

The **EQUALITY PURSUIT**

WiSTEM



Gender Equality in SynBio

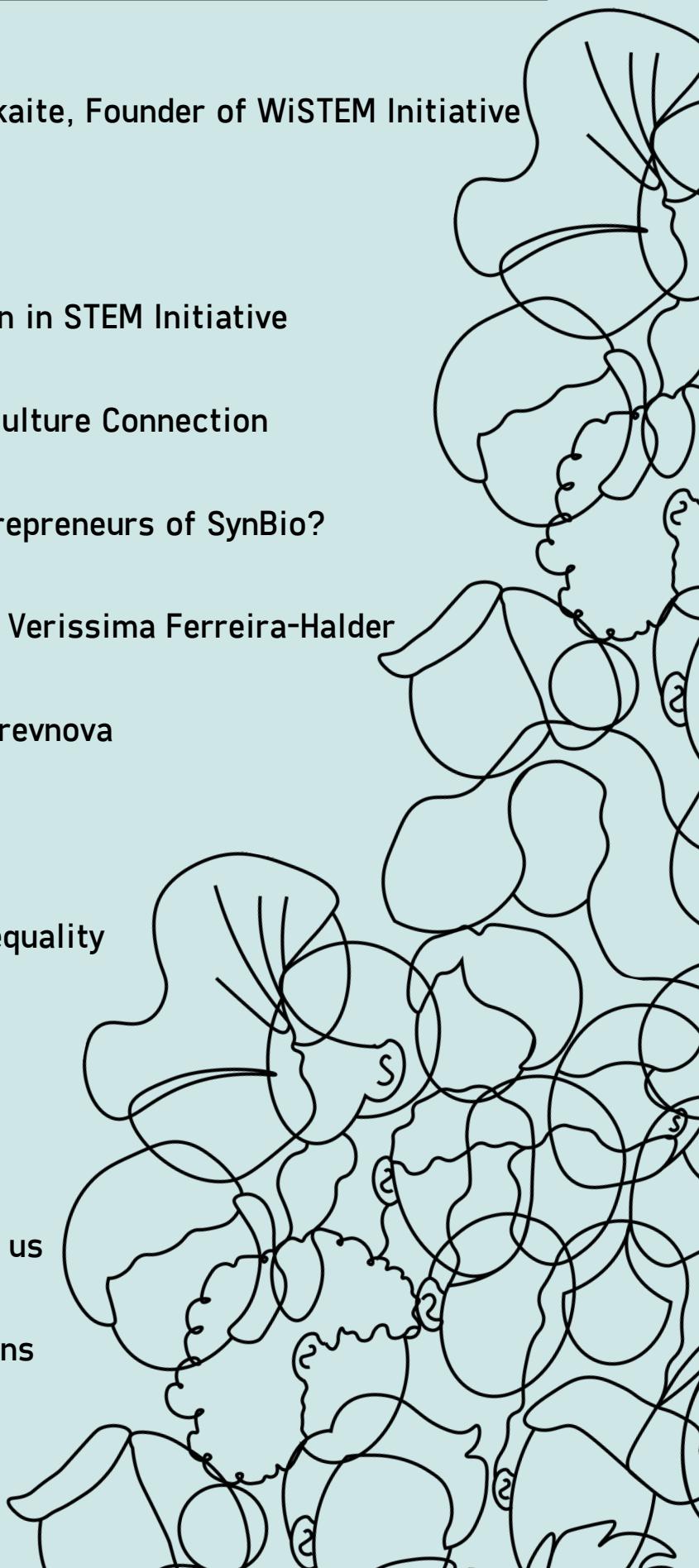
STEM around the world: the effect of culture on gender equality in STEM

Entrepreneurship: check out the data in female entrepreneurs of SynBio

Gender inclusion in iGEM: Meet the teams that strive to make a difference

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LETTER FROM NEMIRA ZILINKSKAITE

Dear Readers,

I am ecstatic to announce the launch of WiSTEM Magazine “The Equality Pursuit”.

The launch of ‘The Equality Pursuit’ marks the end of the remarkable iGEM 2021 season and the start of the new season for After iGEM. For us, as WiSTEM, this magazine highlights the efforts and motivation we put into this first-ever WiSTEM After iGEM issue to inspire girls into STEM careers as well as motivate everyone identifying as women already in their STEM paths.

We hope that “The Equality Pursuit” will inspire you to pursue the careers you always dreamt about, and we hope this gives you enough motivation to take the next step towards your dreams. From the team of five in 2020 to the team of twenty in 2021, WiSTEM continues to empower women and provide support towards careers in STEM and SynBio. This magazine represents the inspiring women and their journeys so far - all aimed at you and your personal development.



With this magazine we want to celebrate WiSTEM as an initiative and as a community we represent - our fellow women with a passion for sciences. We are looking forward to the growth of WiSTEM initiative as well as the whole women in STEM community.

Sincerely,
Nemira Zilinskaite
WiSTEM After iGEM Founder

LETTER FROM THE EDITORS

Dear Readers,

It is an absolute pleasure to welcome you to the inaugural issue of The Equality Pursuit—a magazine launched by the After iGEM Women in STEM (WiSTEM) Initiative. The title adopted is our enthusiastic contribution in ensuring every individual has an equal opportunity in every situation, notably women's equality in STEM.

Synthetic biology is considered young in the STEM field; we hope the template of synbio as engineering will make a change as the ambitions are delivered equally in gender. Women are no longer a minority in STEM professions, and synthetic biologists are not defined based on gender. Through our magazine, which highlights various forms of creative expression by all those who inspire and are inspired, we hope to celebrate those who have paved the way for gender equality in STEM and bring certain issues of gender disparities in the STEM field to light.

Our two articles, "Gender Gap: Science and Culture Connection" and "Democratization of Women in STEM Initiatives" each dissect the lack of female involvement in STEM fields and the role of culture in it.



The article written by the Data team features the results of a mini-campaign aimed at quantifying female participation in founding biotechnology or synthetic biology startups.

Our written interviews, featuring Dr. Megan Palmer, Special Advisor of iGEM Foundation, Executive Director of Bio Policy & Leadership Initiatives & Adjunct Professor, Department of Bioengineering, Stanford University, Dr. Carmen Verissima Ferreira-Halder, tenured Professor at UNICAMP-Brazil, and Dr. Elena Brevnova, Senior Director of Strain Engineering at Ginkgo Bioworks bring to light the challenges and accomplishments of women in STEM firsthand. Apart from the team, Pinays can STEM, a Women in STEM organization based in the Philippines, also contributed to featuring the articles of local support in addressing the gender gap in STEM.

As we move forward, we are grateful for every single one of our contributors, readers, and supporters, for their input and enthusiasm, and we can't wait to hear your stories and amplify your voices.

Cheers,

2021 WiSTEM Magazine Project Team

DEMOCRATIZATION OF WOMEN IN STEM INITIATIVE

By Prakriti Karki



Science, technology, engineering, and mathematics (STEM) have been dominated by males since the origins of these fields in the 18th century during the Age of Enlightenment. According to a report by UNESCO¹ in 2019, only 35% of all higher education students in STEM around the world are female, which helps denote the wide gender gap in the fastest-growing careers in the job market.

This difference in representation is alarming as STEM careers drive innovation, social well-being, inclusive growth, and sustainable development. Several factors, from family expectations to workplace demands, might be contributing to driving such a gap. In response, several policies and strategies along with different women in STEM initiatives² - like Girls Who Code, Women in Data Science Initiative, Pinays Can Stem, Women in STEM initiative etc. - have been established throughout the world in order to minimize this gap.

¹Girls' and women's education in Science, Technology, Engineering and mathematics (STEM). UNESCO. (2020, January 14). Retrieved October 31, 2021, from <https://en.unesco.org/stemed>.

²15 initiatives bringing women into stem. World Wide Learn. (2021, June 18). Retrieved October 31, 2021, from <https://www.worldwidelearn.com/articles/15-innovative-initiatives-bringing-women-into-stem/>.

Women in STEM (WiSTEM) is an initiative of After iGEM that was launched in August 2020 to inspire more women in STEM and SynBio, increase awareness of their underrepresentation in science, and function as a platform to get inspired, network, and develop through the organization of various events and opportunities for education and mentoring.

Differently from the many of the women in STEM initiatives, After iGEM's WiSTEM is spreading slowly to many countries to make a more uniform impact through the vast After iGEM's WiSTEM is spreading slowly to many countries to make a more uniform impact through the vast After iGEM community. Although it prioritizes synthetic biology, it aims to include all of STEM. In addition, because iGEM has a high school division, it is also able to target people at this young age and we thus hope it may have a more assertive impact.

"Our initiative also aims to provide resources to underrepresented people in order to ease their entrance and permanence in STEM careers"

The WiSTEM initiative 2021 has been organized into three subcommittees that work synergistically: Events Team, Data Analysis Team, and Awareness Team. This organization aims to make the initiative more effective: the Data Analysis Team analyzes data based on

specific campaign requests, the Awareness Team organizes workshops, (most recently the Indian High School Workshop), publishes our magazine, and collaborates with other organizations, and the Events Team organizes events broadcasted to a wide audience through social media platforms, such as panel discussions and live interviews.

In order to approach the problems via numbers and statistics and make the initiative more effective, we are also working on the collection and analysis of data related to women's representation in STEM and SynBio.

According to UNESCO³, there are several issues that prevent women's involvement in STEM. Problems may differ country or region-wise. Case in point, developed countries have higher representation compared to developing and underdeveloped countries. Lack of awareness, family financial conditions, and, most importantly, the traditional perception of women's

roles, have been named as the dominant factors driving the underrepresentation of women. For instance, in many South Asian⁴ countries girls face pressure to marry young, and are thus forced to drop out of school earlier which contributes to their

³ Girls' and women's education in Science, Technology, Engineering and mathematics (STEM). UNESCO. (2020, January 14). Retrieved October 31, 2021, from <https://en.unesco.org/stemed>.

