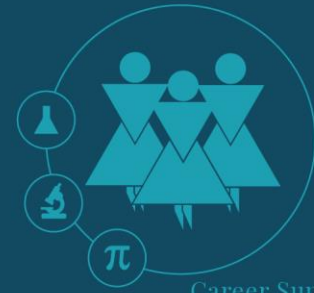


# Part IV:

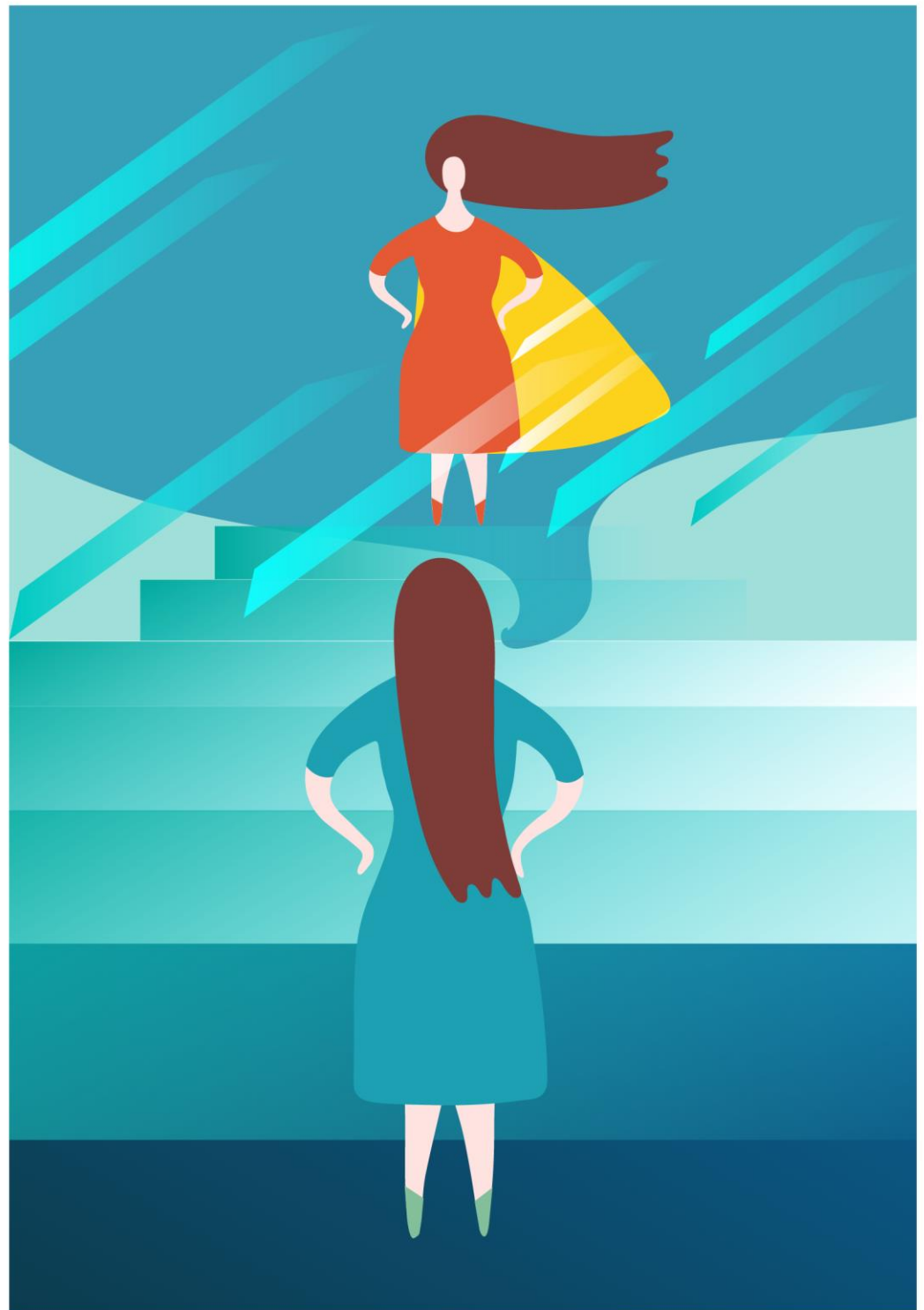
## Gender Diversity Paradox: Her Leadership Story



