Credit: smartboy10/ DigitalVision/ Getty

A giant leap for womankind

Hannah Valantine, Elizabeth Travis, Wafa El-Adhami, Isabelle Vernos, Laura Mosqueda, Elizabeth Wayne, Fiona Kearns-Zimmerman, Lauren Bonefont, Sandhya S. Visweswariah, Wuraola Akande-Sholabi and Jessica Polka

*Around the time that Nature Medicine launched 25 years ago, there was talk about the 'leaky pipeline' in biomedicine — a metaphor that describes how the number of women in the research workforce drops precipitously at ascending career stages, leaving few women in top leadership positions in labs. We've covered the topic continuously over the last quarter-century. In a 2001 article, we noted that "[d]ata show that women leave science careers twice as frequently as men" (*Nat. Med. *7, 637, 2001), and a commentary we published a year later stated that "If the culture is to change, women must not only be recruited for senior faculty jobs, but also for key leadership positions in the administrations of medical research institutions" (*Nat. Med. ***8***, 439–441, 2002). But the pipeline continues to leak.*

We asked 11 thought leaders on how they would advise the research community to make real progress in the next 25 years to address gender inequality in medical research. They offer concrete ideas for change. Here are their prescriptions for advancement.

Hannah Valantine, chief officer for scientific workforce diversity, National Institutes of Health

The culture of science, rife with gender harassment, creates a leaky pipeline for women in biomedical research, perpetuating the message that women do not belong and relegating them to the periphery of science — 'death by a thousand cuts'. A sparse number of women at the top feeds stereotypes that men are better leaders and creates a vicious cycle that deprives women in the pipeline of the opportunity to have role models. Profoundly off-putting is that the few women at the top are often ignored, face extra scrutiny and are held to higher standards than men.

Credit: NIH

Arming women with leadership skills and strategies to bolster their confidence is insufficient to stem the leaky pipeline; strategies for institutional culture change are needed. The National Institutes of Health (NIH), America's major funder of biomedical research, is in a unique position to ensure that efforts towards sustained change in culture are robust and effective, including elimination of the gender gap in leadership positions. As NIH director Dr. Francis Collins recently discussed on the *PBS NewsHour*, gender equity, especially in leadership positions, is key to ending harassment and retaining women in science.

The solution requires a systematic and integrated approach, underscored by transparency and accountability. Institutions should actively monitor, publicize and eliminate gaps in diversity and equity metrics, which must include monitoring faculty demographics, promotion and tenure rates, salary, resources and seminar speakers. These efforts also need to address the availability and affordability of and cultural barriers to work–life solutions. Culture change will only occur when progress is tied to institutional reward systems. We must move beyond 'awards' to 'rewards'. A plaque simply won't cut it!

Credit: Elizabeth Travis

Elizabeth Travis, associate vice president for women and minority faculty inclusion, MD Anderson Cancer Center

When putting together teams and committees, don't ask who's at the table — ask who's not at the table. It changes the lens through which you are looking. The key is to bring more women into leadership. Women in leadership will recognize the problems with gender inequality and push for change to address issues such as salary inequity, sexual harassment and many other challenges facing women. Case in point: when Janet Napolitano became president of the University of California, she required all colleges of the UC system to conduct a pay equity analysis and propose ways to rectify identified inequities. The same goes for minorities — we need to have diverse people with diverse experiences at the decision-making table. Yet people still defer to 'male' as the leader phenotype, and we've got to change this mindset.

To elevate diverse voices, I am a big proponent of a practice from the corporate world called sponsorship — an intentional effort by people in positions of power to actively advance the careers of younger colleagues and steer them toward leadership positions. It's basically talent management. What football coach would leave 50% of their talent on the bench? Senior people in medicine with influence and power have to keep their eyes open for talented young people — specifically, young people who do not look like them — and do their best to advance to prepare them for competitive positions.

Credit: Science in Australia Gender Equality – SAGE

Wafa El-Adhami, executive director, Science in Australia Gender Equity

Achieving gender equity will require change in behaviors and culture, which in turn requires collective leadership, commitment and action. Australia has a major national initiative to mobilize collective on-the-ground action across the STEMM — science, technology, engineering, mathematics and medicine — in higher education and research. It is the Science in Australia Gender Equity (SAGE) Initiative's pilot trial of an evaluation and accreditation framework known as the Athena SWAN Charter (SWAN stands for Scientific Women's Academic Network), which will "encourage and recognize commitment to advancing the careers of women in STEMM employment in higher education and research institutions."

Since its launch in 2015, SAGE has learned two important lessons. First, effective solutions for improving gender equity need to be tailored to context-specific issues and to different stages of women's careers. This requires investment in a framework that facilitates review of an organization's systems, structures, policies and culture, systematic and coordinated action, transparency and accountability.