⁴ Burke, A., Sobey, M., & Brandon, J. J. (2020, January 21). It's time for large-scale investment in girls' education across Asia. The Asia Foundation. Retrieved October 31, 2021, from <https://asiafoundation.org/2019/11/20/its-time-for-large-scale-investment-in-girls-education-across-asia/>.

underrepresentation. On the other hand, some studies⁵ have suggested that in the USA girls begin to lose self-confidence in their ability to do good in STEM as early as middle school. These examples help to illustrate that numerous factors seem to come into play, making this a complex and multifaceted issue that targets women all over the world in many different ways.

Moreover, the question that should arise is whether we are encouraging women already in science to continue their careers and whether or not we are enabling them into becoming the role models that will inspire the new generations of women. According to Thomas Dee's research⁶, the decline in women's interest in science and technology starts as early as the third grade.

Encouraging and empowering young girls and high school girls who are in the early phase of their formal education could help ease their path into careers in science and technology that could lead to more lucrative and stable jobs. STEM Initiatives should therefore prioritize the encouragement of women already in science and, especially, aim to include local female scientists who could potentially inspire young girls through

their achievement or participation in science by getting involved and using storytelling techniques at local schools.

Uniform outreach, awareness, inspiration, and impact can be grouped and termed together as "democratization". The action is not free of obstacles: finances, the educational system, gender expectations, and traditions. To break through these difficulties we believe that a single woman could be an inspiration for thousands of women. The most effective strategy could be to identify such women, encourage them and publicize their works as an inspiration for young girls dreaming to pursue a career in STEM.

In 2020 alone, four women were awarded Nobel prizes⁷ which is in itself an inspiring moment for all the women in science. Women in academia, entrepreneurship, or policy-making related to STEM should be prioritized equally while portraying them as inspirations. All STEM initiatives could collaboratively work together for a shared goal of increasing the participation of young girls in STEM from every part of the world. And for low-income countries we suggest that teacher training, improved

⁵The importance of maintaining girls' confidence in Stem. NIH. (n.d.). Retrieved October 31, 2021, from <https://www.invent.org/blog/diversity/maintaining-girls-confidence-stem>.

⁶Dee, T. S. (2007). Teachers and the Gender Gaps in Student Achievement. *The Journal of Human Resources*, 42(3), 528-554. <http://www.jstor.org/stable/40057317>

educational content, and pedagogy can play a very important role.

At WiSTEM we intend to set an example as an impact-making initiative in the lives of young female and other gender minority dreamers from all parts of the world by continuously motivating women and other underrepresented groups. We aim at democratizing our initiative in the short term by continuously focusing on events, awareness, inspiration, and data collection and analysis through the involvement of more women from different parts of the world.

We have built a very strong team of 21 dedicated volunteers, but we believe that outside collaborations can help us to reach our goals faster, and we are also looking for possible collaborations with different organizations, including biotech companies and other women in STEM initiatives. With the suggestions and feedback from many like-minded people, we expect to contribute to an increased participation and achievement of women and gender minorities in STEM and to support their continued education and career development throughout their lives, so that they can serve to inspire the generations to come.



⁷Sanchez, C. (2020, October 9). Meet the women who won Nobel prizes this year. Harper's BAZAAR. Retrieved October 31, 2021, from <https://www.harpersbazaar.com/culture/art-books-music/a34328866/nobel-prizes-2020-women/>.

⁸Background vector created by rawpixel.com - www.freepik.com

GENDER GAP: SCIENCE AND CULTURE CONNECTION

By Sofia Taday L.

"Science and culture have more than an interrelation; they have a bidirectional relationship in which one promotes the other and vice versa"



Gianrocco Tucci in 2012¹ mentioned in a probable interpretation of reality, it turns out that science offers culture: knowledge as a lively activity that comprehends the entire person; experience or the capacity to interact with the surrounding world; ability to formulate principles and define problems, reasonable assumptions, cognitive-operating practices to act on reality.

Science does not yet define and control human social behavior, although it is capable of directing it. Science deals with the "cause" and addresses the purpose of human development, even though it probably goes beyond what science proposes and believes to understand. That which contributes to the progress of knowledge also contributes greatly to the development of culture.

Beliefs generate knowledge which influences the establishment of laws, economic strategies², shapes the education system, defines standards of progress³, and normalizes behaviors in the population.

Culture has an influence on the division of science in different contexts, such as geographic, social, age, etc. there are different contrasts in the science developed in the western versus the eastern hemisphere, between the science of the postmodern era and the current fifth industrial revolution, between the scientific progress of developed and less developed countries, between races, ethnicities, genders, etc.⁴. As for the latter, centuries ago, human behavior and its beliefs have established a series of habits and thoughts concerning the role of women

¹Tucci, G. (2012). What is your opinion on the relationship between science and culture? Reply in a ResearchGate discussion topic.
https://www.researchgate.net/post/What_is_your_opinion_on_the_relationship_between_science_and_culture

in society.

These implanted stereotypes are part of a very broad belief system that includes attitudes toward female and male family roles, female and male occupations, and perceptions of the self-associated with gender. As bipolar constructs, gender stereotypes imply that masculine is not feminine and vice versa.⁵

In many cases carried along by the current of collectivism. But does the fact that a process is accepted multitudinously make it correct, or assertive?⁶

Several of these stereotypical habits and assumptions around the world have proven to be detrimental to the evolution of a functional system. Gender bias implies lack of opportunities and resources, increased violence and induction of poverty, biased

laws, disruption of coexistence harmony, and affects foreign policy objectives for a more prosperous, peaceful and sustainable world.⁷

And in STEM, it is subject to the wage gap affecting the workforce,⁸ disparity in occupational and academic choices,⁹ lack of political representation, family discouragement, lack of confidence related to self-efficacy, etc.¹⁰

Based on Eccles' expectancy-value model, which highlights the impact of culture-based stereotypes and identity-related constructs on educational and occupational choices,^{11,12} several studies in Switzerland have shown that academic self-concept and subject interests (mathematics, physics, chemistry) are among the most relevant determinants in the

selection of university careers for high school students and specialization in higher education.

College students once they enter the workforce after obtaining their degrees experience a gender wage gap. This means that women earn less than men in similar positions. The gender wage gap independent of human capital factors such as engineering degree and grade average, and job preferences is argued to arise from cultural beliefs about women's and men's suitability for STEM professions that shape people's personal beliefs in the form of self-efficacy.¹⁰

Self-efficacy is the perception of efficacy, it is confidence in one's own ability to achieve intended outcomes¹³ that is dependent on self-confidence and individual self-image. The latter is the comparison of

²Bertay, A. C., Dordevic, L. and Sever, C. (2020). Gender Inequality and Economic Growth: Evidence from Industry-Level Data. IMF Working Papers. International Monetary Fund

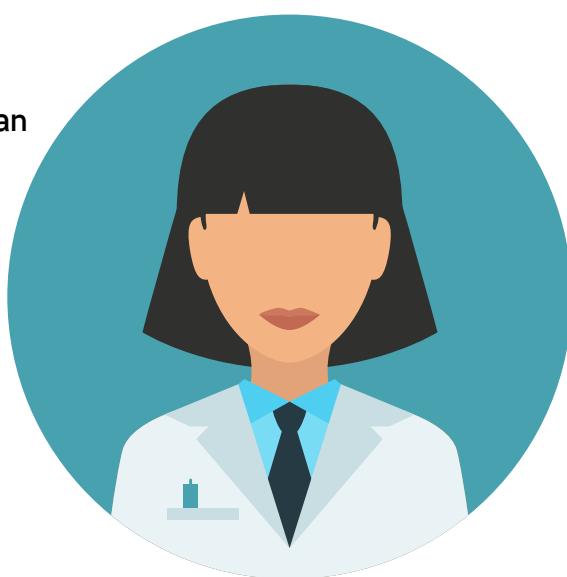
³Mitra, A., Bang, J. and Biswas, A. (2013). Gender equity, governance and economic growth: Do opportunities or outcomes matter more? Feminist Economics.

one's own self-image with the image of an occupation and one's judgment of the correspondence between those two.⁵ Over decades the self-image of women in STEM has been affected by the masculine figuration that society views science with. When an adult or a child is asked to describe a scientist, it is usually done through a masculine image, this idealization has become embedded in human behavior and is recognized by children from an early age due to the driving force that the male gender has in STEM.¹⁰ From the beginning of history men monopolized scientific careers owing to cultural precepts that discouraged women from taking the path of independence and pursuing an academic career.

In the workplace it is no different, the expectations of achieving a high position for a woman is lower than for men.¹⁴ In Latin America and the Caribbean, women hold only 15% of managerial positions and own only 14% of companies, according to a study by the Inter-American Development Bank (IDB) in 2021¹⁵ and it isn't much different in high-income countries.¹⁶ The UN in 2017¹⁷ has recognized women are underrepresented at the highest levels of the international organizations which shape much of the global dialogue on education.

Further, we can state that the gender gap do discriminate between developed or underdeveloped countries according to the World Economic Forum's 2021¹⁸ global gender gap list and the main factor which configures gender inequality in STEM and society in general, is the cultural context.⁶

Thus, for example, in Japan, the United States, and Ethiopia,¹⁹ the key aspects that determine the gender gap are: masculinity, collectivism, and cultural rigidity. Masculinity means gender-based role expectations for both men (as breadwinner) and women (as primary caregiver) in society, and collectivism leads women to feel a strong responsibility to play their expected role in



⁴Iaccarino, M. (2003). Science and culture. Western science could learn a thing or two from the way science is done in other cultures. *EMBO reports*, 4(3), 220-223. <https://doi.org/10.1038/sj.embor.embor781>

⁵Makarova, E., Aeschlimann, B. and Herzog, W. (2019) The Gender Gap in STEM Fields: The Impact of the Gender Stereotype of Math and Science on Secondary Students' Career Aspirations. *Front. Educ.* 4:60. doi: 10.3389/feduc.2019.00060

their family, which is taking care of the household children, neglecting their own career advancement.

