

Beyond the bench: how inclusion and exclusion make us the scientists we are

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ABSTRACT Recent events encompassing social injustices, healthcare disparities, and police brutality against Black citizens highlight the continued need to strive toward unbiased and inclusive practices in all realms of the world. Our voices as cell biologists are powerful tools that can be used to combat inequities in the scientific landscape. In this inaugural *Voices* essay, we discuss how exclusion and inclusion events have contributed to our scientific journeys and how scientists can work to create an inclusive environment for our trainees and colleagues. As underrepresented minority scientists in the early and late stages of our scientific training, we frame the trainee experience to provide insight from unique perspectives. This essay also provides actionable items that the cell biology community can implement to promote inclusivity. We anticipate that initiating an open dialogue focused on diversity and inclusion will promote growth in the field of cell biology and enable scientists to assess and assume their role in creating welcoming environments. We believe that scientists at all stages in their careers can make meaningful and habitual contributions to supporting inclusivity in cell biology, thereby creating a future where diversity, equity, and inclusion are expected, not requested.

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MICROAGGRESSIONS: CHRONIC DAMAGE

The scientific landscape harbors a pervasive culture of exclusion that hinders the well-being and success of community members (Asai, 2020). While macroaggressive exclusion based on racial, gender, social, sexual orientation, religious, disability, or economic identity are noticeable types of discrimination, subtle microaggressions are often less obvious forms of exclusion that can cause irreparable damage to one's scientific identity (Harrison and Tanner, 2018). To fight exclusionary behaviors, scientists must begin by building an environment rooted in inclusive practices. Inclusion is the sense of belonging that individuals experience from being valued, respected, and acknowledged for their contributions to a group. It is well estab-

lished that creating an inclusive atmosphere supports diversity, productivity, and creativity (Ferdman and Deane, 2014). Indeed, we believe that inclusion is a basic human right, not a privilege. Moreover, diversity in the cell biology community will never exist without dedicated, intentional, and persistent inclusionary efforts by all members.

Microaggressions are subtle discriminatory acts frequently directed toward marginalized groups that highlight the exclusive culture within a community (Pierce *et al.*, 1978; Solorzano *et al.*, 2000; Sue *et al.*, 2007). A common microaggression that is far too prevalent in the scientific setting is *those awards are easier to get for a person like you*. These types of comments denounce the achievement of the scientist by attributing the accomplishment to race, gender, or circumstance instead of skill, hard work, or merit, which is both demeaning and confusing. Scholarly analyses have demonstrated that National Institutes of Health (NIH) R01 applications from Black investigators had a lower probability of being funded (Ginther *et al.*, 2011). In line with these findings, it has been shown that the overall R01 award rate for Black applicants is only 55% of the success rate for white applicants (Erosheva *et al.*, 2020). Meanwhile, the conversion rate of NIH Pathway to Independence Awards (K99) to the R00 phase is significantly lower for Black awardees compared with white, multiracial, or Asian awardees (Pickett, 2018). Collectively, these data provide clear evidence that it is not

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Abbreviations used: ASCB, American Society for Cell Biology; FRED, Faculty Research and Education Development; HSI, Hispanic Serving Institutions; MAC, Minority Affairs Committee; STEM, science, technology, engineering, and mathematics; UCLA, University of California, Los Angeles; UNM, University of New Mexico.

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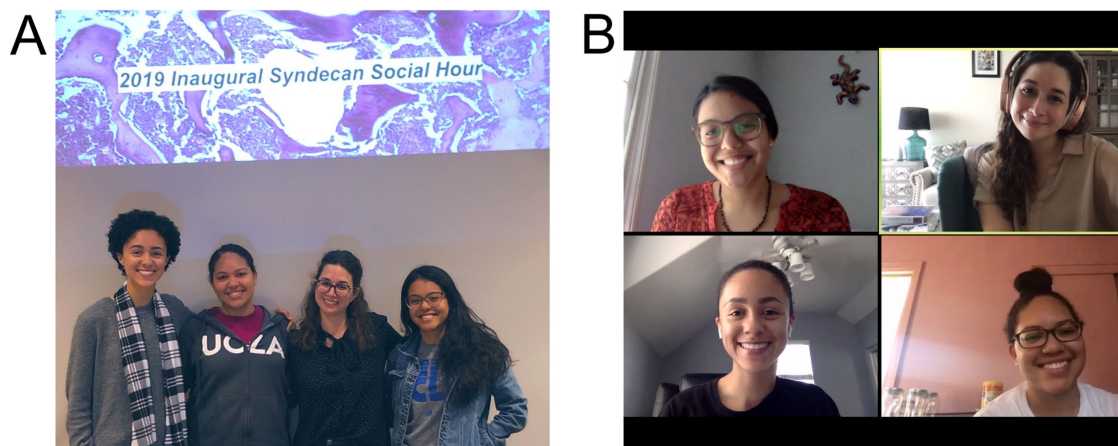