Career Support Group  
Women in Science

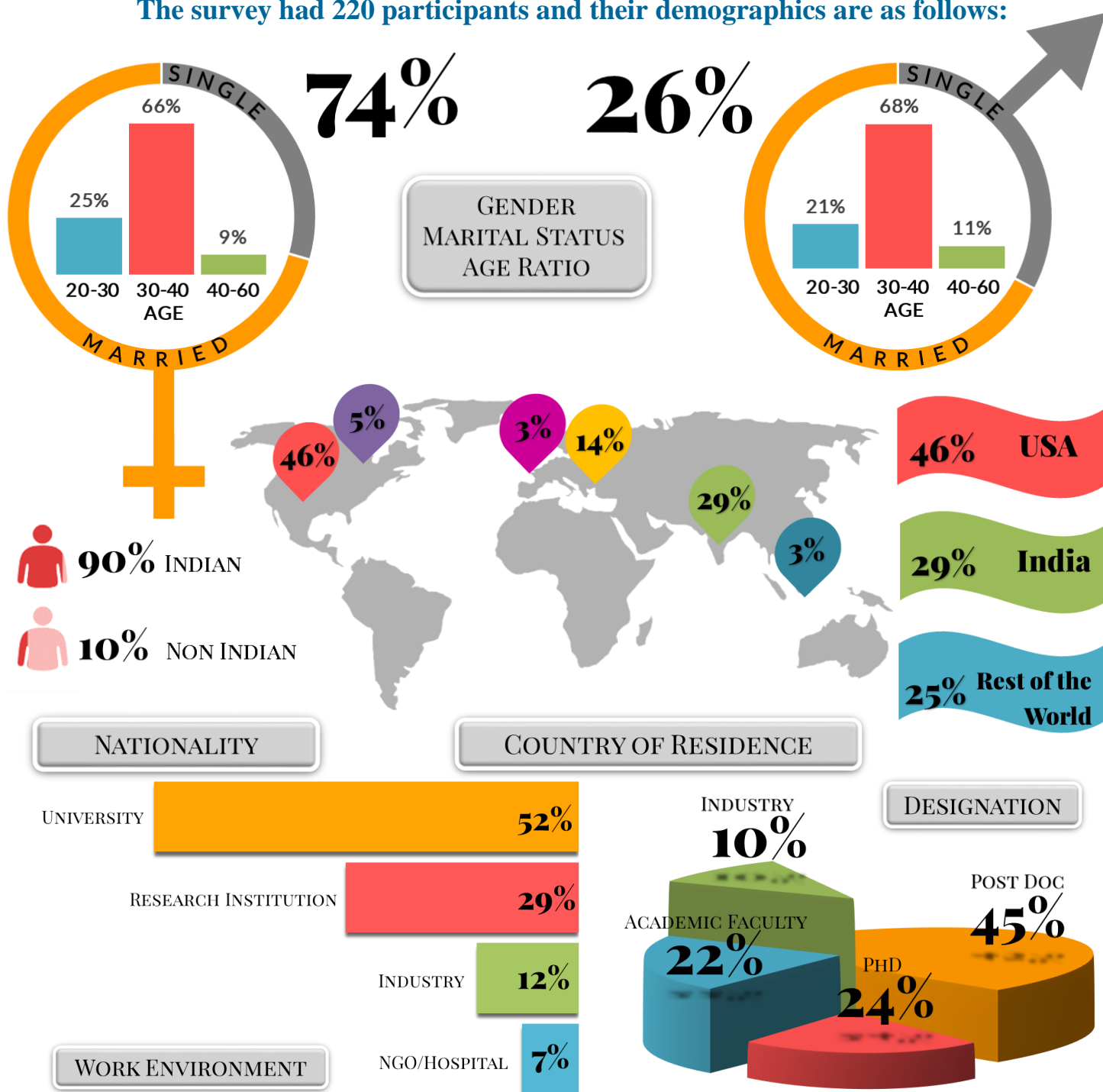
CSG-WIS Survey

2018-19



In early 2018, a [post](#) on Career Support Group (CSG) asking about the challenges faced by women in their work place/graduate school, got an overwhelming response. There were stories and struggles shared, but also support and willingness to take action. This led to the inception of Women in Science (WiS) sub-group of the PhD [Career Support Group \(CSG\)](#), a group of volunteers both women and men who care about the challenges faced by women in their lives. This survey is a part of an initiative to identify and address gaps in the support received by women researchers in a professional STEM environment and will be published as a 5-part series on [ClubSciWri](#).

The survey had 220 participants and their demographics are as follows:



# Gender Diversity Paradox: Her Leadership Story

*Soudeh Yaghouti, PhD and Poorva Dharkar, PhD*

Xing Xi (assumed name), grew up in a gender-neutral household as her parents took a genderless approach to raise their three daughters. When she was in her 20's and 30's, she was the only woman in upper leadership, and her closet consisted of only pants and suits, she purposely did not apply any makeup, and kept hair very short - all this just to be like a man and to be heard at the table.

She rose to a senior leadership position in a federal agency. Despite being a senior leader in a national organization that promotes public health, her significant talents, awards and accomplishments were hindered. She had to strategically break barriers and gender stereotypes to attain the same advantages as her male peers and advance in her career. She attributes her success to being focused, having integrity, making the right decisions, and building credible relationships. Though she never had any mentor, she always learned from others (both men and women) along the way. She says that currently the number of women in senior leadership in federal agencies has improved, but still the numbers are less as compared to men. Even today, there are no mandatory training programs, fewer efforts for awareness, and training is provided only when gender issues are raised.

## Career Ladder for STEM Gender Parity



## Introduction

Xi's experience demonstrates that, in spite of women's achievements and progress in scientific and business arenas, stereotypical attitudes towards women in STEM environments pose a significant barrier for their progress, especially in senior leadership positions.