It is therefore not surprising that many women worry about how to manage their careers along with family responsibilities long before they marry and/or have children: they expect to spend much more time fulfilling family responsibilities than their partner and therefore try to avoid a career choice that would make it difficult to fulfill that role.

To understand gender inequality in STEM, Miner et al. in 2018²⁰ illustrate how an individual lens and a socio-structural lens provide complementary perspectives. They indicate that gender inequality in STEM should not be understood simply from an individual lens relating to individual choices and responsibilities, but also from a socio-structural lens relating to societal structures, processes, and meanings associated with gender.

⁶Yoshikawa, K., Kokubo, A., & Wu, C. (2018). A Cultural Perspective on Gender Inequity in STEM: The Japanese Context. *Industrial and Organizational Psychology*, 11(2), 301-309. doi:10.1017/iop.2018.19

⁷Save the Children (2021). Gender Discrimination: Inequality Starts in Childhood. <https://www.savethechildren.org/us/charity-stories/how-gender-discrimination-impacts-boys-and-girls>

⁸Kochanski, J. and Ledford, G. (2001). How to keep me"—Retaining technical professionals. *Res. Technol. Manag.* 44, 31-38

⁹Busch F. (2020). Gender Segregation, Occupational Sorting, and Growth of Wage Disparities Between Women. *Demography*, 57(3), 1063-1088. <https://doi.org/10.1007/s13524-020-00887-3>

¹⁰Sterling, A., Thompson, M., Wang, S., Kusimo, A., Gilmartin, S., Sheppard, S. (2020). The confidence gap predicts the gender pay gap among STEM graduates. *Proceedings of the National Academy of Sciences*, 117 (48) 30303-30308; DOI: 10.1073/pnas.2010269117

¹¹Eccles, J. S. (1994). Understanding women's educational and occupational choices. *Psychol. Women Q.* 18, 585-609. doi: 10.1111/j.1471-6402.1994.tb01049.x

¹²Eccles, J. S., and Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annu. Rev. Psychol.* 53, 109-132. doi: 10.1146/annurev.psych.53.100901.135153

¹³Ormrod, J. E. (2006). *Educational psychology: Developing learners* (5th ed.). Upper Saddle River, N.J.: Pearson/Merrill Prentice Hall.

¹⁴Ammerman, C. and Groysberg, B. (2021). *How to Close the Gender Gap: You have to be systematic*. Harvard Business Review Press. May-June edition <https://hbr.org/2021/05/how-to-close-the-gender-gap>

¹⁵IDB (2021). Study reveals high gender inequality in companies in Latin America and the Caribbean. <https://www.iadb.org/en/news/study-reveals-high-gender-inequality-companies-latin-america-and-caribbean>

¹⁶Tomaskovic-Devey, D., Rainey, A., Avent-Holt, D., Bandelj, N., Boza, I., Cort, D., Godechot, O., Hajdu, G. et al.. (2020). Rising between-workplace inequalities in high-income countries. *Proceedings of the National Academy of Sciences (PNAS)*, 117 (17) 9277-9283; DOI: 10.1073/pnas.1918249117

¹⁷UNESCO (2017). Gender inequality persists in leadership positions. https://gem-report-2017.unesco.org/en/chapter/gender_monitoring_leadership/

¹⁸WEF. (2021). *Global Gender Gap Report 2021*. https://www3.weforum.org/docs/WEF_GGGR_2021.pdf

¹⁹Taday, S. and Amdework, N. (2021). Interview: Cultural diversity in STEM [Live transmission in After iGEM instagram account]. Recover of https://www.instagram.com/tv/CR_dZnzkYo/?utm_medium=copy_link

²⁰Miner, K. N., Walker, J. M., Bergman, M. E., Jean, V. A., Carter-Sowell, A., January, S. C., & Kaunas, C. (2018). From "her" problem to "our" problem: Using an individual lens versus a social-structural lens to understand gender inequity in STEM. *Industrial and Organizational Psychology: Perspectives on Science and Practice*, 11 (2), 267-290

WHERE ARE THE FEMALE ENTREPRENEURS OF SYNBIO?

By WiSTEM Data Team

Introduction

In the emerging world of SynBio, which is expanding every day with every new discovery, the field of entrepreneurship is a major step in its evolution and growth. The process of setting up a business is known as entrepreneurship, while the person that takes this initiative is called an entrepreneur. An entrepreneur is an individual who creates a new business, bearing most of the risks and enjoying most of the rewards. They are commonly seen as an innovator, a source of new ideas, goods, services, and business/or procedures.¹

But, why is entrepreneurship so important? An entrepreneur plays a key role in any economy, using the skills and initiative necessary to anticipate needs and bringing good new ideas to the market. As they create new businesses and invent new

WiSTEM Data Team hopes to gather and present relevant data in order to better understand and communicate female participation in the SynBio world. This article is based on the social media mini-campaign of WiSTEM aimed at obtaining a first look into gender diversity in SynBio and biotech entrepreneurs. For this campaign, we mapped the reported gender of the founders of 258 biotech/synbio startups founded over the last 15 years from all regions in the world. Details include the gender's founder ratio per region, female participation growth over the years, and prospective women's participation in the field in light of recent initiatives that target female entrepreneurs.



goods and services, a ripple effect is often created, resulting in further development. Such development generates new jobs, new products or technologies, creates new markets and new wealth, and ultimately adds to gross national income. The unique inventions that are introduced reduce dependence on existing methods and systems, thus breaking tradition and creating social change.^{1,2}

Synthetic Biology, or SynBio, is the most exciting science of the twenty-first century, bringing together engineers and biologists to design and build novel biomolecular components, networks, and pathways, and to use these constructs to rewire and reprogram organisms, just like you would a computer.

¹ Abouzahr, K., Krentz, M., Harthorne, J., & Taplett, F. B. (2021, January). Why women-owned startups are a better bet. BCG Global. Retrieved from <https://www.bcg.com/publications/2018/why-women-owned-startups-are-better-bet>.

Synthetic Biology Future Science Platform. (2019). Boosting female founders initiative. Retrieved from <https://research.csiro.au/synthetic-biology-fsp/boosting-female-founders-initiative/>

For the last 20 years, SynBio has promised to change the course of humanity, allowing us to use simple life forms engineered to manufacture cheaper drugs and vaccines, targeted therapies for attacking 'superbugs' and cure diseases, such as cancer and Covid-19.

It also aims to help us overcome the biggest challenge of our generation, climate change, by allowing us to harness the power of life to substitute our dependency on fossil fuels and stall the emission of greenhouse gases.³ And these many promises are starting to become a reality. SynBioBeta Market Report 2020 published that the SynBio startups funding increased by two-and-a-half times in 2020 compared to the previous year and reached nearly \$8 Billion of investment funding.⁴

And it is at this critical stage of SynBio development that we must ask ourselves, where are the female entrepreneurs of SynBio? We believe that a science that is poised to enact profound change in human technology should be as inclusive and diverse as humanity itself. Therefore, we aimed at obtaining a first look into gender diversity in synthetic biology and biotechnology entrepreneurs.

Results

For this campaign, we mapped the reported gender of the founders of a total of 258 biotechnology/synbio startups founded over the last 15 years from all regions in the world.

Most startups were founded in North America (87 startups), followed by Europe (76 startups) and Australia and Asia (61 startups). Latin America and Africa had the smallest participation with 29 and 7, respectively. (Fig. 1)

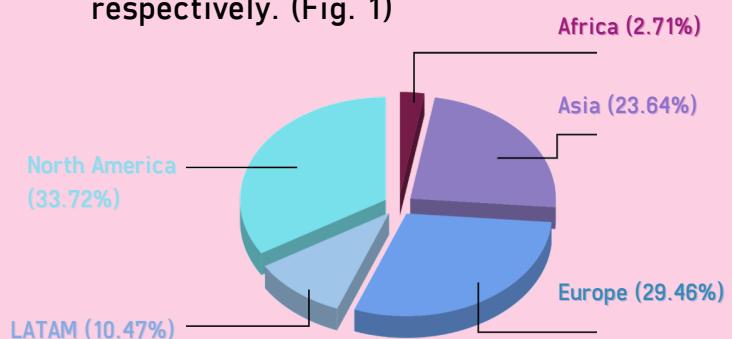


Fig. 1 Distribution of 258 synbio/biotechnology startups by world regions

The distribution of SynBio startups shown in Fig. 1 reflects the expected knowledge and technology flow, with North America and Europe leading with the highest number of startups. However, we notice that Australasia is gaining strength, which is in agreement with the growth in global flow towards Asia in this century and its current highest ranking in world GDP.

³ DecaBillion+. Retrieved from <https://beyondthebillion.com/decabillionplus/>

⁴ EPIC - After iGEM. Retrieved from <https://igem.org/EPIC>

⁵ Entrepreneur Center - Women in bio. (n.d.). Retrieved from <https://www.womeninbio.org/general/custom.asp?page=EntrepreneurCenter>.

Latin America has traditionally lagged behind in biotech development because government investment in research and development (R&D) has been relatively low compared to top innovation countries like the US and Israel. Nevertheless, there has been an increased influx of private capital in the pharmaceutical industry in recent years, almost doubling from \$68B to \$110B, which is driving the development of new medical devices, treatments, and medications and a revolution in healthcare in Latin America.⁵ In consequence, we expect significant growth in biotech startups for this region over the next decade.



