

## ESSAY

## ESSAY SERIES: EQUITY, DIVERSITY AND INCLUSION

# Operation STEM fatale – how an equity, diversity and inclusion initiative has brought us to reflect on the current challenges in cell biology and science as a whole

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## From a simple thought to a multicellular movement

As a cell biologist, I, Nicole Amberg, have always been fascinated by cell type diversity in nature and how ‘form meets function’ for distinct cell populations. However, when looking at academia, I was discouraged to see that the system does not reflect nature’s diverse and variable shapes. Instead, academic institutions (and society as a whole) still lack homogenous access to education, opportunities and chances, resulting in strong imbalances in representation of gender, ethnicity and ultimately and most importantly, mindsets. With a keen sense for equality, I thus set out to become an advocate for progressive change, believing that change can only be implemented by action. I teamed up with several colleagues and founded ‘The STEM fatale Initiative’ (<http://stem-fatale.com>; @STEM\_fatale\_ on Twitter; Fig. 1) in order to determine the professional, societal, structural and personal factors impacting women’s careers in STEM, and to then propose strategies to improve the current situation. Among the ‘STEM fatale’ participants, I recruited fellow cell biologist Melissa Stouffer and structural biologist Irene Vercellino, partners in marathon training and long conversations on the current state of equity, diversity and inclusion (EDI) in life science, STEM and society at large.

Since ‘STEM fatale’ was created and has operated, as a result of the current imbalance in EDI in cell biology, as well as in other scientific disciplines, the three of us (Nicole, Melissa and Irene) decided to take the opportunity in this Essay to report on what we have learned about EDI through our own experiences, mainly focusing on the role of women.

As a whole, we have been part of 11 labs in six different countries spread across two continents, forming a personal idea of the status of women in STEM. Additionally, thanks to the ‘STEM fatale’ and via direct interviews with various faculty members at the Institute of Science and Technology Austria (ISTA) – Professors Carrie Bernecky, Tom Henzinger, Martin Loose and Gaia Novarino – we’ve obtained the perspectives of successful women, but also men, on the topic. Therefore, just like a cell biologist investigates biological phenomena by a plethora of techniques, we have employed interviews, literature and personal experience to address EDI.

Taken together, our methods allowed us to identify relevant patterns in the issues faced by women in STEM and present possible solutions to leave a message of hope for a brighter, more equal future.

## Unconscious bias – the invisible ball-and-chain at women’s ankles

One of the most important contributors to (the lack of) EDI, recurrently encountered in our experiences and reports from others, is unconscious bias. As defined by the neurobiologist Prof. Jennifer Raymond, “Unconscious biases are mental habits that tend to

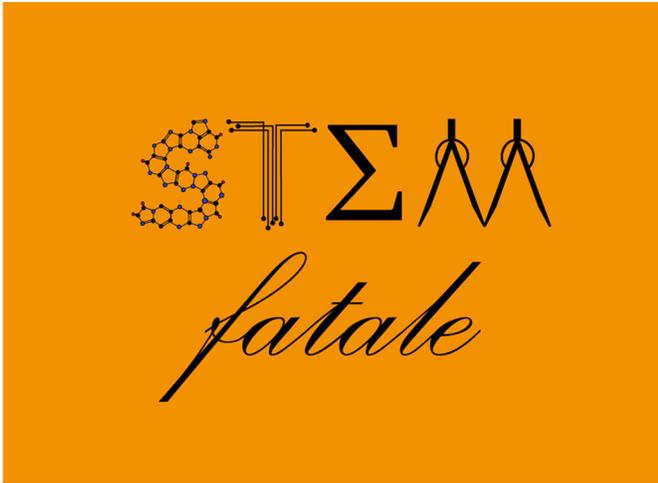
dominate our gut reactions” (e.g. young women are not worth hiring and promoting because they will end up quitting their job once they get pregnant), but importantly “we also have more rational decision processes, which compete with our biases for control of behaviour. Just as one can overcome physical habits [...], one can suppress undesirable mental habits such as gender bias through deliberate, conscious strategies” (Raymond, 2013).

Since unconscious biases are instinctively present in humans, there is no way to eliminate them, but we can and must reverse their negative effects by acknowledging their existence and actively trying to make rational decisions instead. Raising awareness of the existence of the unconscious bias leads to a two-pronged benefit: on the one hand, people realise that the problem exists, and on the other hand, when it comes to the role of women in STEM, both men and women can correct their negative thoughts and behaviours towards women, whereas women can more easily spot biased treatment if it occurs. It has in fact emerged from our interviews that women often recognise having been mistreated in hindsight, and as the ‘me too’ movement has proved, raising awareness is a key first step to solving the problem.

Importantly, unconscious bias might contribute to the leaky pipeline (i.e. the progressive underrepresentation of women in senior positions) beyond hiring discrimination by affecting women’s publication number or even their selection to receive prestigious awards. A recent study, discussed in this news article (Watson, 2021) has uncovered that women’s share of international prizes rewarding research excellence lags behind the proportion of professorial positions held by women. The authors identified 141 highly prestigious international prizes – including the Nobel prizes, the Fields Medal for mathematics and the Robert Koch Award for biomedical sciences – and found that the distribution between male and female awardees could not be more different: while these research recognitions were given to 2011 men, they had only been awarded to 262 women between 2001 and 2020. These results do not correlate with lack of quality or quantity of women’s research. Instead, implicit bias from award committees, coupled with a lack of proactive efforts to address inequalities in science, reinforces a system that undervalues women. Such studies are of enormous significance, as they help to increase our perception of the systemic factors making women less visible to both the scientific community and society.

