

# Women in STEM continue to rise over the years, a much-needed change for the future

*Tithi Prajapati, Krisha Pandya, Kalina Kostova*

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## About the Authors

*Tithi Prajapati* is a rising undergraduate sophomore pursuing a Bioinformatics and Computational Biology degree at the University of Maryland, Baltimore County. She is a Meyerhoff Scholar at UMBC. Her program supports the mission of increasing the number of Ph.D. for minorities in the STEM field. Being part of such a program, and her dedication to obtaining a Ph.D., she has decided to get research experience to learn the skills and techniques which will be critical in her educational journey. She started working in the Center of Advanced Sensor Technology (CAST) because she found that CAST had various projects where she could learn various skills, both biological and technological, which are fit for her major. She enjoys working with CAST and being part of such a diverse and welcoming group. Being here only for a short time so far, she has learned multiple things—working on the nitrate absorbance data, CO<sub>2</sub> sensor, and creating microfluidic chips—and she can't wait to expand her knowledge.

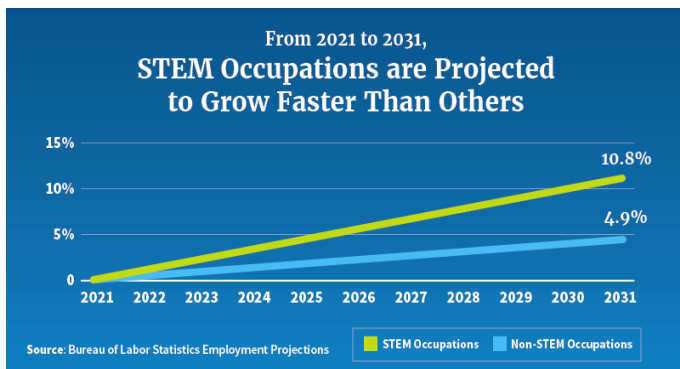
*Krisha Pandya* is a rising high school senior at Franklin High School, Baltimore County. An avid member of the Science Olympiad chapter at her school, she has found a passion for STEM over the three years of her participation there. She was introduced to CAST this summer and has assisted in several projects, under the guidance of amazing mentors. Krisha has worked with the time to conduct trial experiments for CO<sub>2</sub> sensors and nitrate testing in tap water and DI samples. She now looks forward to planning her next academic year, applying to colleges.

*Kalina Kostova* is a rising freshman in high school, attending Centennial High School in Howard County, Maryland. While she might not have much experience in the STEM field, she has always been curious about it and is eager to expand her knowledge. During her internship at CAST, she helped collect nitrate absorbance data. Kalina is very grateful for everything she was taught by her mentors and for their responsiveness to any issues she faced during this experience. She is interested in pursuing a career in STEM in the future and looks forward to working with others in similar fields.

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## I. Introduction to STEM

STEM is an acronym grouping together fundamental interdisciplinary principles: *Science, Technology, Engineering, and Mathematics*. It is a commonplace term pertinent to the conversation of the various technical undergraduate degrees and career possibilities today.



Source: U.S. Department of Labor, 2022

STEM is a pinnacle representation of improvement and change, yet ongoing trends carry on to illustrate widespread disparities within the field. Even in 2023, the number of women in STEM remains much lower compared to the male proportion. Women persist as an underrepresented demographic despite the progress in gender equity and growing interest in the field in the past decade.

## II. Factors Contributing to the Gender Gap

Several factors contribute to the gender gap in STEM today. This includes stereotypes propagating traditional domestic values equating women as low IQ, unable to perform engineering and mathematical operatives; this creates bias in hiring and funding— women are less likely to be compensated and promoted for grants and awards. There is also a shortage of good role models [3]. There are strong female role models, like Dr. Marie Curie, but the young generation lacks the knowledge of accomplishments of all such female leaders in STEM. If they know more, they will surely be fascinated by their significance and be drawn to take positive action themselves. Young females must learn about Dr. Curie’s extraordinary impact in doing a job that was male-dominated

STEM Job Category	Male/Man	Female/Woman	Total
<b>Science</b>	<b>70,568</b>	<b>49,546</b>	<b>120,114</b>
Percent	21.04%	14.77%	35.81%
Row Percent	58.75%	41.25%	
Column Percent	29.75%	50.43%	
<b>Technology</b>	<b>63,599</b>	<b>23,378</b>	<b>86,977</b>
Percent	18.96%	6.97%	25.93%
Row Percent	73.12%	26.88%	
Column Percent	26.82%	23.79%	
<b>Engineering</b>	<b>89,447</b>	<b>18,855</b>	<b>108,302</b>
Percent	26.67%	5.62%	32.29%
Row Percent	82.59%	17.41%	
Column Percent	37.72%	19.19%	
<b>Math</b>	<b>13,550</b>	<b>6,469</b>	<b>20,019</b>
Percent	4.04%	1.93%	5.97%
Row Percent	67.69%	32.31%	
Column Percent	5.71%	6.58%	
<b>Total</b>	<b>237,164</b>	<b>98,248</b>	<b>335,412</b>
	70.71%	29.29%	100.00%

Source: U.S. Equal Employment Opportunity Commission, 2019

at that time [1]. Such encouragement is needed in society, not the opposite. Discouragement is high, and it is uncommon for women to have leadership roles that other young women can look up to for guidance. Lastly, women are more challenged in finding a good work-life balance than men.

To understand the situation in STEM, we interviewed a few women in STEM. In the interview, they all gave similar responses to the question, “how do you maintain a good balance between your personal and professional life?”

Revati Kadolkar, a graduate student at the University of Maryland-Baltimore County said, “it is a challenge.”