Fig. 2. General female:male ratio of entrepreneurs in synbio/biotech

Overall, we found that only 1 female per 4.4 males became a biotech/synbio entrepreneur, an average of barely 19% of female founders in the 258 startups reported. This number is even lower than the global percentage of females employed in STEM, which was reported at 29.3% by UNESCO in 2019.⁶

Breaking down this number by regions, we found that, remarkably, the more affluent and socially conscious regions of North America and Europe showed the lowest percentage of female founders (16% and 14%, respectively) compared to Asia (27%), Latin America (22%), and Africa (31%), regions that are more commonly associated with poverty, traditional gender roles and fewer opportunities for women and girls.⁷

(Fig. 3)

█ Males
█ Females

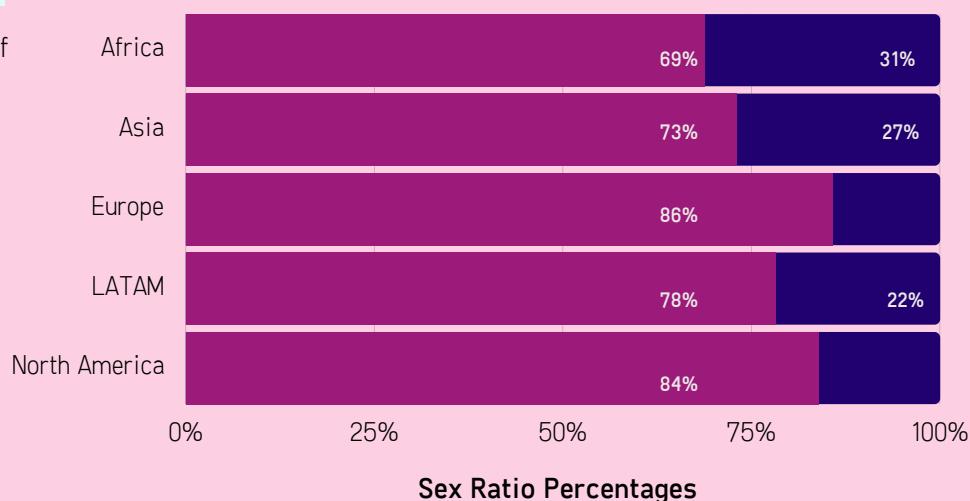


Fig. 3. Female-to-Male Biotech Startup Founder Ratio, 2009 to 2021

⁶ Hayes, A. (2021). What you should know about entrepreneurs. Investopedia. Retrieved from <https://www.investopedia.com/terms/e/entrepreneur.asp>.

⁷ Kanze, D., Huang, L., Conley, M. A., & Higgins, E. T. (2018). We ask men to win and women not to lose: Closing the gender gap in startup funding. *Academy of Management Journal*, 61(2), 586-614. <https://doi.org/10.5465/amj.2016.1215>

In the data we analyzed, out of 82 startups reported, American startups led by women only make up for 16.3%. Sangeeta Bhatia, CEO of Glympse Bio along with other MIT professors noticed the same problem from a smaller scale within the MIT women faculty. Out of 250 biotech startups created by MIT professors, 22 percent of MIT faculty which are women-only had founded less than 10 percent of it. The Future Founder Initiatives⁷ was launched in 2020 in response to this finding, aimed at increasing the number of MIT female faculty members to lead a startup. The initiative starts with increasing the participation of women faculties in entrepreneurial conversation and in-depth connections with venture capitalists.

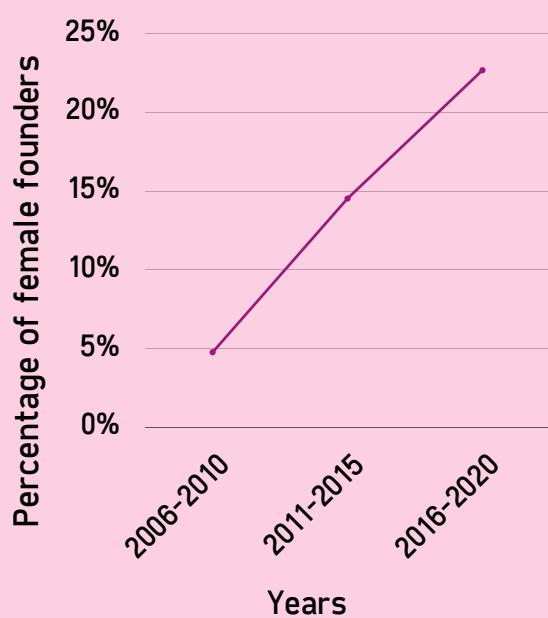


Fig. 4. Evolution of the participation of female founders over 15 years (2006-2020) in 5 year intervals

Over time, we have found that the percentage of female founders has more than tripled in the last 15 years, from 4.8% in the 2006-2010 period, followed by a raise to 14.5% in 2011-2015 and almost doubling to 22.7% in 2016-2020. This steady increase in female representation amongst startup founders is encouraging and gives us reason to hope for more equity in the future. (Fig. 4)

What can be done?

Venture capital companies (VCs) or investors play a key role in either maintaining or avoiding gender disparity. We know that both STEM and entrepreneurship are highly gender-skewed² and the small number of female entrepreneurs that we found in our analysis clearly illustrates the double masculinity that exists at this intersection. Not surprisingly, research has shown that there is a marked gender bias in the questions that investors pose to entrepreneurs during pitch hearings that affects the amount of money raised by female founders. VCs tend to ask male founders how to win, while they ask female founders how not to lose, thus leading the entrepreneurs to answer in line with the questions.

⁸Kate S. Petersen | School of Engineering. (2021). Future founders initiative aims to increase female entrepreneurship in Biotech. MIT News | Massachusetts Institute of Technology. Retrieved from <https://news.mit.edu/2021/future-founders-initiative-aims-increase-female-entrepreneurship-biotech-0224>.

⁹Kuschel, Katherina & Ettl, Kerstin & Díaz-García, María & Alsos, Gry. (2020). Stemming the gender gap in STEM entrepreneurship - insights into women's entrepreneurship in science, technology, engineering and mathematics. International Entrepreneurship and Management Journal. 16. 1-15. DOI: 10.1007/s11365-020-00642-5.

By answering how not to lose instead of how to win, female entrepreneurs end up raising considerably less money for their enterprises.

Authors further proved that by training women to respond how-not-to-lose questions with how-to-win answers they increase money raised.⁸ Therefore, in order to increase gender equality, many targeted initiatives have been taken by VCs to actively reduce their implicit biases that lead to such underrepresentation of female entrepreneurs. One example is Sequoia Capital in India that has started the SPARK⁹ fellowship, where 15 women founders-to-be from Southeast Asia and India are awarded one-on-one mentorship in order to build their companies. Another leading initiative is Decabillion+10, backed by two joint-initiatives, Beyond the Billion and High Water Woman, that aims to mobilize \$10 Billion in investments for women-led startups, while also reaching out to diverse races in their portfolio.

If these initiatives seem exaggerated, we should consider that research conducted by the Boston Consulting Group has shown that businesses founded by women ultimately deliver higher revenue—more than twice as much per dollar invested—than those founded by men, making women-owned companies better investments for financial backers.¹¹

Consequently, we should strive to accelerate the participation of females in the synbio innovation ecosystem and support the creation and maintenance of other initiatives, like the Women in Bio¹² organization that supports and mentor female entrepreneurial journeys in the life sciences and the government grants system offered by Australian CSIRO¹³(Commonwealth Scientific and Industrial Research Organisation) aimed at “Boosting Female Founder Initiative”.



¹⁰Meng, F., Ellis, T. (2020) The second decade of synthetic biology: 2010-2020. Nat Commun 11, 5174 . <https://doi.org/10.1038/s41467-020-19092-2>

Sequoia Spark Program. Retrieved from

¹¹<https://www.sequoiacap.com/india/build/programs-events/sequoia-spark/>

If you are a female interested in becoming an entrepreneur in SynBio, reach out to us and we will do our best to put you in touch with initiatives that can help you on your journey, like our very own EPIC initiative¹⁴.

WiTEM Data Team: Foteini Papadakis, Ruth Quintero, Meghiya Michelle, Rachel Ardón, Shruti Sansaria, Johana Rincones

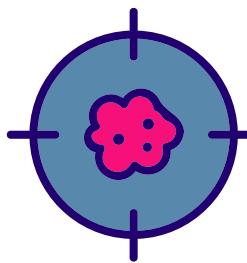


**We still have a long road ahead
in our quest for gender equality
in the SynBio innovation
ecosystem, but we seek to
actively showcase and support
all the initiatives that are
taking significant steps
forward.**

¹² UNESCO Institute for Statistics. (2019). Fact Sheet No. 55: Women in Science. p. 2. Retrieved from <http://uis.unesco.org/en/topic/women-science>

¹³ Varas, P. (2019, October). Biotech is booming in Latin America: Here's why. Nearshore Americas. Retrieved from <https://nearshoreamericas.com/biotech-is-booming-in-latin-america-heres-why/>.

¹⁴ Wisner, S. (2021). Synthetic biology investment reached a new record of nearly \$8 billion in 2020 - what does this mean for 2021? SynBioBeta. Retrieved from <https://synbiobeta.com/synthetic-biology-investment-set-a-nearly-8-billion-record-in-2020-what-does-this-mean-for-2021/>



INTERVIEW WITH DR. CARMEN VERISSIMA FERREIRA-HALDER

TELL US ABOUT
YOURSELF AND WHAT
MOTIVATED YOU TO
PURSUE A STEM
EDUCATION?

First of all, I must congratulate iGEM for launching "The Equality Pursuit" magazine. I'm Carmen Veríssima Ferreira Halder, a 52-year-old Biochemistry Professor, pharmacist, born in Mariana, a small town in the state of Minas Gerais, Brazil.

My education was primarily in public institutions, of which I am proud. Since 1999, I have been working at the University of Campinas, where I coordinate the OncoBiomarkers Research Laboratory.

Our research focuses on understanding the biochemical aspects behind metastasis and tumor resistance to treatments.



Dr. Prof. Ferreira-Halder holds a Bachelor degree in Pharmacy, and MSc and PhD degrees in Biochemistry. She is currently a tenured Professor at UNICAMP, one of the best universities in Latin America, where she coordinates the

OncoBiomarkers Laboratory, focused on understanding the biochemical aspects behind metastasis and tumor resistance. She and her group have published over 100 scientific papers that have been cited by over 12,000 publications.