## The devil’s in assumptions

Unconscious bias is just one of the many issues that, to this day, fuel the leaky pipeline. In addition, common misconceptions about why women get progressively lost along their professional path (i.e. the lack of realistic data concerning women, a widespread topic of concern across numerous fields referred to as the ‘gender data gap’) may lead to the implementation of suboptimal corrective measures.



**Fig. 1. The STEM fatale logo.** The letters comprising the word STEM graphically represent the various STEM fields (S is made of atoms, for science; T is an electrical circuit, for technology; E is the Greek letter epsilon and mathematical symbol; M is made of two compasses, for engineering). The logo also represents the flag unifying our EDI efforts, beyond our specific academic and scientific interests.

These end up creating a system that is in principle aimed at achieving gender equity, but practically still fails to do so.

A clear example of this comes from a survey conducted by Harvard Business School of more than 25,000 graduates, analysing the career trajectories of men and women after completion of their studies (<https://hbr.org/2014/12/rethink-what-you-know-about-high-achieving-women>). The results, applicable to managerial positions in any field, found that against common belief, women do not ‘opt out’ from their profession in favour of child care, although they do feel the stereotypical societal pressure to do so. After child birth, women rather tend to find themselves in unfulfilling roles with dim prospects for advancement. Thus, despite making more efforts in creating flexible and/or part-time positions for mothers, employers seem to have largely failed to incorporate the value of the intellectual challenges of these roles.

The frequent misbelief that part-time working women aim for less challenging work causes women to rate these jobs as not fulfilling, which directly translates to decreased professional satisfaction and a higher probability of discontinuing their careers in such work environments. Furthermore, being part-time automatically takes women off the structured review and promotion ladder in a number of companies, thus introducing a glass ceiling simply based on assumptions, further contributing to the unconscious bias. Individuals, companies and society must re-think, re-evaluate and adjust their inherent beliefs and expectations of women’s aspirations in order to sustainably create flexible and inclusive career options for all members of society. This statement does not just pertain to men, it also requires women to become aware of how they might be jeopardized by their own implicit biases and stereotype convictions.

#### **Biological bias multiplies unconscious bias**

Another example of a ‘double-edged sword’ measure, set out to help fix the leaky pipeline but perhaps not completely helpful in reality, relates to how the inclusion of parental leave is differently considered for men and women by funding agencies and employers. First of all, the recognition that pregnancy and birth take a large toll on a woman’s body is a step in the right direction,

certainly as biology dictates that men cannot take on these roles. In addition to the energy demands and hormonal fluctuations, a woman working in a life science lab is by law excluded from performing many experiments during pregnancy in order to protect the foetus, meaning that she potentially falls behind her colleagues even before birth. Thus, parental leave related to the biological role of pregnancy and birth is absolutely necessary. On the other hand, postnatal care *can* be shared, but as pointed out during our interviews of professors, current measures don’t seem to adequately take fathers into consideration. As an example, mothers are given a greater extension (18 months per child, plus legally documented maternal leave beyond this time) in eligibility than fathers are (duration of paternity leave only) for European Research Grants, the largest funding agency in Europe, a pattern that is similarly followed by other European funding agencies.

Notably, government-supported parental leave varies widely among EU countries, meaning that men from countries with little parental leave might not have the ability to take it at all. The important question stemming from such policies is whether they might decrease the incentive or ability for men to take parental leave, especially in couples formed by academics where both careers depend on grant eligibility. If so, the childcare burden can end up still falling predominantly on women. Furthermore, proof of parental leave for fathers is tied to each country’s policy, so that any additional time taken may not be considered for grant eligibility and, potentially, on CVs in general. From this it seems clear that, to achieve gender equality, men have to be put in the equation because only the concerted action of men and women can lead to equality. In fact, for women to be granted equal career opportunities in STEM, men have to be motivated and (legally) able to share the unpaid parental duties traditionally performed by women, at least when they are biologically capable of doing so. Furthermore, a revolution of ‘maternity leave’ towards a clear and separate recognition of ‘pregnancy’ and ‘childcare leave’ can ensure fair treatment of child bearers and carers, irrespective of their gender (with positive implications for families not composed of a male-and-female couple) and relieve mothers from their traditionally imposed role as primary caregivers.

The fair distribution of parental care duties is a particularly important goal towards equality because childcare is one of the activities contributing to so-called ‘unpaid work’; this includes the obvious household duties and childcare, but also increasingly includes elderly care, all of which to this day still take a higher toll on women than men, even in high-income, developed countries ([https://www.oecd.org/dev/development-gender/Unpaid\\_care\\_work.pdf](https://www.oecd.org/dev/development-gender/Unpaid_care_work.pdf)). This inequity can negatively impact women’s output in their paid jobs, as, for example, became particularly evident during the first COVID-19 lockdown, when women submitted fewer papers to preprint servers and registered fewer new projects compared with men (Viglione, 2020). During one of the ‘STEM fatale Women’s Round Table’ discussions at ISTA, a mother/scientist said that without her supportive and equitable relationship, she would never have been able to take on her very demanding high-level job that requires a lot of travel. We think men and women can thus help the situation by making sure that both partners know what’s going on regarding domestic duties, with women asking their partners to do more when and if necessary.

#### **Outlook**

We would like to conclude this essay with an important piece of advice for young women who want to pursue a career in STEM, coming from our interviewed professors: feel free to follow your goals, do NOT care about what others (peers, as well as society at

large) might think, do NOT compromise your goals; STEM is NOT too hard for girls and even if few girls are in STEM at the moment, so what? Being unique is a value!

At the end of the day, although representation is tremendously important, young girls should not get discouraged – not having many role models to follow also means they now have the chance of becoming the next!

#### Acknowledgements

The authors want to thank Professors Carrie Bernecky, Tom Henzinger, Martin Loose and Gaia Novarino for accepting to be interviewed, thus giving significant contribution to the discussion that lead to this article.

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