of factors that cannot always be solved by gender-based solutions. US-serving institutions, such as the University of Michigan have a particular responsibility to the historically suppressed populations included in our definition of HURMs. We therefore implore US institutions to apply this framing to their discussions and research.

According to social role theory, this department is not adequately serving their non-Caucasian trainees. Implicit biases that affect perceptions of marginalized groups are the primary issue, but we must acknowledge that it is not always possible to identify members of historically under-served communities. For instance, after data analysis, we learned that at least one speaker in our data set should have been categorized as a HURM instead of Caucasian, but it wasn't readily apparent from their internet presence or CV. This limitation makes two important points: that perceived identity often plays a larger role than self-identification, and that we need better tools to identify members of marginalized groups.

Instituting policy change within the Department of Microbiology and Immunology

In an attempt to promote inclusion within the Dept. M&I these data were presented to faculty members and the dept chair (Harry Mobley). Since, trainee demographics were not represented within seminar speaker demographics over the past 5 years, we proposed a policy change as to how seminar speakers were being invited. This policy change included switching from PI invited to lab invited in an attempt to allow trainees to choose a speaker that best represented themselves. In addition to this we also created resources which allowed scientists to self-identify and provide host faculty with more diverse choices.

Building Diversity

To help address this issue, we make some suggestions (Table 1) and have developed a resource to identify scientists who are members of marginalized and/or historically under-served groups. Motivated by a lack of such resources and inspired by similar resources—DiversifyEEB and DiversifyChemistry—we created

DiversifyMicrobiology and DiversifyImmunology. These resources are a tool for symposium organizers, award committees, search committees and other scientists to identify individuals to diversify their pools. Additionally, we have built these as a tool for use by other fields and organizations to create their own lists. Importantly, since these lists are compiled by self-nomination, we can ensure that only scientists comfortable revealing their marginalized identities are included.

The self-nomination form is a Google Form with entries logged in a private Google Sheet. This form is embedded within the website and can be linked to directly. The use of a Google Forms allows us to maintain this database at no cost and gives us the flexibility to add questions or change response options without disrupting previous responses. Entries are logged in a private spreadsheet so that entries can be screened before being added to the public database. This screening currently includes two steps: 1. Confirming that each person is listed in the database only once. 2. Verifying that the submitted website is a professional website for the person being listed. If a person has not been listed in the database previously and passes step 2, a new entry is added to the public database spreadsheet. If a person is already listed in the database, their information is updated to the most recent submission.

This public spreadsheet is embedded in the website and can be open separately as a locked (uneditable) Google Sheet. Importantly, this allows the list to be easily searched. We have chosen to list individuals' academic information first in the spreadsheet to encourage a focus on academic achievement rather than tokenization of marginalized identities. Currently the database lists individuals in order of self-nomination but future versions will be re-sorted based on name and/or academic field to varying the individuals who may receive more attention for simply being at the top of the list.

The website provides an interface to the Google forms and spreadsheets with template pages for viewing the list, adding a name to the list, and finding additional resources. Importantly, our website creation tool is hosted for free by GitHub, which provides a free website for each GitHub organization. Basic tools and skills required to set up a Diversify site include knowledge of, or experience with, the version control tool git, the webtool GitHub, and a text editor. A tutorial in the DiversifyMicrobiology repository on GitHub provides links to these resources and instructions for adapting the tool to your own field.

Conclusion

To increase the retention of white women and HURMS in STEM, they must also be represented as experts. However, the invited speaker diversity at one department does not represent the diversity of trainees. There

is a lack of research on invited speakers examining factors other than gender. To facilitate the identification and recruitment of individuals in these historically under-served groups, we have built a tool to create self-nominated, field-specific lists.

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Author Contributions

A.K.H. collected the data, assigned demographics, analyzed the data, and created the website. R.M.P. created the Google lists, forms, and website content and the description of their maintenance. J.L. wrote the introduction and provided conceptual advice. All authors contributed to preparing the final manuscript.

Code and data availability

The anonymized data, code for all analysis steps, and an Rmarkdown version of this manuscript is available at https://github.com/akhagan/Hagan_SpeakerDiversity_XXXX_2019/. Template and complete instructions for generating a field-specific Diversity website are available at <https://github.com/diversifymicrobiology/DiversifyMicrobiology.github.io/>.