Second, government involvement — supported by actions of the Australian Academy of Science and the Australian Academy of Technology and Engineering — is a key driver of success. To date, the pilot project has engaged half of the higher education and research sector. Concrete solutions being implemented by member institutions include support for parental leave, return to work following that leave and child-care responsibilities, and enhancement of policy and practice regarding flexible work arrangements. The actions also include support for management of career gaps due, for example, to parental and caring responsibilities or ill health, introduction of 'performance appraisal that factors in achievement relative to available opportunity', and improvement of career-advancement programs, such as leadership development, networks, sponsorship and coaching, and increased access to these programs. Lastly, member institutions have also made improvements to criteria for promotions and processes that address the gender pay gap and have done more to enhance the visibility of female role models and bolster communication and engagement to promote women's achievements.

Credit: CRG

Isabelle Vernos, ICREA research professor at the Center for Genomic Regulation, Barcelona; outgoing chair of the European Research Council's Gender Balance Working Group

One big source of concern for gender equality in medicine is disparity in funding. When I began as chair of the European Research Council (ERC) Gender Balance Working Group in 2013, our priority was to rectify the difference in success rates of men and women applying for ERC grants. Receiving these prestigious awards is a major career-booster for a scientist, and, in turn, it is crucial that all applicants have the same chance at earning one. We addressed all fronts — the application forms, the evaluation procedure and the gender composition of the panels — to see where bias could potentially be introduced. We introduced many modifications, such as revising the application to eliminate the free text on applicants' own achievements and training panel members and others involved in selection on implicit bias. We currently have an equal success rate for men and women in receiving the award, and the number of women grantees has increased from 20% to 27%. The next issue to tackle is the rate of female applicants, which is still relatively low, though slowly increasing.

Another major pressure point is institutional change. I also work with a European Commission project called LIBRA to establish effective gender equity plans at universities and research institutions. This entails first evaluating the issues at a specific institution and then formulating a plan to address them and designating someone to implement it. We are beginning to see results — for example, in increased hiring of women for group leader positions at several institutions. There is no silver bullet here — creating an equitable institution requires working at many levels and never thinking

that any action is too insignificant to bother with. It also requires documenting and tracking both disparities and solutions.

Credit: Photo by Ricardo Carrasco, courtesy Keck School of Medicine of USC

Laura Mosqueda, dean of the Keck School of Medicine, University of Southern California

Being the first woman dean at this medical school is an opportunity to lead by example, nurture early and mid-career women so that they successfully transition to leadership roles, seek and fix issues in the equity arena and guide the uncomfortable dialogues that must occur. It is easy to find reasons to avoid talking about sexual harassment, childcare, equal opportunity for advancement and many other important issues. Part of my responsibility is to insist on bringing these issues to light in a way that is simultaneously forthright, respectful, urgent and clear.

We cannot shrink from discussing how to proudly preserve women's roles as wives, mothers, daughters and/or sisters, which may be important parts of who we are. We cannot be afraid to point out hypocrisy and injustice. We must support each other to rise and be resilient during turbulent times. It may take many forms: changing broken systems, speaking up on behalf of ourselves and others, ferreting out subtle forms of discrimination and understanding and living our personal values, all in the name of making our field of bioscience one that truly supports the role of women in order to create a better world.

Credit: Bret Hartman; Elizabeth Wayne

Elizabeth Wayne, postdoctoral fellow at the Eschelman School of Pharmacy, University of North Carolina, Chapel Hill; podcast cohost, *PhDivas*

Institutions will have to actively make space for women and minorities. As long as institutions keep treating minority students as imaginary unicorns instead of real fixtures of the scientific enterprise, we cannot advance the conversation. We're here and we're talented, but we are being erased. To find us, check out social media hashtags like #womeininstem, #BlackandSTEM and #latinsandSTEM. Yet, research by Kenneth Gibbs at the US National Institute of General Medical Sciences and others shows that, even as the pool of minority postdocs is expanding, the number of those young researchers being hired for academic jobs is not.

Some universities do have a real commitment to diversity, both among the faculty and the higher administration, and are hiring accordingly. These institutions see the value in diversity — not just for minorities, but for everyone. So far, however, this change is happening in isolated pockets; minority faculty come to those places, while other institutions have little incentive to change. As we redefine what we think of as a traditional education, I'm hopeful that space for diverse voices in academia will expand. I stay in academia because I want to be a part of the change I want to create. I view myself not only as a scientist interested in gene delivery, but as someone who is shaping the educational path of future scientists.