Gender disparities still exist arguably in STEM research environments [1-2]. Statistics show considerable gender inequality in the career advancement of women professionals, specifically in the leadership levels in both science and technology environments [3-8]. USA is among the top 10 countries with the highest investment in STEM and total number of researchers (4255 researchers per million inhabitants) [9], however, women accounted for less than 32% of the scientific landscape across North America in 2015 [10]. According to a report provided by the National Science Foundation (NSF) in 2015, male participation (206,000) surpassed female participation (123,000) in the academic doctoral science and engineering workforce [1]. The number of female students who earned doctoral degrees in the US in the STEM fields has been steadily increasing since 2004 and has been either almost equal or even exceeded that of the male doctoral graduates [11]. Still women mostly hold junior faculty positions (42.5%) as compared to senior faculty roles (30.9%) [1]. In a study published by the National Academy of Sciences [6] females were under-represented in high profile biology labs led by elite male faculty where male grad students and postdocs outnumbered their female counterparts by two to one and three to one respectively. High performing female labs, however, did not reflect this issue. Even independent biomedical research fellowship programs which provide an alternative path to lead a lab and achieve non-tenure track positions, report evidence on the presence of gender bias in a recent study published in 2019 [7].

Men win a major share of scholarly awards, while women receive a higher proportion of teaching and service accolades due to imbalanced representation [5]. The smaller pool of potential women nominees is not because of the lack of talent. Nobel Prize winners and trailblazers like Professor Donna Strickland and Professor Frances Arnold have discussed the various explicit and implicit barriers they faced over their lifetime that impeded their scientific career progression [12].

Although 62% of women earn PhDs in the life sciences, 77% do not have any women on their scientific advisory boards [8]. Another statistics from 2013-2017 shows that biotech IPOs consistently had women underrepresented among their CEOs, boards of directors, scientific advisory boards, and C-level leaders etc. [13]. These issues highlight the view that to claim leadership positions, women researchers have to overcome significant gender bias and severe lack of good mentorship to compete on an equal platform with men.