FIGURE 1: Syndecan Social Hour. (A) Scientists from the University of California, Los Angeles, meet at the Syndecan Social Hour to discuss their academic, scientific, and personal well-being. From left to right, Destiny M. Batton, Kalaya Hill, Christina M. Termini, and Amara Pang. (B) During the COVID-19 pandemic, scientists use the Zoom digital meeting platform for formal and informal discussions and continued mentoring.

easier for underrepresented minority, specifically Black, scientists to receive research awards. Unless all scientists acknowledge and denounce microaggressions in all scientific environments (laboratory, classroom, conferences, peer-review, etc.), scientists will never progress toward generating and sustaining a diverse cell biology community.

Underrepresented minority scientists are fatigued from fighting battles against microaggressions. Furthermore, during vulnerable stages in our training, we have felt helpless in speaking out for a fear of being labeled as difficult, which may negatively impact our career prospects. Proactive allies are a crucial resource for combating microaggressions, as allies have the ability to leverage their privilege to initiate positive change (Radke *et al.*, 2020). We ask that prospective allies educate themselves by reading, discussing, and working to identify microaggressions. Speaking out against bias and racism is not the job of the person under attack—it is up to all of us to protect each other and hold each other accountable to support inclusivity. Our responsibility as scientists extends far beyond the bench; allies, especially those in influential positions, can use their platforms to educate trainees, employees, colleagues, and collaborators and help initiate change in the scientific culture.

INCLUSION BY NEAR-PEER MENTORING

As underrepresented minority scientists, we have developed a strong mentor–mentee relationship that has enabled scientific, academic, and personal development during our time in the Chute lab. However, this is not the case for all trainees, as the laboratory environment can be intimidating for undergraduate students, particularly for trainees from marginalized groups who may not feel the same sense of community that majority students experience (Hurtado *et al.*, 2009; Cooper *et al.*, 2019). To create a nonjudgmental space for students to speak openly about their scientific discoveries, current events, academic progress, and career development, we founded the Syndecan Social Hour (Figure 1A). Even during the pandemic, we use Zoom to hold Syndecan Social Hours (Figure 1B) to enable continued academic progress and also discussion of more serious issues such as racial injustices against Black citizens, the DACA ruling, and healthcare disparities arising from the COVID-19 crisis. Near-peer mentoring models that involve a mentor (more experienced trainee) paired with a mentee (less experienced trainee) have been shown to promote success in science, technology, engi-

neering, and mathematics (STEM) (Zaniewski and Reinholz, 2016) and also support an appreciation for science and persistence in STEM (Anderson *et al.*, 2019). We strongly recommend identifying how you can create inclusive spaces that enable the scientific, professional, and personal growth of scientists from all walks of life.

THE POWER OF COMMUNITY

While conference and seminar attendees share scientific interests, diversity within the speaker pool is often limited. Diversity is described by Rodriguez (2016) as “the recognition of visible and invisible physical and social characteristics that make an individual or group of individuals different from one another, and by doing so, celebrating that difference as a source of strength for the community at large.” One retrospective study analyzing diversity within the University of Michigan Department of Microbiology and Immunology seminar series determined that only 8.5% of invited speakers identified as historically underrepresented minorities, while more than 80% of speakers were Caucasian (Hagan *et al.*, 2020). In other fields, invited speaker slots filled by women have been documented to be less than 20% (Shishkova *et al.*, 2017). It is essential that diverse scientists be highlighted in visible realms such as speaker slots, session chairs, and plenary lectures to show trainees that diverse scientists are capable of success in a given field to strengthen the scientific identity of underrepresented minority trainees. As scientific identity has been documented to positively influence the likelihood of a student pursuing a career in science (Stets *et al.*, 2017), it is critical that speaker lists showcase a diverse population of scientists.

Conference organizers need to be vigilant in ensuring that diversity is acknowledged by providing representation of underrepresented minority scientists in all aspects of the meeting program. Additionally, mainstream speakers could use their status to support diversity within their sessions by ensuring that they discuss and cite how the work of scientists from underrepresented minority backgrounds has contributed to their scientific field of interest. They might also consider giving their trainees from underrepresented backgrounds the opportunity to represent their labs and give a talk in their place. Established scientists could also consider declining invited speaking opportunities at events and sessions that do not showcase scientists from underrepresented backgrounds, instead suggesting underrepresented minority scientists who should be

considered as speakers. Prominent members of the cell biology community could also foster a more inclusive environment by introducing themselves to scientists outside of their network and engaging in conversations with researchers at their posters and at social events. A small gesture such as inviting scientists to sit at a shared table can go a long way toward promoting inclusivity and building a sense of community.