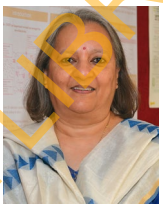
Credit: Keith Zimmerman

Credit: Lauren Bonefont

Fiona Kearns-Zimmerman and Lauren Bonefont, authors and managers of the *Two Women Scientists* blog

Diversity is too often approached with passivity. Most individuals do not question whether their own attitude is inclusive, so they don't hold their institutions accountable either. When institutions do not actively recruit with gender and racial parity in mind, only the groups that are already in power are served. Each institution must listen to underrepresented groups on its campus to solve its specific problems, as not all settings will benefit from the same solutions. Furthermore, many institutions ignore issues surrounding sexual assault and safety. Simply put, policies more often protect perpetrators like faculty and high-ranking staff, while victims — often already less empowered because of their race, gender or job status — are ignored or told to stay quiet. Addressing these issues within research institutions, professional societies and funding bodies is critical to retaining women in science.

Scientific institutions need to put in place educational training for lab leaders about sensitivity to cultural, racial, gender and sexual-orientation diversity (research shows that lab leaders can exhibit biases unknowingly). These institutions should also establish mentorship programs connecting young female researchers with experienced women in faculty positions to help navigate early-career and work–life balance issues; additionally, young LGBTQ identifying faculty could be assigned mentors who also identify as LGBTQ as well. Other moves they could make include offering high-quality on-site childcare and requiring departmental seminars to be more gender and minority inclusive (meaning an active attempt at larger numbers of racial, gender and LGBTQ-identifying minority speakers). We feel that these suggestions would help all in science and that those who don't agree are a part of the problem.



Credit: Manoj Sudhakaran

Sandhya S. Visweswariah, chair, Department of Molecular Reproduction, Development and Genetics, Indian Institute of Science Bengaluru; outgoing chair, Women in Science Panel, Indian Academy of Sciences, Bangalore, India

There is no overt bias in India in terms of encouraging young women to go into science. In biomedical research, more than 50% of our PhD students are female. However, throughout the rest of their careers, the number of women in senior positions diminishes. In my institute, with a 400-strong faculty, maybe 30 to 35 are women. What is glaring in the Indian system is that there are no senior women directors among any of the national institutes for undergraduate and higher education in this country.

Changing this situation will first of all require that men become more sensitized to it. They must embrace the idea that, all things being equal, you should pick women for junior faculty positions and also as directors of institutes, so they may act as a source of inspiration for early-career women. Senior male administrators must appreciate that diversity is good for their institutions. Perhaps 20 out of my 30 PhD students over the years have been women, and every one of them is still gainfully employed in science; having a role model helps. But many women studying with my male colleagues have dropped out. Additionally, institutions in India should embrace policies that support women's success, such as maternity leave and extending the tenure clock for women who have children. My institute has taken the lead on many such issues, but many institutions have not.

Credit: Wuraola Akande

Wuraola Akande-Sholabi, Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Ibadan, Ibadan, Nigeria

For women scientists in particular, a key issue is mentorship. For example, of the more than 13,000 registered members of one major international professional association, the Marie Curie Alumni Association, less than 1% are Africans by nationality who reside in Africa, and only around 0.2% are female Africans. It would be a noble idea for organizations of this kind to create a platform for collaboration and networking for women that could promote relationships within the global research and innovation community. The lack of mentorship slows down the progression to leadership positions and reduces the possibility of research collaborations.

Another challenge for women in Africa is our lack of exposure to international conferences, seminars and other venues for disseminating research findings and networking. Little financial support is available to cover travel expenses and other costs. Also, attaining competitive positions in biomedical research frequently requires relocation, which is often impossible due to family and insufficient compensation.

In general, biomedical and other researchers in Nigeria are hobbled by inadequate access to funding. We need a wider range of funding sources — such as from nongovernmental organizations, philanthropists and private organizations — in the developing world.

Credit: Jessica Polka

Jessica Polka, executive director, ASAPbio; visiting scholar, Whitehead Institute

Women and underrepresented minorities face pervasive biases that affect every part of the scientific process: hiring, promotion, collaboration and publication. We need to be mindful of who is visible on podiums and in photographs of institute leadership that decorate the walls. We should ensure 50% representation of women in positions of visibility: on organizing committees, as conference speakers and award recipients and on boards. It's not enough to have token participation, which can leave one member of an underrepresented group to represent an entire population. Furthermore, committees and boards must be mindful of the overall administrative burden each member carries (as this can be higher for members of underrepresented groups, who are called upon more often) and adjust the workload accordingly. Ultimately, this change in composition is necessary to counter current expectations about who is — and isn't — a leader. ❐

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