To build a better knowledge base and uncover the issues faced by women scientists, CSG-WiS launched an international dialogue at the nexus of gender and scientific research, with an aim to create new applied knowledge and to help in the development of evidence-based policies and practices. We gathered data on the status of gender equity in academia and industry through the personal experiences of 219 researchers residing across the world and 5 subject areas. In the present article, we highlight gender gap in academia and try to identify whether and why women lack leadership opportunities. Moreover, we provide recommendations on various avenues to nurture women leadership and discuss how embracing diversity can help us advance towards gender parity in STEM.

## Methods

We focused our analysis on questions from the survey that were based on Women leadership. The survey had three questions;

- A) Would you choose/prefer to work with a female advisor?
- B) Are leadership opportunities delegated equally to women and men at your workplace? (e.g. leading a project or a meeting, supervising, planning etc.)?
- C) Do women/men perform tasks not directly related to the scientific responsibilities but necessary for smooth running of the workplace? (E.g. cleaning, arranging and organizing things in the lab, recording minutes of meetings etc.).

Except Q1 that had options- Yes, No and maybe, the rest of the questions had five options: 1) Always, 2) Mostly, 3) Sometimes, 4) Rarely, and 5) Never. Chi-square statistics were carried out and *P*-value for hypothesis test were obtained to calculate statistical

significances of these analyses. Our survey respondents consisted of 73.5% female and 45.6% resided in USA and 29.2% in India.

## Results

### (A) Working academic environment

We analyzed our survey data of question (A) to evaluate supporting academic environment for women scientists. The following observations sum up our findings.

1) 63.5% of participants responded positively to working with male advisors, and 53.4% to women advisors. Note that the preference for male advisors is 1.19 times higher than working under women advisors.

2) Of negative respondents, there is a 5 times higher response for women advisors (10.1 vs 2.3%) (Figure1), which stresses that men advisors are preferred over women.

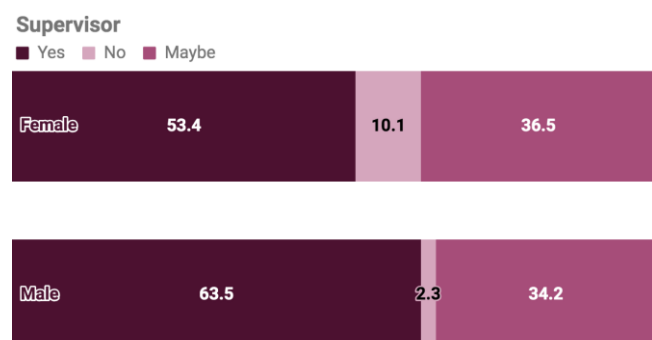


Figure 1: The stacked bar chart compares the percentages of researchers who prefer men and women advisors, in our survey which includes 219 respondents and 73.5% of them are women.

In the analysis of article 2 Gender Bias - Myth or Fact [14], 56.6 % of the female survey participants claimed to have faced most bias from other women. These analyses can be correlated with our results to prove that there is less preference for female advisors for similar reasons. On the contrary to this perception, a study on six PhD student cohorts between 2004–2009 at the California Institute of Technology, shows positive productivity of female students when they coauthor with female advisors [15].

### (B) Workplace leadership opportunities

There is clearly a systemic tension between gender role expectations and careers of women in science. We

analyzed the percentage of men and women who are given a leadership role in their workplace, which may be either managing a project, supervising interns, leading a smaller group etc. Our aim was to get answers specifically if there are gender differences in leadership roles offered.

- We observed that the percentage of men and women who are “always” leading projects is comparable, 21% of men vs 18.1% women, which is a positive result.

- When we compared the percentage of projects that are led “mostly” and “sometimes”, men outnumber women (41.1 % vs 28.3%), while women lead projects “sometimes” with a higher percentage (49.3% vs. 33.8%).

- Men and women had comparative responses in both “rarely” and “never” leading categories, which indicate that both genders do participate in equal numbers in the categories with positive responses.