In this regard, in addition to personnel resources, we contribute to advances in cancer patient management.

The decision to become a scientist came at the end of my undergraduate degree in pharmacy, after completing a mandatory internship in the pharmaceutical industry.

The routine that I witnessed and confirmed, along with the stories I received from pharmacists during my internship, was unquestionably the most crucial factor in my decision to pursue a career in another pharmaceutical

field. Conviced that I should follow academics, I chose Biochemistry to be my subject of work. Biochemistry was always the subject I liked the most in my undergraduate, in large part, due to the professor responsible for it.

Therefore, I chose one of the best universities in Brazil to carry out my postgraduate studies: the University of Campinas. Since then, 28 years have passed, and I can say without any doubt that doing science is a personal and professional achievement!

INTERVIEW WITH DR. CARMEN VERRISSIMA FERREIRA-HALDER

WHAT ARE SOME OF THE CHALLENGES THAT YOU HAVE FACED AS A FEMALE PERSON OF COLOUR IN STEM?

My main challenge was to have my competence questioned. At the beginning of my career, it was common for some people to doubt and look surprised at the position I occupied. But, particularly, this didn't affect me, because, since my childhood, my father always talked about the challenges that black people had to overcome, like growing professionally and having independence. I recall my father advising me on several occasions that I needed a competitive CV to ensure that my professional future was NEVER in the hands of others. And so I did! To put it another way, my family has fought diligently for my self-esteem since I was a child!

WHAT THOUGHTS DO YOU HAVE ABOUT THE POSITION OF UNDERREPRESENTED COMMUNITIES IN ACADEMIA AND OTHER FIELDS OF STEM?

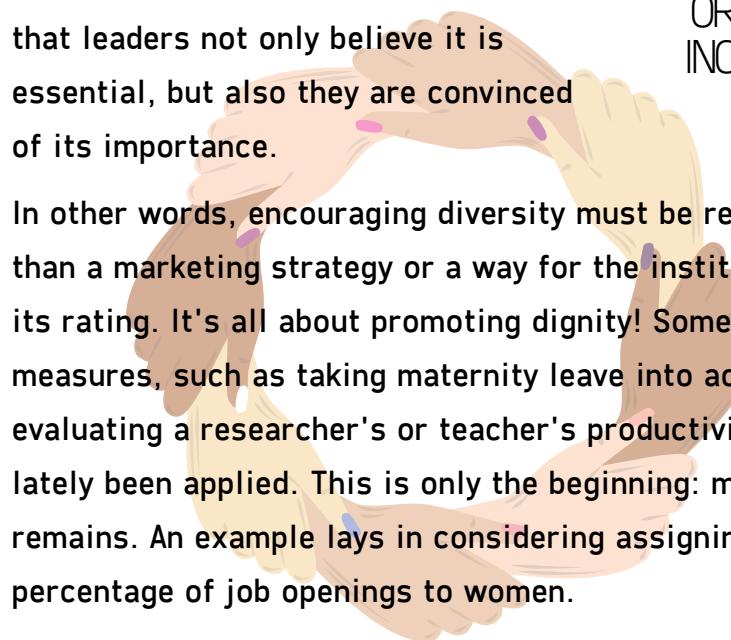


I think a lot still needs to be done. Not only the total number of people need to increase, but also more prominent positions for them play a decision-making role. Thus, we will have greater representation. But for this, educational and awareness-raising actions are needed.

I believe it is fundamental that research institutions employ strategies to promote diversity. For this reason, I consider it essential that leaders not only believe it is essential, but also they are convinced of its importance.

In other words, encouraging diversity must be regarded as more than a marketing strategy or a way for the institution to improve its rating. It's all about promoting dignity! Some of the measures, such as taking maternity leave into account when evaluating a researcher's or teacher's productivity, have just lately been applied. This is only the beginning: much more work remains. An example lies in considering assigning a certain percentage of job openings to women.

WHAT MEASURES DO YOU BELIEVE ARE BEING TAKEN, OR COULD BE TAKEN, IN YOUR ORGANIZATION TO INCREASE GENDER DIVERSITY?



INTERVIEW WITH

DR. CARMEN VERRISSIMA FERREIRA-HALDER

WHAT DO YOU THINK READERS OF THE EQUALITY PURSUIT MAGAZINE NEED TO KNOW TO EMPOWER YOUNG GIRLS AND WOMEN IN THEIR COMMUNITY TO PURSUE EDUCATION AND CAREERS IN STEM?

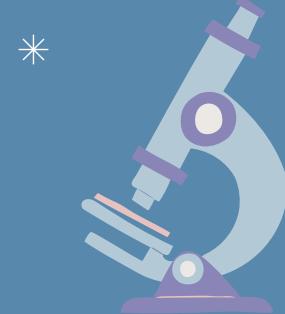
They need to know stories of success! Stories that emphasize the significance of women's ability to create, innovate and have a different perspective on the world: Important traits for education and science. Also, they need to know how important it is to invest in education from an early age. It is a powerful method to channel their youth, vigor, and enthusiasm towards accepting and leading changes.

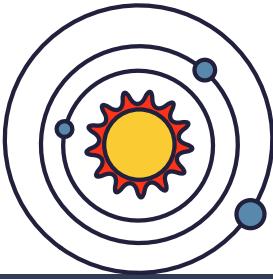
Look for research groups that historically have gender and race diversity on the team. The quality of researchers and their positions/jobs are further factors to consider. The final piece of advice is to invest in international internships.

WHAT IS ONE PIECE OF ADVICE THAT YOU WOULD LIKE TO GIVE TO ASPIRING FEMALE SCIENTISTS?

WE ALSO AIM TO DEBUNK SOME STEREOTYPES ASSOCIATED WITH SCIENTISTS AND HOW SCIENCE WORKS. WOULD YOU LIKE TO SHARE A FACT ABOUT YOURSELF THAT IS NOT ASSOCIATED WITH YOUR WORK?

One of the stereotypes is that a scientist is sullen and a loner just holed up in a lab. It's not true, for example, daily I joke about simple things and I love discovering places around the world together with my husband and daughter.





INTERVIEW WITH DR. ELENA BREVNOVA



Dr. Elena Brevnova holds a bachelor in Radiation Physics and Ecology from the Moscow Institute of Engineering Physics and a PhD in Molecular Biology from the Institute of Genetics and Selection of Industrial Microorganisms in Moscow, Russia. With postdoctoral experience at

Stanford University and the University of California, San Diego, she has established herself in industry having acted at GlycoFi (Merck), Mascoma, Total New Energies (Novogy), Evelo Therapeutics and, currently, as the Senior Director of Strain Engineering at Ginkgo Bioworks. She is the author of significant scientific publications and patent applications in the fields of strain and protein engineering and a respected scientific leader in the exciting field of synthetic biology.

TELL US ABOUT
YOURSELF AND WHAT
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biology, which I found so much more interesting. I later got a PhD at the Institute of Genetics and Selection of Industrial Microorganisms in Moscow, Russia.

I came to the US as a wife on a spouse visa that gave me no rights whatsoever, I didn't even have a social security number or bank account and was not allowed to have a paid job. Fortunately, at the time it was relatively easier to get a postdoctoral position, which I did at Stanford.

I am the daughter of two scientists, an astrophysicist and a geologist, and I always imagined I would be a scientist too. I started my bachelor in physics, but that eventually led to molecular

It was very stressful to get a new visa because that requires you to leave the country. I went to Vancouver for the paperwork and came back to the US with a working visa. After Stanford I took other postdoctoral positions and then started to get frustrated because it was so hard to get an industry job due the visa status.

You can only change an academic visa to an industrial one once a year at a specific date. Most companies don't have the flexibility to wait for the right month to start a position.

Luckily for me and many other international PosDocs, a founder of GlycoFi, Dr. Tillman Gerngross, wanted to build an international team for his startup.

INTERVIEW WITH DR. ELENA BREVNOVA

He rescued many of us from academia and gave us the opportunity to get our first industry job and a green card. After GlycoFi I was able to establish myself in industry and I have worked as a scientist and project and people leader at several biotech companies. Nowadays I am a Principal Organism Engineer (Senior Director) at Ginkgo Bioworks.

WHAT ARE SOME OF THE CHALLENGES THAT YOU HAVE FACED AS A WOMAN AND AN IMMIGRANT IN STEM?

I have faced challenges as a woman my whole life. And as an immigrant, I have also faced discrimination both as a Russian and as an immigrant, which are two different things. In addition, I have faced discrimination based on my accent and also because of my short height! In fact, most people, women, and men, have a list of things they are being discriminated against.

There is huge discrimination against women in the industry that I have experienced many times over. Mostly I have felt that women are severely penalized for any mistake, you must be absolutely perfect, while men can make mistakes and oftentimes face no consequences. This creates impossible standards for women. Also, women in the industry just expect that they will be treated fairly and that recognition based on their good work will just come to them, they don't usually ask for recognition or promotion or the best projects.

On the other hand, men just take things, whether they deserve it or not, and this ends up frustrating women and eventually forces them to play by men's rules. I have found that you can decide how to react to this situation, if you choose to be angry you will spend a lot of time being angry. It is best to accept some of these situations and try to change them from within to the best of your abilities. I do see things are getting better slowly with discrimination against women in the biotech industry. I also see younger generation women acting much more assertively and confidently than we did a couple of decades ago, which makes me feel very proud of them.

Ginkgo is the most inclusive and diversity-conscious company I have ever worked for. The most remarkable aspect is that these subjects are constantly talked about in the most transparent way. There are diversity and inclusion committees within the organization that constantly monitor the participation of females and peoples of color at all levels of the organization.

WHAT MEASURES DO YOU BELIEVE ARE BEING TAKEN, OR COULD BE TAKEN, IN YOUR ORGANIZATION TO INCREASE GENDER DIVERSITY?