Like the other interviewees, she describes that the gender gap is very much prominent and that the

household duties do eventually take a toll. Kadolkar positively affirms the importance of consistency though—women must enable themselves to be consistent through their work to create their impact.

### III. A Need for Representation

STEM fields have been primarily male-dominated, despite some developments in the 20th and 21st centuries[1]. From an MIT study, in 2023, the percentage of women in the STEM workforce comes to a marginal 28% around the world. When comparing statistics of other big nations specifically, we see that the United States has 24%, European Union has 17%, Japan has 16%, and India has 14% women in the STEM workforce [3]. Hence, not just in the US, this is a worldwide problem. Women are largely seen working lower-level administration positions at lower pay rates than their male counterparts.

Statistics show women in healthcare comprise 80% of total employment, but a closer look at the statistics evidences only 21% of this population holds upper executive positions even in healthcare [6]. Women are much less likely to have stature enabling them as authoritative figures responsible for decision-making and upper management. Their skill sets are undermined evident by the continual absences of more women in the engineering and computational science areas, and surgery.

In an interview with Dr. Sadhika Jamisetti, an Assistant Professor in the Department of Family and Community Medicine at UT Southwestern Medical Center, she points out, *“In terms of female to male ratio, we actually have more females, because I’m in family medicine, but if you get out of family medicine and you go to different specialties, like surgical, especially surgical, might not see as many women...”*. She still believes there is hope, and aspires that one day there will be more women in STEM. Excelling in multiple specialties, not confined to just one.

Dr. Prerna Joshi, working more at the technical forefront, also feels similarly. A senior scientist-electrochemistry at Xerion Advanced Battery Corp in Ohio, she says, *“In the field of electrochemistry I have not seen more women, they either go in biology as in pursuing medicine or in chemistry as in polymer related things but they don’t usually go towards the physics kind of field in science.”* But she too hopes that this problem will be fixed soon.

Women are more involved in the social standpoint of the world. They are more likely to read blogs, make up a huge audience of social media content readers, and generally they tend to stay more engaged in world affairs than men [4]. Having such strong involvement adds value to their perspective and their activeness and dedication proves to be of significant value towards the

society. A strong attribute of females that STEM cannot put away. Not just females, diversity in STEM is critical as a whole.

#### **IV. Diversifying the Demographics**

When seeking a solution to challenges and problems faced, the lack of diversity in STEM acts as a barrier. Increasing diversity in the STEM field will bring new ideas and creativity, which will only help foster more development within STEM. This development is only possible when multiple perspectives are taken into account. STEM should be more inclusive of minority groups including not just women, but marginalized racial groups and children.

With the many opportunities and career choices today, lies the future of the new generation. This new generation needs to be informed on how they can contribute to the advancement and progression of their lives by being part of STEM. Diversifying STEM is diversifying an ideology that promotes stronger collaboration and unity.

*Dr. Sai Kiran Mani, how she found her way*

*“It’s amazing how different minds think differently. [It makes for] a dynamic environment.”*

As postdoctoral fellow at UMBC, Dr. Sai Kiran Mani focuses her research on the development of low-cost and effective sensors for water samples, specifically nitrate sensor. She is a strong believer that passion drives an individual and firmly stands for collaboration in the workspace.

According to her, having mentors and experts who are willing to give their guidance helps alleviate the pressure of benchwork in STEM.

*Dr. Preety Ahuja, on why she chose STEM*

Dr. Preety Ahuja is an Assistant Research Scientist at UMBC with a Ph.D. in Electrochemistry from the University of Delhi, India. A reputed member of the Center for Advanced Sensor Technology (CAST) here at UMBC and as a mother, Dr. Ahuja has shifted her research focus to the development of non-invasive room-temperature CO<sub>2</sub> monitors for neonates.

Dr. Ahuja decided she wanted to make safer sensors that would not be irritable to newborns with sensitive skin. Current CO<sub>2</sub> sensors for newborn care are within the temperature ranges of 44-45°C ; these temperatures are extreme for younger children, especially neonates [7].

In her statement, she mentions she wanted to do this for her daughter. She has first-hand witness of the technologies used for neonate care and opines that huge improvements are needed within

healthcare especially on technologies for postnatal and neonatal care. She aspires to initiate the change through CAST.

At CAST, she has the freedom to be able to begin her project. The reason Dr. Ahuja was able to do this is because she had the opportunity to do so – something not many women have access to.

*Dr. Pegah Rezaei, on her journey to the US*

Dr. Pegah Rezaei has been part of the CAST team at UMBC. She described her experience in Medical School in Turkey, where medical students from neighboring countries would come to Turkey to study. She realized the differences in medical advancement even between borders, not everyone has the same access to medicine.

To explore this, she got interested in research, and came to the US to start her post doctorate after medical school. As part of her research, she has been working on developing the CO<sub>2</sub> monitoring device relevant to the escalating opioid crisis.

These three women with three different backgrounds yet they come together to work in a lab in another country. Together they continue to show their knowledge and motivation towards research by being strong leaders in their respective fields, working towards the creation of low-cost and highly effective sensors such as nitrate and CO<sub>2</sub> sensors.

## **V. Conclusion**

There are fewer women relative to men in STEM. Even fewer minority-based women. There is a need for regulation in underdeveloped policies and agendas which facilitates a culture where women are discredited and remain segregated in the opportunities they are given to succeed. To say the least, America has yet to cross the 50% benchmark but there is still change to come about, slowly but surely.

## **VI. Acknowledgments**

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We lastly extend our gratitude to Dr. Govind Rao, the Director and Chairman of CAST, who has welcomed us to be a part of the CAST team. Thank you.

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