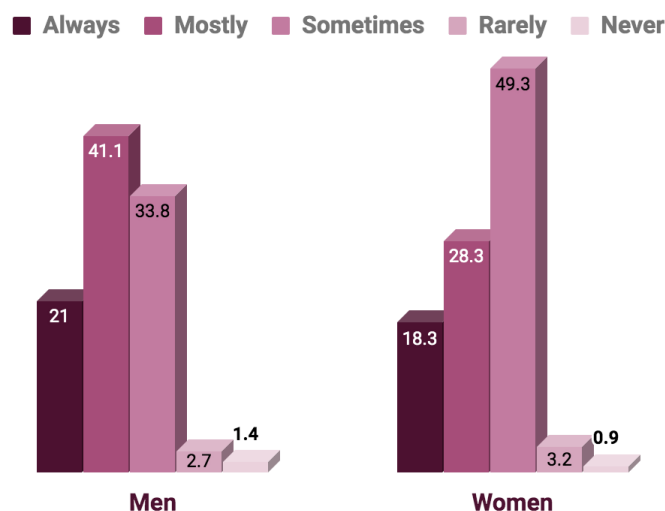


Figure 2: Bar graphs to show the percentages of men and women taking up leadership roles in laboratories.

On the contrary, we have results from other surveys to demonstrate that women do not end up in equal number of leadership positions, which again raises more questions- why are these numbers skewed?

To achieve a leadership position, it is important for a scientific professional to progress through two major steps; first, publications and citations in high-impact journals and, secondly, securing grants and patents, where several studies have reported considerable gender bias in all steps [4, 16, 17]. High number of

citations are the gateway to getting hired in an elite laboratory, and, also creates further collaboration opportunities. There are reports on gender bias in literature citation [16]. Women academicians suffer from what is called as the “Matilda effect” [17], in which women are unable to publish their research because of being perceived as having a lower publication quality as compared to their male peers, and not being able to collaborate at the same intensity. Moreover, in a study published by Nature Biotechnology, show the number of women patent holders in US is only 10% [4].

So far only two women have won the Nobel Prize in Physics in the 100 years the award has been conferred. The late Maryam Mirzakhani is the first female recipient of the most prestigious prize in Mathematics, Fields Medal. In the past years, to recognize and promote female STEM achievers a few awards that have been introduced include the L’Oreal and Nature Research Awards [18,19] for recognizing accomplished early-career female researchers and those who advocate for girls and women in STEM to encourage them to engage with STEM subjects and pursue scientific careers. Apart from promoting the rising talent of women in research these platforms also highlight female role models who can inspire a newer generation of female leaders.

### (C) Non-scientific responsibilities and its impact on career progression

We have evaluated the survey responses to analyze respondents who perform laboratory tasks, specifically non-scientific tasks, and here are our observations (Figure 3, P-value 0.03):

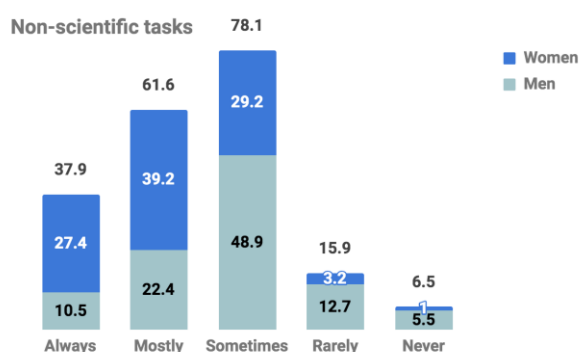


Figure 3: Bar graphs depict the comparison between the percentage of women and men in performing non-scientific tasks. The result shows that compared to their male colleagues, women are always 2.6 times more likely to volunteer for laboratory tasks.

1) Out of 219 survey responses, 52 women responded that they “always” volunteer for laboratory tasks and 92 women “mostly” take up these responsibilities. Out of the respondents were only 20 men, who “always” do these tasks, and 57 doing it “most” of the time.