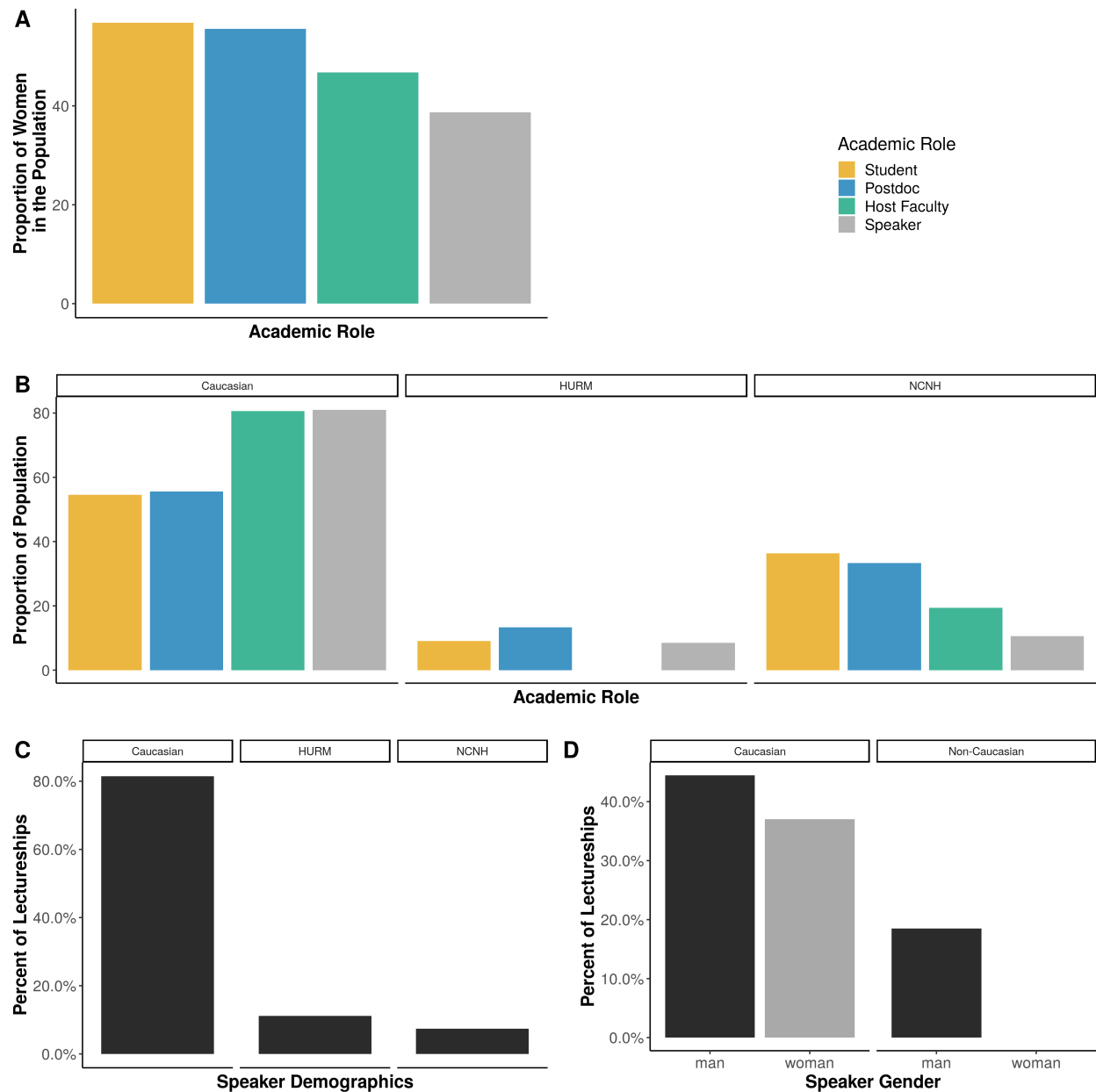


Figure 1: **The demographics of invited speakers, hosting faculty, and trainees.** A) The proportion of women in each academic role. B) The proportion of each academic role represented by individuals that are Caucasian (left), Historically Underrepresented Minorities (HURM, center) or International (right). C-D) The percent of lectureships awarded to individuals that are C) Caucasian, HURM, International or D) Caucasian or Non-Caucasian by gender.

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Table 1: List of suggestions and resources to increase invited speaker diversity.

Suggestion	Description	Resource
Lab-invited speakers	Faculty members can request suggestions from trainees	
Use a list	Many lists of scientists from under-represented and underserved groups are available	https://DiversifyMicrobiology.github.io/resources
Create a list	Use the GitHub template create a self-nomination list and resource for your field	https://github.com/diversifymicrobiology/DiversifyMicrobiology.github.io
Highlight the journey	Invite all speakers to spend a few moments describing their personal science journey	