INTERVIEW WITH DR. ELENA BREVNOVA

They have specific action items to increase diversity and are encouraged and inspired by Dr. Reshma Shetty, COO and co-founder of Ginkgo Bioworks. I believe this success is in large part due to Dr. Shetty actively pushing for equal opportunities for women and people of color at Ginkgo.

An additional action that companies could take to increase female diversity at all levels of the organization is to adopt equal maternity and paternity leave policies, as the Scandinavians do. In Russia what they did was to increase maternity leave to up to three years and that was a disaster; it led to open discrimination against women because how can companies afford to hire someone who may leave for up to three years?

In contrast, in Scandinavian countries parental leave can be taken by either parent, usually whoever has the lower salary, or can be split between the two. In this way, companies can't discriminate because they cannot guess in advance who will take the parental leave.

WHAT DO YOU THINK READERS OF THE EQUALITY PURSUIT MAGAZINE NEED TO KNOW TO EMPOWER YOUNG GIRLS AND WOMEN IN THEIR COMMUNITY TO PURSUE EDUCATION AND CAREERS IN STEM?

The Equality Pursuit should aim to communicate to the younger generation. This new generation is so much better than us, so they need to know that they can do anything. I actually feel much closer to this new generation than my peers. I recommend the readers to listen to Hillary Clinton's inspiring address to

young girls in her concession speech in 2016. I watched it with my daughter and we found it inspiring and uplifting.

In addition to making noise you need to deliver good results and own them. You cannot just support causes like feminism, you actually need to deliver great scientific results and make sure you get recognition for your work.

WHAT IS ONE PIECE OF ADVICE THAT YOU WOULD LIKE TO GIVE TO ASPIRING FEMALE SCIENTISTS?



INTERVIEW WITH DR. ELENA BREVNOVA



WE ALSO AIM TO DEBUNK SOME STEREOTYPES ASSOCIATED WITH SCIENTISTS AND HOW SCIENCE WORKS. WOULD YOU LIKE TO SHARE A FACT ABOUT YOURSELF THAT IS NOT ASSOCIATED WITH YOUR WORK?

This question is interesting. Back when I was in Russia when I told people that I was a scientist I would get instant respect. When I came to the US I also got a little respect, but sometimes I also got a little negative feedback. It made me feel like maybe I was also a little weird, or creepy, or nerdy. Not all reactions were positive, and I got the feeling that in the public eye it is not as great to be a scientist in the US as it was in Russia. And this struck me and recently got me thinking that maybe scientists could take something akin to the Hippocratic Oath and swear to do good for the world, the environment, society and do no evil. Maybe this could help change some of the negative connotations I have perceived.

In the end, scientists are just regular people, we go about our daily lives just like everyone else, some of us are funny and extroverted, some of us are more serious, many of us have families and enjoy the same things everyone does.

PiNAYS CAN STEM:

Celebrating every Pinay's skills, capabilities, and dreams in STEM



Pinays Can STEM shows young girls that they too, with their own abilities, can do anything! By building their confidence and exposing them to the wonders of STEM, we encourage them to achieve greater heights, then eventually reimagine a better life for the nation.

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Affiliation: STEM+PH - Unilab Foundation

Keywords: Pinays, Women in STEM, Pinays in STEM, gender advocacy, STEM, women empowerment, STEM education, future of work, role models, STEM careers, empowerment in STEM

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Instagram: instagram.com/PinaysCanSTEM

"What I want to see is to have any young girl interested in science find role models in an accepting environment, to push them to pursue that career and be successful in it." - Dr. Reina Reyes, Physicist, in Pinay's Can STEM's #MySTEMJourney video last November 2020.

STEM+PH is a Unilab Foundation's flagship program that promotes STEM education by nurturing integrated STEM learners, innovators, and the workforce launched Pinays Can STEM, an online community advocacy that aims to empower and encourage young Filipinas in STEM. Pinays Can STEM encourages and influences Filipinas to pursue their dreams while providing them with opportunities to lead the future, inspiring others to do the same. When given the right choices, opportunities, and tools, Filipinas can achieve greater heights in STEM, no matter what job they decide to take.



Addressing the gender gap in STEM

The Philippines ranks 16th in the world's gender gap, making the country have the smallest gender gap in Asia. In fact, women comprise 49% of the Science and Technology workforce. However, even with this growth, many factors contribute to the gender gap in STEM, particularly for young female learners. On average, only 36% of STEM graduates are women, and from that, only 46.2% are employed in STEM-related fields.

According to the Youth in STEM report, research findings showed that the presence of Filipina role models, either as STEM professionals or as industry leaders in STEM, directly influence young girls' interest in pursuing that path.

There is a significant gap in the area of STEM subjects that males are more likely to pursue, such as Engineering, compared to females who are more inclined to take medical-related subjects and careers such as Chemistry and Biology. Aligned with this is another notable finding that female students across the country were more inclined to pursue STEM as a discipline when they are able to contribute to society.

Much is yet to be done in raising awareness on other STEM careers, particularly on the natural sciences, technology, and mathematics.

"I want to shatter the notion that you have to fit a certain criterion to pursue a career here—that you can wear head-to-toe pink and still be taken seriously. STEM will be a place for all women. The future of STEM won't be as daunting as hearing 'science, technology, engineering, and mathematics because it will be multidisciplinary, collaborative, creative, and non-judgmental." - Erika Modina, President of EpiMetrics, Inc., in Pinay's Can STEM's Pinay of the Month article 'Healing Together: Erika Modina's Journey with Public Health' last January 2021.

A whole gamut of hindering factors—the male-dominated STEM education system, the lack of support towards girls' capabilities, gender stereotypes and biases, and the global digital divide—disproportionately affects women and girls everywhere. In the country, the apparent lack of female role models, prevailing gender stereotypes, and the underrepresentation of women professionals in STEM discourage young Pinays to pursue the STEM track.

¹World Economic Forum. (2020). Global Gender Gap Report 2020. http://www3.weforum.org/docs/WEF_GGGR_2020.pdf
²Wadhawa, D. (2019, May 17). The World Bank. World Bank Blogs. <https://blogs.worldbank.org/opendata/there-are-fewer-female-male-stem-graduates-107-114-economies>

"Diversity should come in the form of increased opportunities for all gender and socioeconomic strands so that tech turns into a right instead of a privilege." - Audrey Pe, Founder of WiTech, in Pinays Can STEM's STEMpower article: This International Day of the Girl, meet the (girl) gang making their mark in STEM, during International Day of the Girl last October 2020.

Strengthening gender advocacy through role models

Founded on the belief that all Pinays are able to create life-changing breakthroughs, it is Pinays Can STEM's vision to build a community of STEM Pinays believing in their own capabilities. Breaking barriers and defying gender perceptions, the advocacy platform provides insightful infographics, interactive quizzes, local and international inventions and achievements, and inspirational role models for all young Pinays. Through these stories and STEM journeys, young girls will feel more inspired and be more aware of how diverse STEM careers are, motivating them to pursue their destined path in STEM.

Ever more highlighted by the COVID-19 pandemic, Filipinas have had a presence and a greater contribution not only in healthcare, but also in research, engineering, information technology, and public health in the country. In a recent study by the International Labour Organization, gender diversity in the workplace has increased profitability, productivity, and creativity in various Filipino companies, pushing the growing need to invest in building opportunities for women in STEM.

"I think it's great to see different organizations like Pinays Can STEM where I can talk to real-life Pinays in STEM and hear her backstory and what drove her to pursue this field." STEM Student Jammy Mapa in Pinays Can STEM's #MySTEMRoleModel video with Angelyn Mercado, a Pinay in Robotics.

Within just a few months, Filipinas have already shared their experiences in STEM--from inadequate support from their environment, gender discrimination, to the lack of opportunities in STEM--all of which affects their own choices in their careers.

³ Philippine Statistics Authority. (2016). The Statistical Handbook on Women and Men in the Philippines. <https://psa.gov.ph/sites/default/files/Women%20and%20Men%20Handbook%202016.pdf>

⁴ Student Edge's YouthInsight, Unilab Foundation's STEM+PH, & Philippine Business Coalition for Women Empowerment (PBCWE). (2020). Perceptions of the Filipino Youth Around STEM and The Need to Understand It. <https://youthinsight.com.au/world/phippines-youth-in-stem-2020-report/>

"My goals in STEM aren't fully supported by my parents because they think that my kuya should be the breadwinner of the family. I wish to take med, regardless if I'm the breadwinner or not. I'll be a winner for myself." - Testimonial from a 3rd-year high school STEM student in one of Pinays Can STEM's posts.

Strengthening gender advocacy through role models

Through informative social media cards and articles, and videos centered around role models and women empowerment, Pinays Can STEM continues to engage more young Filipinas to pursue the STEM track, and has featured more than 20 Pinays in STEM, over 500,000 audience reach, and more than 4,000 followers on their Facebook and Instagram pages in just 1 year.

"I am a consistent honor student and pangarap ko talaga na magkaroon ng M.D.-Ph.D sa dulo ng pangalan ko. A future doctor that'll soon make a great change. But a lot of people around me are insisting that I should not continue because it's a waste of time and money. Sayang daw ako

and so on. Despite these comments, I still chose STEM as my strand with no hesitation and I'm proud of being a STEM student." - Testimonial from a Pinay in one of Pinays Can STEM's posts.

Awakening Transformative Consciousness

Pinays Can STEM, Unilab Foundation, and STEM+ PH recognize that, to build an inclusive community for women to grow in STEM, their surrounding environment should actively take part in the process. Institutions such as schools and companies can promote gender equality by bringing more women leaders, creating and preserving safe spaces for women. Male classmates, peers, and family members can be allies who commit to promoting gender inclusion and sensitivity. Leaders can also strengthen and implement existing policies that facilitate STEM education and fields, promote women empowerment, and strengthen partnerships in the women's sector, policies against harassment, and accountability mechanisms. STEM+PH recognizes the youth's role in transforming society and, as the leaders of the future, it

⁵ International Labor Organization. (2020, September 18). Gender diversity is good for business says new ILO survey in the Philippines. https://www.ilo.org/manila/public/pr/WCMS_755609/lang--en/index.htm

takes conscious effort to plant the seeds on the importance of women's economic empowerment and gender equality in the workplace and provide them the opportunity to demonstrate and test their leadership.