2) Women are 2.6 times more likely to volunteer for laboratory tasks all the time, and 1.6 times they do these tasks most of the time as compared to their male colleagues.

3) Men reported to never doing these tasks 5.5% higher than their female peers.

4) Of the respondents who do lab tasks “sometimes”, women again outnumber men taking up these responsibilities 1.6 times more than their men peers.

Overall, we can conclude that women are more likely to volunteer for non-scientific tasks and this is correlated with them not being able to contribute to their research projects in the same capacity as their male peers, hence impacting their career progression and getting hired as faculty.

Unfortunately, despite the amount of the work time being spent on non-scientific tasks such as coordination and organization which happens to be mostly done by women, these activities are undervalued [20]. Certainly, the soft skills earned by these activities such as organization and coordination can equip women to take on leadership roles.

### Global efforts to achieve gender equality towards women’s leadership

One of the key objectives for the World Bank’s Advisory Council on Gender and Development is to accelerate progress on closing gaps between men and women and thus promote the WBG’s resources committed to gender equality [21]. The report will culminate with the implementation of the World Bank Group’s Gender Strategy in 2023.

UN Women leads to build knowledge on gender equality and thus promote women’s empowerment for sustainable global development. It is believed that investing in women’s economic empowerment helps in gender equality, reducing poverty and promoting an inclusive economy [22]. International Labor Organization’s goal is to promote equal opportunities for women and men.

According to an analysis of Fortune 500 companies by UN Women, it is reported that companies that have highest representation of women in management positions produced a 34% higher return to their shareholders as compared to the companies with a low percentage of women [23]. As part of another initiative, UN women and UN Global Compact have signed up 1,000 CEOs who have committed to corporate social responsibility for gender equality globally by participating in Women's Empowerment Principles [24].

### Recommendations to bring about necessary change

We provide recommendations tailored to what academic organizations can do to address the above issue, drive systemic changes and promote more women in leadership roles in academia as well as industry.

Create and promote strong and diverse mentoring networks.

According to a study, mentoring programs make companies' leadership significantly more diverse [25]. The same study reveals that in general, women and minorities are often first to sign up to receive mentoring. On average, mentoring programs boost the representation of black, Hispanic, and Asian-American women, and Hispanic and Asian-American men, by percentages ranging from 9% to 24%. Mentoring helps by promoting intergroup contact, breaking down stereotypes, and thus leading to more equitable hiring and promotion. We suggest that organizations should continue group and individual mentoring programs. Besides, individuals should also pay it forward by mentoring others and helping in constructively helping others to advance.

Networking organizations and role models.

Networking and meeting female leaders help young female researchers acquire insight and approaches to overcome the struggles they face to advance their career. In a study by Northwestern University [26], it was shown that women who are connected to an inner circle of female networks who are at advanced stages of their career, increase the possibility of accessing them to leadership positions.

Organizations such as Association of Women in Science [27], 500 women Scientists [28], Women in Technology [29], Society of Women Engineers [30] are

working towards supporting women in STEM and, also resolve to take action towards a more diverse and inclusive society.

Career talks, mentoring workshops, panels and symposiums for women are another way to stir a dialogue and take an action to move forward. A series that highlights the achievements of women is "Women who Changed Science" by Nobel media and Microsoft [31]. These are places, where women are brought together, on a common platform, new relationships are made and hence opportunities are explored.

Create diverse, inclusive and innovative environments

The funding agencies, such as the NSF and National Institutes of Health in the United States, and the European Commission (EC), have been important contributors to advancing inclusion and gender diversity. In the past several decades, many national governments, international agencies, universities, and increasingly, organizations have adopted to advancing gender equality as they understand the role of women in the larger context for economic development [32, 33]. If the federal agencies continue to focus on these issues, the increased awareness at organizational level is maintained. We recommend that organizations and individuals should continue to participate in conferences, meetings and, also contribute to promoting inclusive environments at organizational and team levels. This will help to drive systemic changes for gender parity.

A report from McKinsey Global Institute [34] states that six types of intervention that can bridge the gender gap and the creation of economic opportunity is one of the interventions.