Several programs organized by the American Society for Microbiology (ASCB) Minorities Affairs Committee (MAC) help foster a sense of community at the ASCB Annual Meeting. As participants in the MAC Travel Award Program (Segarra *et al.*, 2020b), we have both had invaluable opportunities to connect with scientists, present our research, and receive additional mentoring. As a postdoctoral participant in the ASCB Faculty Research and Education Development (FRED) Program (Segarra *et al.*, 2020a), one of us (C.M.T.) also made lasting connections with scientists that have led to collaborations and mentoring that would not have previously been possible. We believe that it is our responsibility to pay these experiences forward to current and future trainees, colleagues, and even mentors. If we have a connection or opportunity that can help a scientist in need, we will do our part to link other scientists to these resources to support their inclusion in the scientific community.

While there is always an outstanding turnout at the MAC events at the ASCB Annual Meeting, there is much to be desired regarding space allocations, resources, and advertising. It is our hope that allies demonstrate solidarity with the minority community by attending and engaging in MAC events. For example, scientists can serve as MAC poster judges, mentors to new meeting attendees, or even FRED mentors. It is my hope that the ASCB will find ways to ensure that future MAC events are highlighted to the general cell biology community and not only minority scientists. Possible mechanisms to do so could be incorporating talks about diversity, equity, and inclusion into the highly attended plenary seminars or other major scientific sessions. We need to do our part to ensure that diversity and inclusion are not afterthoughts but instead are at the forefront of conference programming.

The ASCB has shown commitment to diversity through its sponsorship of the ASCB Prize for Excellence in Inclusivity, the ASCB Women in Cell Biology Awards, and the ASCB MAC E.E. Just Lecture. Recently, the ASCB meeting featured a Scholarship of Diversity poster session, which we hope will continue to provide an opportunity to showcase scholarly diversity efforts being undertaken by members of the ASCB community. We hope that these activities will continue to be expanded upon to provide more opportunities to diverse scientists at all stages in their training and from all career backgrounds. We are proud to be cell biologists and members of the ASCB. We believe that only through the acknowledgment and celebration of the diverse community of scientists will we make progress in generating inclusive spaces for scientists to thrive.

MEET THE AUTHORS

Christina Termini

After receiving my undergraduate degrees from the University of Maryland, College Park, I decided to pursue a PhD in Biomedical Sciences from the University of New Mexico (UNM). In 2019, UNM was identified as one of only 14 Research I universities designated as Hispanic Serving Institutions (HSI). HSI designation by the U.S. Department of Education is provided to eligible higher education institutions that have an undergraduate full-time student enrollment of at least 25% Hispanic students within a given award year. Further strengthening my inclusion as a scientist was the mentorship

I received by my Ph.D. advisor, Jennifer Gillette, while at UNM. No matter how seemingly insignificant or disappointing an experimental result was, I was amazed by Jen's optimism and ability to find a nugget of gold in all data. By asking challenging questions, Jen also forced me to think critically and openly while also learning to stand up for my scientific viewpoints when needed. The environment at UNM combined with Jen's mentoring empowered me as a scientist. I have since pursued additional training in larger, tougher, less diverse and more competitive environments. The confidence gained at UNM empowered me to assume my identity as a scientist and recognize that I belong in these environments regardless of the composition of my surroundings. As I approach the end of my scientific training as a Damon Runyon postdoctoral fellow at the University of California, Los Angeles (UCLA), and prepare to launch an independent career, I aim to channel Jen's positivity and optimism into my own mentoring to give trainees similar opportunities to grow.

Amara Pang

My scientific journey was inspired by my father, who in my eyes qualifies as a scientist. His excitement in explaining phenomena like gravity, the combustion reaction moving a car forward, or how electricity illuminated a lightbulb instilled a scientific curiosity in me from a young age. While my family supported me unconditionally as I pursued undergraduate studies, being a first-generation college student left me unprepared to navigate the unwritten rules of the college experience that extend beyond the coursework. Nevertheless, I am fortunate to have been mentored by professors at Pasadena City College, who enabled me to transfer to UCLA to pursue advanced training. As an undergraduate student at UCLA, I had the opportunity to obtain my BS in Microbiology, Immunology, and Molecular Genetics while completing a minor in Biomedical Research, which stimulated my interest in a career in research. Now as a staff research associate, I've had the invaluable opportunity to discover my scientific identity as I prepare to advance my scientific career as a M.D./Ph.D. applicant. I have been fortunate to have exceptional mentors and scientific role models who have shown me that the traditional mold of what we perceive as a scientist should not limit me from pursuing my goals of becoming an independent researcher.

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