By exposing our girls to STEM, we give them the freedom to explore its wonders, opportunities, and eventually develop their passions. This will inspire others to live a life well-lived by following their STEM dreams, then eventually reimagine a better life for the nation.

Pinays Can STEM hopes to influence young Filipinas to start with the small things, then further transform their STEM dreams into reality.

Let's empower Pinays in STEM together! Check out our pages for more updates: Facebook, Instagram, Blog.

"In the future, I envision women to be and feel as welcome in STEM as in any other discipline." - Angelina Aquino, Teaching Associate under the Electrical and Electronics Engineering Institute at University of the Philippines, in Pinays Can STEM's Pinay of the Month article

Powered by:



'Defying Deviations: Exceeding the Norm with Angelina Aquino' last December 2020.

In STEM+PH, we continue to collaborate and co-create with like-minded organizations as part of our advocacy to provide equal opportunities for Filipinos, as well as adequate and quality access to STEM education. After all, in order to achieve this, a collective effort from diverse sectors is a must.

We look forward to your support and collaboration in further empowering young Filipinos to pursue STEM.

You may reach us at stem.ph@unilabfoundation.org or check our Facebook page for more information.!

Together, we can #STEMify the Philippines!



iGEM TEAMS THAT PURSUIT EQUALITY



In the fight for gender equality, we are not alone. Through the years of the iGEM Competition, there have been many iGEM teams with female leaders, members or projects that revolve around gender issues and thus helped to raise awareness. Let's see some notable examples from the 2020 and 2021 editions.

iGEM 2021 IISER-Tirupati_India - OviCloak

A contraceptive is more than a product, it's a tool for empowerment of its users by upholding their right to plan a family and enable safer choices, that's why Team IISER-Tirupati_India created a contraceptive. After realizing the negative effects of current contraceptives on women, they decided that they needed to come up with a better alternative, one that is non-hormonal, reversible, and one that specifically acts on the gamete and not on the body of the user. OviCloak aims to modify the commensal bacteria of the fallopian tubes to produce an ovum-specific contraceptive molecule in a regulated manner. The bacteria will also be engineered with kill switches for the reversibility of contraception and biosafety.



Team wiki: https://2021.igem.org/Team:IISER-Tirupati_India

Team presentation: <https://video.igem.org/w/5EHqam6VMLj7pJURZMp7Lq>

iGEM 2021 Paris-Saclay - EndoSeek

Team 2021 Paris-Saclay's project, EndoSeek, aimed to develop a new diagnostic tool to detect recently identified miRNAs that can be found in circulating blood at different concentrations in endometriosis-affected females compared to healthy individuals. The diagnostic kit is based on the nucleases Cas13a and Cas14a1 and the production of a fluorescent signal that could be measured with a smartphone. Endometriosis is a painful and poorly known pathology caused by proliferating uterine-lining cells outside of the uterus. It affects approximately 10% of women worldwide and can take up to 8 years to be diagnosed. The team's project aims at significantly reducing the time for an accurate diagnosis. They also brought a significant discussion on how the Covid pandemic affected the lives of endometriosis patients during the lockdown and the decreased access to medical care.

Team presentation: <https://video.igem.org/w/4v2fpJ4wc5LuaZztnmQ1Kt>

Team wiki: https://2021.igem.org/Team:GO_Paris-Saclay/Description#

The Rosalind Chronicles - iGEM 2021 collaboration by Teams Patras, Thessaloniki, ULaval and Concordia_Montreal with After iGEM WiSTEM

iGEM Concordia, ULaval, Thessaloniki, Patras, and After iGEM WiSTEM collaborated together in order to produce the Women in STEM - Diversity and Inclusion Workshop and the Rosalind Chronicles. This was a very unique and worldwide collaboration in which all iGEM teams were asked to submit a female scientist, past or present, that they admired. The result is the Rosalind Chronicles Padlet, highlighting the hard work of many women in science, check it out!

The Rosalind Chronicles Padlet: https://padlet.com/louisjacquesruel/Rosalind_Chronicles

Team British_Columbia (UBC iGEM) 2021 - Human Practices & Education

UBC iGEM strives for equality and diversity in their various community initiatives in order to empower the next generation of innovators and young leaders. This summer, the team organized a Q&A event on social media where young females in high school were encouraged to submit their questions about pursuing an education or career as a woman in STEM. Female-identifying team members addressed these questions and provided essential advice and feedback on these challenges by sharing their personal stories on Instagram. The team also hosted a career workshop for female high school students in their local community in Vancouver, Canada. The workshop presenters addressed issues such as gender-based prejudice existing in biotechnology-related fields and discussed the various concrete ways in which girls can get involved in STEM education and science projects in high school and university.



Team wiki, Communication:

https://2021.igem.org/Team:British_Columbia/Communication#Vancouver

iGEM 2020 Calgary - Oviita

As a leading global cause of preventable blindness and mortality, vitamin A deficiency (VAD) is a serious health problem, particularly in developing regions and that mainly affects pregnant women and children. iGEM 2020 Calgary's project, Oviita, aims to equip these vulnerable regions with a sustainable and community-based solution to VAD. The proposed solution uses a food-safe strain of *Yarrowia lipolytica* modified to produce beta-carotene, a Vitamin A precursor. Through the course of their project, team Calgary has targeted several SDG's with special emphasis on SDG 5, which aims to achieve gender equality and empower all women and girls. In order to attain this goal, Team Calgary proposed to teach local women's groups how to manufacture a nutritious probiotic yogurt, which they can sell for a profit from small grassroots kitchens in order to both make a living for themselves and nourish their communities. Oviita could thus serve both as a nutritious supplement and a supplementary source of independent income and thus help empower local women.

Team presentation: <https://video.igem.org/w/jQHwW2CPGr1TGMJ1AxdlNx>

Team wiki: <https://2020.igem.org/Team:Calgary/Description>

iGEM 2020 Rochester - UteRus

Team 2020 Rochester's project, UteRus, sought to create a novel, noninvasive diagnostic for endometriosis using menstrual effluent. Endometriosis is a chronic disease that causes aberrant endometrial-like tissue growth outside of the uterine cavity. It affects more than 200 million women worldwide and can lead to severe symptoms impacting reproductive health. The team also created a menstrual cup best suited for the collection of menstrual effluent and the comfort of endometriosis patients, and designed inexpensive laboratory equipment for clinics without easy laboratory access. Together, they were able to create a simple diagnostic for endometriosis that can be employed in a variety of clinical settings and used to resolve the gap of knowledge and raise awareness for female reproductive healthcare.

Team presentation: <https://video.igem.org/w/gMQYxWUWaTTbvqHicfL6Ts>

Team wiki: <https://2020.igem.org/Team:Rochester>

iGEM 2020 UNI_Laussane 2020 - Gender Awareness

Women face different inequalities in the fields of science, technology, engineering, and mathematics (STEM). In Switzerland, several initiatives have been established by the universities and the government in order to reduce them as much as possible. Unfortunately, gender equality is still far from being achieved, and much remains to be done. For their Human Practices, Team UNI-Laussane tackled the issue of gender inequality in science by producing an awareness video in the form of interviews that aims to highlight gender inequalities in the scientific field. Similar questions were asked to women and men and their answers were analyzed. Moreover, since participants came from different academic backgrounds, an analysis of inequalities was made as the academic levels increased. Finally, the team met Marie Pasquier, project manager at the Equal Opportunities Office (BEC) of the University of Lausanne (UNIL), to discuss the solutions that are currently being implemented.

Awareness video:

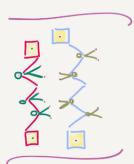
<https://video.igem.org/w/wyT514hNZm8FA32Wp9mjLf>



The life and times of V

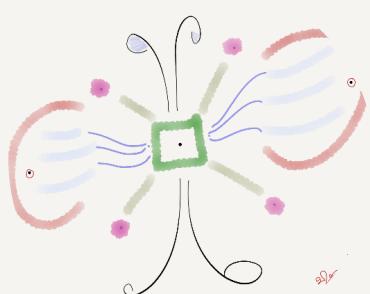
By Vijay

Every parent hopes that their child will have a good life.
Little did V give attention to his studies till he was fifteen.
But a miracle certainly did happen at 16 for he scored first
in all the subjects - except English which was his nemesis.
He managed to obtain the first rank in the class, by taking
tutorials from a professor of English, and by quoting poetry
from study materials beyond the recommended curriculum.



V always wanted to become a doctor, but as a Brahmin, 97%
in Physics, Chemistry, and Mathematics was not sufficient.
Having not secured a place to study in the state where he
lived, he traveled 2000 km away from his parents' place to
study Chemical Engineering.

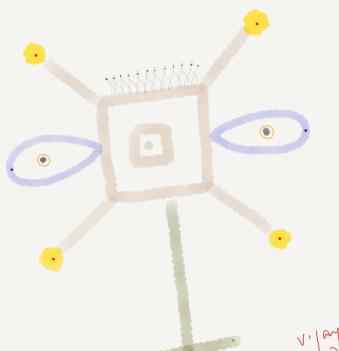
The Channel Tunnel between England and France had just
been inaugurated. He dreamt of taking it one day and this
indeed materialized in 2007. He obtained the best grades in
his BEng and graduated with Honours. He made good
friends, improved his Hindi and English. He got a job
through campus recruitment (the only one who was offered
a job out of ten candidates) to work at a paint and pigments
company, but V decided to pursue a master's degree at IIT
New Delhi after succeeding in the highly competitive
entrance examination.



V had the good fortune of being the only student in a
master's program that was offered for the first time in the
Bio-Chemical Engineering and Biotechnology department.
New Delhi was a culturally vibrant city; it offered many new
avenues to explore and enjoy. New friendships ensued. V's
old friends from BEng got married, some as young as 23.