Committees and task forces that promote women in STEM

Many organizations have created task forces for increasing diversity. *Diversity managers* in organizations too, boost inclusion by creating social accountability.

Some companies that appoint diversity managers see 7% to 18% overall increases in all hiring and retention of such groups [25].

These cumulative efforts may be able to shift the lens as currently about 64% of American girls are unable to name a woman in STEM, and hence the role played by women advocates and such organizations is very significant. If we as individuals, take up roles in

diversity committees or organizations to contribute to this effort, it will help in bridging the gap in the long run.

### Cross-gender allyship and mentorship

An ally is any person that actively supports, promotes, and cultivates the culture of inclusion through positive and conscious efforts that helps people overall. It is so important to promote men allies in the workplace to build trusting relationships, confident networks and provide more opportunities for women in STEM. When men are intentionally engaged in gender inclusion programs, it has been observed that 96% of organizations see advancement, an impactful number to demonstrate the power of support that requires to be sought from men at every level in all organizations [35, 36].

On a global level, also there have been significant advances such as the MenEngage Symposium in India organized by UN Women [37] and HeForShe campaign. CSG WiS group also promotes involvement of men and even our data analysis and writing group has very fair involvement of men for balanced perspective.

### Conclusion

The current study is a survey of the challenges faced by women in research environments against obtaining advanced leadership opportunities. The survey findings and previous research provide insights into the careers of women in STEM and how the gender gap still prevails in science careers. Based on our survey results as well as previously published survey analyses, we find/conclude that women get less recognition by scholarly awards as compared to their male peers, and publication and grants have severe gender inequality.

According to research done at AWIS, the lack of gender and racial diversity in leadership impacts organizational success in the long term [33]. Women in general volunteer more for “non-promotable tasks” in an academic setting and are still required to publish

and demonstrate excellence in research in the laboratory, which creates a “double bind” [38]. In many situations, women are expected to be assertive yet flexible; accommodative but still tough and strong to climb up the ladder. These are opposing situations and create a paradox, which we call as the “Gender Diversity paradox”.

We can infer that the skewed laboratory management patterns may be a result of lack of mentoring, women not being able to break the cultural barriers or conscious or unconscious bias on the part of peers and leaders. Enough evidence points towards the fact that women leaders are role models for young female researchers who are in the early stages of their career.

We need a fundamental shift in gender equity and as Phumzile Mlambo-Ngcuka, the Executive Director of UN Women states, it will happen only when all forces act together for a longer period of time. To progress towards systemic change for women in STEM, we need to drive innovative approaches that are inclusive for women and especially for women of color. We recommend creating mentoring platforms, increasing allyship with men peers and supervisors, participating in organizations that support women in STEM, promoting diversity & inclusion environments, and engaging in committees that advocate and support these efforts.

The key will be to address the complex barriers to STEM inclusion for women in these fields. We consider this survey and its analysis as a collective educated action, so that we can implement the changes, for mentoring and leadership programs, association work, networking opportunities, diversity committees, for women in STEM, especially after analyses of the current data surrounding women of color doing science. This will have a significant impact on the global economy and eventually, the private sector will also benefit if we are able to focus on improving the parity between men and women.

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## CSG-WiS Survey 2018-19

### [Part I: An Unequal Support Conundrum](#)

### [Part II: Gender Bias: Myth or Fact?](#)

### [Part III: Does Every Biased Action Have An Effective Reaction?](#)

## ACKNOWLEDGEMENTS



[Author: Literature Review] [Soudeh Yaghouti](#) earned her Ph.D. in Electrical Engineering from the University of Naples, Federico II, Italy. Her research has been focused on network electrical systems and their collective behavior. Currently, she is an independent researcher who additionally collaborates with Prescouter, Inc. to assess emerging technologies focusing on the solutions for efficiency and robustness of electrical systems.