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References

1. 2012. Colloquy on minority males in science, technology, engineering, and mathematics. National Academies Press.
2. **Coe IR, Wiley R, Bekker L-G.** 2019. Organisational best practices towards gender equality in science and medicine. *The Lancet* **393**:587–593. doi:10.1016/s0140-6736(18)33188-x.
3. **Eagly AH, Steffen VJ.** 1984. Gender stereotypes stem from the distribution of women and men into social roles. *Journal of Personality and Social Psychology* **46**:735–754. doi:10.1037/0022-3514.46.4.735.
4. **Carter AJ, Croft A, Lukas D, Sandstrom GM.** 2018. Women's visibility in academic seminars: Women ask fewer questions than men. *PLOS ONE* **13**:e0202743. doi:10.1371/journal.pone.0202743.
5. **Kalejta RF, Palmenberg AC.** 2017. Gender Parity Trends for Invited Speakers at Four Prominent Virology Conference Series. *Journal of Virology* **91**. doi:10.1128/JVI.00739-17.
6. **Casadevall A, Handelsman J.** 2014. The Presence of Female Conveners Correlates with a Higher Proportion of Female Speakers at Scientific Symposia. *mBio* **5**. doi:10.1128/mBio.00846-13.
7. **Klein RS, Voskuhl R, Segal BM, Dittel BN, Lane TE, Bethea JR, Carson MJ, Colton C, Rosi S, Anderson A, Piccio L, Goverman JM, Benveniste EN, Brown MA, Tiwari-Woodruff SK, Harris TH, Cross AH.** 2017. Speaking out about gender imbalance in invited speakers improves diversity. *Nature Immunology* **18**:475–478. doi:10.1038/ni.3707.
8. **R Core Team.** 2017. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.
9. **Wickham H.** 2017. Tidyverse: Easily Install and Load the 'Tidyverse'.
10. **Wilke CO.** 2019. Cowplot: Streamlined plot theme and plot annotations for 'ggplot2'.
11. **Allaire J, Horner J, Xie Y, Marti V, Porte N.** 2018. Markdown: 'Markdown' rendering for r.
12. **Xie Y, Allaire J, Golemund G.** 2018. R markdown: The definitive guide. Chapman; Hall/CRC, Boca Raton, Florida.
13. **Allaire J, Xie Y, McPherson J, Luraschi J, Ushey K, Atkins A, Wickham H, Cheng J, Chang W,**

- 222 **Iannone R.** 2018. Rmarkdown: Dynamic documents for r.
- 223 14. **Xie Y.** 2014. Knitr: A comprehensive tool for reproducible research in R. *In* Stodden, V, Leisch, F, Peng,
224 RD (eds.), Implementing reproducible computational research. Chapman; Hall/CRC.
- 225 15. **Xie Y.** 2018. Knitr: A general-purpose package for dynamic report generation in r.
- 226 16. **Grolemund G, Wickham H.** 2011. Dates and times made easy with lubridate. *Journal of Statistical*
227 *Software* **40**:1–25.
- 228 17. **Wickham H, Bryan J.** 2018. Readxl: Read excel files.
- 229 18. **Ooms J.** 2019. Pdftools: Text extraction, rendering and converting of pdf documents.
- 230 19. **Wickham H.** 2018. Scales: Scale Functions for Visualization.
- 231 20. **Neuwirth E.** 2014. RColorBrewer: ColorBrewer Palettes.
- 232 21. **Allagnat L, Berghmans S, Falk-Krzesinski HJ, Hanafi S, Herbert R, Huggett S, Tobin S.** 2017.
233 Gender in the global research landscape.
- 234 22. **Science and Engineering Statistics NC for.** 2017. Survey of Doctorate Recipients, Survey Year
235 2017. National Science Foundation, Alexandria, VA.
- 236 23. **Nittrouer CL, Hebl MR, Ashburn-Nardo L, Trump-Steele RCE, Lane DM, Valian V.** 2018. Gender
237 disparities in colloquium speakers at top universities. *Proceedings of the National Academy of Sciences*
238 **115**:104–108. doi:10.1073/pnas.1708414115.
- 239 24. **Hwang W-C, Goto S.** 2008. The impact of perceived racial discrimination on the mental health of
240 asian american and latino college students. *Cultural Diversity and Ethnic Minority Psychology* **14**:326–335.
241 doi:10.1037/1099-9809.14.4.326.
- 242 25. **Tran VC, Lee J, Huang TJ.** 2019. Revisiting the asian second-generation advantage. *Ethnic and*
243 *Racial Studies* **42**:2248–2269. doi:10.1080/01419870.2019.1579920.
- 244 26. 2013. Seeking Solutions: Maximizing American Talent by Advancing Women of Color in Academia:
245 Summary of a Conference. National Academies Press, Washington, D.C.
- 246 27. **Whittaker JA, Montgomery BL, Martinez Acosta VG.** 2015. Retention of Underrepresented Minority
247 Faculty: Strategic Initiatives for Institutional Value Proposition Based on Perspectives from a Range of

- 248 Academic Institutions. Journal of undergraduate neuroscience education: JUNE: a publication of FUN,
249 Faculty for Undergraduate Neuroscience **13**:A136–145.
- 250 28. **Pololi L, Cooper LA, Carr P.** 2010. Race, Disadvantage and Faculty Experiences in Academic
251 Medicine. Journal of General Internal Medicine **25**:1363–1369. doi:10.1007/s11606-010-1478-7.
- 252 29. **Hassouneh D, Lutz KF, Beckett AK, Junkins EP, Horton LL.** 2014. The experiences of
253 underrepresented minority faculty in schools of medicine. Medical Education Online **19**:24768.
254 doi:10.3402/meo.v19.24768.
- 255 30. **Gibbs KD, Basson J, Xierali IM, Broniatowski DA.** 2016. Decoupling of the minority PhD talent
256 pool and assistant professor hiring in medical school basic science departments in the US. eLife **5**.
257 doi:10.7554/elife.21393.
- 258 31. **Johnson MDL.** 2019. mSphere of Influence: Hiring of Underrepresented Minority Assistant
259 Professors in Medical School Basic Science Departments Has a Long Way To Go. mSphere **4**.
260 doi:10.1128/mSphere.00599-19.