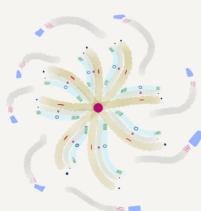
After completing his MRes, he was offered a job at a
pharmaceutical company in Ahmedabad, but after only three
months he decided to come back to research in a non-profit
institute in Jaipur.

Working at a research organization deepened his interest to pursue a Ph.D. career in biotechnology. He went back to the library in IIT New Delhi and printed everything that he could find on metabolic engineering. V bought the only book on metabolic engineering available at the time with half his monthly salary. He wrote to the author, a professor at DTU in Denmark, and got invited with a stipend to come first as a research assistant at DTU. A year after he got a fully-funded Ph.D. position at DTU. Thus began a long journey that would span three different continents over 12 years.



For V, eating with a knife and fork was challenging. His Portuguese and Swiss friends taught him to how to use cutlery and helped him to speak in English slowly and clearly. V is eternally thankful to them. When V came out in Denmark in 2005, his Portuguese friend supported him emotionally, else he would have kicked the bucket long time back.

After his PhD, V went to UPenn for postdoctoral research in neuroscience. However, a demanding work environment and his quest for fundamental questions on life made him leave the postdoc job and start a teaching position at an alternative school in England. He delved into the nature of thought and taught Chemistry at the school. V was introduced to the world of classical music through his partner Being comfortable with his sexuality in an open environment gave him confidence.



After eight years of teaching and being in administrative roles, V decided to come back to research.

He applied for a research grant from DTU but was not shortlisted because of his age and for not having enough publications. Brazil chose him.

V had a fantastic experience in Campinas. Desert flowers blossomed. New talents arrived: drawing using crayons on paper, drawing using fingers on an iPad.

He took piano lessons and learned the Portuguese language.

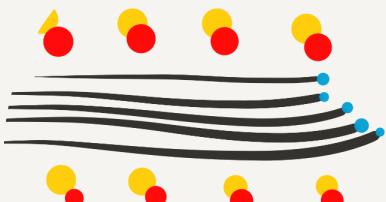
He authored numerous poems and blogposts.

After two years in Brazil, V moved to Sweden for a year to work on second-generation ethanol. As climate change was undeniable, his research focused on ways to produce chemicals sustainably. From Sweden, V went to Sheffield, to work on yeast propagation, and with fantastic professors who are now retired. After three years in the UK, V is now back in Sweden as a lab manager, in a permanent position, training researchers, and maintaining a lab of forty-five people, together with another person.



Securing a tenure track position at the university for performing research is difficult. V realized that that ship has sailed owing to his age, and hence he decided to become a laboratory manager. V still reads scientific articles, and he learns about nice and interesting research. Constantly. He supports researchers instead of applying for grants. He also promotes laboratory activities on social media and trains new students.

V's father passed away due to Covid in May 2021. In the span of two weeks, his grandfather also died, and his brother nearly did not make it. There is now pressure on him to come back to India and fulfill the role of an elder son. Except for V's younger brother, no one knows about his sexuality, and this is making his life exceedingly difficult. V has decided to stay in Europe, for he has stayed far too long to go back and live a 'normal' life in India.



V discovered that colours and drawing allow one to explore the freedom that life offers. Sharing experiences - cultural, technical, or personal - helps learners and educators to challenge myths and create awareness by using diversity. V has visited several schools and colleges in India, Brazil, Sweden, and the UK, talking to high school and college students about career options after their studies.

V has been part of various minorities throughout his life.

Indian in the West, brown in the white, vegetarian among the meat-eaters, Brahmin in India, artist in the science, gay in the world.

Same-sex activity was a crime in India until 2018, still a crime in many other countries and still not accepted in most countries in the world.

Education has been his savior to escape the constrained environment he grew up in.

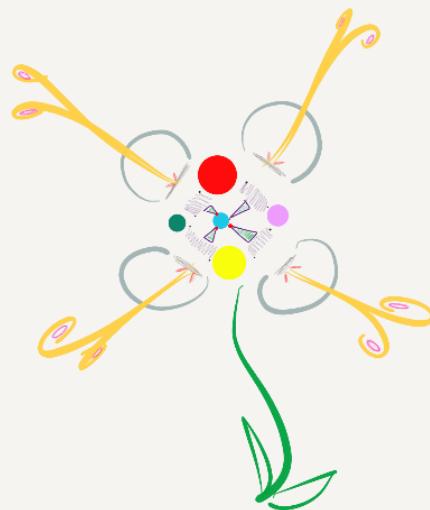
At the boarding school where V worked as a teacher in the UK, he was living with his

partner, and the whole school community was aware of his relationship.

Having a gay couple on the campus changed the way many students and adults perceived homosexuality.

Sexuality has never been an issue in most of his workplaces. Not all.

He proudly wore the rainbow lanyard to support the LGBT community in Sheffield. V has given a talk in the 'Out Thinkers' event, to inspire young people who are struggling with their sexuality, to demonstrate that one can be a scientist, an educator and an openly gay person.



Crossword

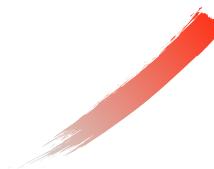


Across

2. Groundbreaking female physician. She was a pioneer for women in science; she was the first woman to hold a full professorship at Johns Hopkins School of Medicine, the first woman elected to the National Academy of Sciences, and the first woman to head a department at the Rockefeller Institute for Medical Research (Surname)
3. Greek mathematician, astronomer, and Neoplatonist philosopher. She is the first female mathematician whose life is reasonably well recorded
6. The belief in full social, economic, and political equality for women
7. American woman, a disability activist and lecturer to be the first deaf-blind person to earn a Bachelor of Arts degree and went on to become a prolific author of 14 books and hundreds of speeches and essays.
9. The Q in LGBTQ stands for
10. The country where it is hardest for girls to receive an education
12. Structure of the DNA shown by Rosalind Franklin's Photo 51 (2 words)
14. Woman scientist who discovered the genetic transpositions or jumping genes (surname)
19. American cardiologist who founded the field of pediatric cardiology. She is credited with developing the concept for a procedure that would extend the lives of children born with Tetralogy of Fallot (the most common cause of blue baby syndrome) (Surname)
21. First African American woman in space (Surname)
23. American computer scientist and United States Navy rear admiral, she was the first to devise the theory of machine-independent programming languages (Surname)
24. World's foremost expert on chimpanzees and leading primatologist (Surname)
25. Hungarian-American biophysicist, scientist, and inventor who was a pioneer in solar energy technologies (Surname)

Down

1. Iranian mathematician who was the first female winner of the Fields Medal, the most prestigious award in mathematics (Surname)
4. Ethiopian molecular plant pathologist whose cutting-edge research is dedicated to helping the world's smallholder farmers grow more food and rise out of poverty. She was awarded a L'Oréal-UNESCO Award for Women in Science in 2014, named one of the 100 most influential African women by Forbes Africa, and elected as a Fellow of The World Academy of Sciences in 2015 (Surname)
5. Globally around ___ % of young women were married before their 18th birthday
8. Pharmaceutical chemist whose visionary research on malaria treatment is rooted in ancient Chinese medicine. Her discovery of artemisinin, a compound that quickly reduces the number of Plasmodium parasites in the blood of patients with malaria, has saved millions of lives (Surname)
11. Country that has the highest proportion of women in the world
13. African American mathematician whose calculations have been essential to U.S. space exploration. As a NASA scientist, she calculated trajectories, launch windows, and emergency return paths that flew the first U.S. astronauts into space and Earth's orbit. Her life was portrayed in the film Hidden Figures (Surname)
15. Invention that awarded the Nobel prize to Jennifer Doudna and Emmanuelle Carpentier
16. Country that had the first female president in the world
17. Female physicist who was the first woman to win a Nobel prize and the only scientist, male or female, to have won Nobel prizes in two different categories
18. Author of the groundbreaking book "Silent Spring", she called attention to the dangers of indiscriminate use of synthetic pesticides and helped launch the modern environmental movement (Surname)
20. When International Day of Women and Girls in Science is celebrated (abbreviated)
22. One of the leaders and founders of the American Women's Suffrage Movement of the mid-nineteenth century (Surname)



WOMEN WHO HAVE INSPIRED US

WHO AM I?

1.I used a method that greatly enhanced the density and contrast of photographic images by exposing the silver in the emulsion of a photographic negative to radiation, and then creating a second image by exposing a second emulsion to the radiation from the first one.I was named Inventor of the Year by the Association for the Advancement of Inventions and Innovations – the first woman to receive the honor. Even today my method is used in astronomy and medical x-rays.

WHO AM I?

2.I have developed a powerful new method of gene editing that in a few short years has already revolutionized genetic engineering, and whose future contributions to medicine – therapy as well as basic research – are incalculable.The method is called “CRISPR/Cas9.” CRISPR stands for “clustered, regularly spaced, short palindromic repeats,” and is basically a region of the bacterial chromosome that acts as a spacer between different coding regions, or genes. Cas9 is an enzyme produced by certain bacteria

the acts like scissors, cutting a chromosome at the CRISPR region. The discovery of this pair of structures and how they operate together has made it possible for the first time for scientists to contemplate “editing” genes virtually at will. And I am in the list of 50 people who deserve a Nobel Prize in 2017.

WHO AM I?

3.I am the first woman to lead a major university in the Middle East and remained in the post of President until 2002. I study corrosion in various technological systems, including engine cooling systems, distillation units for crude oil, and high temperature geothermal brines.I also worked on the electrochemical behavior of a wide variety of metals and metal alloys, from aluminum to vanadium to cadmium to low-carbon steel. Moreover, I collaborated in the discovery of a new class of molybdenum-based catalysts, which can be used to enhance the octane rating of gasoline without the use of undesirable benzene by-products.

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