[Author: Data Analysis] [Poorva Dharkar, PhD, MBA](#) earned her doctorate from the National Chemical Laboratories (NCL) and later performed research at the National Institutes of Health [NIH], USA on cancer neuroscience using protein crystallography. She is the current President of *The Association of Women in Science (AWIS), Bethesda*. She has also contributed to high impact projects that make a difference at the MBA Student Association, AWIS, and NIH. She also provides business consulting services to start-ups in USA and India. You can follow her on [LinkedIn](#) or [Twitter](#).



[ClubSciWri Editor] [Arunima Singh](#) obtained her PhD from the University of Georgia, followed by postdoctoral training at New York University. A computational structural biologist by training, she enjoys traveling, reading, and the process of mastering new cuisines. Her motivation to move to New York was to be a part of this rich scientific, cultural, and social hub. She is hoping to work full time in the area of science communication.



[ClubSciWri Editor] [Roopsha Sengupta](#) did her PhD at the Institute of Molecular Pathology, Vienna and postdoctoral research at the Gurdon Institute, University of Cambridge, UK, specializing in the field of Epigenetics. During her research, she was involved in many exciting discoveries, and had the privilege of working and collaborating with a number of inspiring scientists. She joined CSW as an editor in 2017, and enjoys the challenge of coherently presenting articles, while nudging authors to give their best. Besides science and words, she loves doodling, singing and spending time with children.



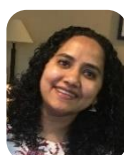
[ClubSciWri Illustrator] [Bhruhu Yagnik, PhD](#) is a Postdoctoral Fellow at [Emory Vaccine Centre, Yerkes National Primate Research Centre](#), Emory University, Atlanta and works on the development of a HIV/AIDS vaccine. Bhruhu is passionate about communicating science creatively and work as a writer and illustrator with various scientific magazines and sci-blogs. In his free time, Bhruhu indulges himself into the spirituality where he attempts to bring amalgamation of science and spirituality. Follow him on [Twitter](#), [LinkedIn](#) and [ResearchGate](#).



[Illustrator: Demographics] [Vibhav Nadkarni, PgDipSci](#), a biotechnologist by training has gained multifaceted experience in sales, marketing, team management, market data research and entrepreneurship. He completed his post-graduation in Biosciences from University of Auckland, NZ. In his spare time, he works on building his [online travel venture](#), and explore ways to incorporate creativity into life sciences. Connect with him on [LinkedIn](#)



[CSG-WiS Survey Coordinator] [Shraddha Lad, PhD](#) completed her doctoral thesis in Epigenetics and Imprinting as a Marie Skłodowska-Curie Early Stage Researcher from Naples, Italy and is currently working as a Medical Editor at [Klick Inc.](#), Toronto, Canada. She is passionate about communicating fascinating science succinctly and encouraging women empowerment. In her free time, she enjoys reading, tasting different cuisines, music and coordinating interesting events Connect with her on [LinkedIn](#)



[CSG-WiS Administrator] [Deepa Balasubramaniam, PhD](#) is a Research Scientist at the Lilly Biotechnology Center in San Diego (Eli Lilly and Company) where she unravels protein-protein interactions. She is passionate about helping others succeed and volunteers her time as a mentor for CSG Gurukool and founded CSG-WiS to support her peers. She enjoys reading and exploring the world with her two girls. Connect with her on [LinkedIn](#).

### Survey Design

Aishwarya Swaminathan, PhD, Awanti Sambarey Pandit, PhD, Disha Chauhan, PhD, Heena Khatter, PhD, Madhurima Das, PhD, Malvika Sharan, PhD, Manasi Pethe, PhD, Pallashri Saha, PhD, Radhika Gopal, PhD, Sandhya Sekar, PhD, Shivasankari Gomathinayagam, PhD

### Survey Analysis

Aishwarya Swaminathan, PhD, Ashwani Sharma [PhD student], Divya Swaminathan, PhD, Malvika Sharan, PhD, Soudeh Yaghouti, PhD, Poorva Dharkar, PhD, Shivasankari Gomathinayagam, PhD, Shubhendu Sen Roy, PhD, Shraddha Lad, PhD, Siddarth Chandrasekaran, PhD

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