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# Anecdotes and guidance notes: surviving and thriving as a woman in science

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## Abstract

Women have overtaken men in academic engagement and achievement at virtually all levels of secondary and tertiary education. However, despite numerous initiatives over several decades, women currently comprise only a fraction (13%–28%, depending on the discipline) of those following engineering, physics and materials-science careers, particularly at the senior level. Consequently, role models for early-career women scientists are sorely lacking. Aware of these and other obstacles for women in science and having engaged with many who have faced such challenges, a group of early- to senior-career women (including four of the current authors) were keen to improve the situation ‘on the ground’ for their peers. Accordingly, meetings were organised in the UK in 2023 (Femincam, focusing on electronic materials) and in 2025 (Women in Science Promoting Energy Research, focusing on energy materials). In total, there were around 200 participants, mainly PhD and postdoctoral researchers, of whom 5%–10% were male. We both heard about the exciting science of early-career women via talks and poster presentations and learned of the personal experiences that accompanied their creative and scientific endeavours. We hoped to find out whether career experiences could be improved and, if so, how this might be done. A wide variety of challenges were articulated, and potential solutions were discussed at both meetings. The challenges reflected existing published data, but new perspectives also emerged. In this paper, we present guidance notes, based on recommendations of and conversations with the participants at the meeting. We hope that all who are concerned with keeping women researchers in science careers find these reflections helpful and are moved to act upon them.

## 1. Introduction and motivation

This article does not repeat statistics or information about known obstacles for women in science; many excellent papers already address these topics [1, 2]. Instead, our aims are to listen to personal accounts of early-career women researchers, and to consider ways to help them thrive. Before proceeding further, we emphasise that we do not seek to imply negative views of any group; it is certainly true that people of any gender can be supportive or unsupportive, and experiences vary widely across individuals. The challenges discussed here arise from structural and cultural factors. Indeed, many participants described outstanding support from their men colleagues, and senior women also acknowledged supportive men throughout their careers. Instead, reflecting the purpose of the two meetings, this article focuses on issues that women face in the material-science and energy fields, particularly in academic environments. It is also noted that industry poses similar challenges.

The article reflects the authors’ own experiences; indeed, it would be disingenuous to comment on experiences not lived. We strongly believe that all minorities deserve equal recognition, respect, and support. Some groups face even greater challenges by being at the intersection of different minorities and

are further marginalised [3]. Without the full involvement of minorities, societies fail to make the most of available talent. It is well documented [4] that bringing diverse participants together enables better performance outcomes. We remain committed to advocating for all minority groups; importantly, progress for one group can often create or improve mechanisms of change that benefit other groups (e.g. paid EDI roles and transparency in decision-making).

Initial motivation for the two meetings came from the experiences of the lead author of this paper, Judith Driscoll (JD). Having had almost no formal mentoring and little informal mentoring in her career, she realised that subsequent generations may be facing a similar challenge. Through conversations held while acting as an informal mentor for over 15 early-career women in many institutions across the world, she became acutely aware that the problems that she had faced still persisted. Difficulties related by her mentees, all of which resonated with JD's long experience, included the following.

- Women were often not listened to by higher (or even lower) ranking researchers.
- Women were accused of being emotional, aggressive or pushy (usually when they were assertive after not being listened to).
- They were not made aware of influential committee or leadership roles that were open to them.
- They were told they were 'not ready' to be promoted, when it was clear that they had a good chance.
- They were not properly celebrated after achieving prizes or awards.
- They were expected to take on housekeeping duties in the workplace (without proper reward).

The mentees also noted that there was often no one in the workplace to whom they could turn. Moreover, when they did manage to voice their concerns to someone in authority, it frequently backfired on them; they were 'black-listed', labelled troublemakers, and, in some circumstances, role-reversal was employed to portray the victim as the aggressor. In short, the mentees conveyed the belief that women researchers often feel very lonely and discriminated against in the workplace. FR, who has spent most of her career in industry, observed similar challenges in retaining women and enabling them to thrive in their materials careers, whether it be R&D, product and process development or manufacturing.

Overall, JD deduced that women scientists would benefit greatly from talking to and learning from each other. Gathering early-career women researchers to initiate and promote such exchanges was the foundational idea for the two meetings.

## 2. The two meetings of early career women: what we learned

To find out about the present challenges being faced by women in science, two meetings were held, spearheaded by JD:

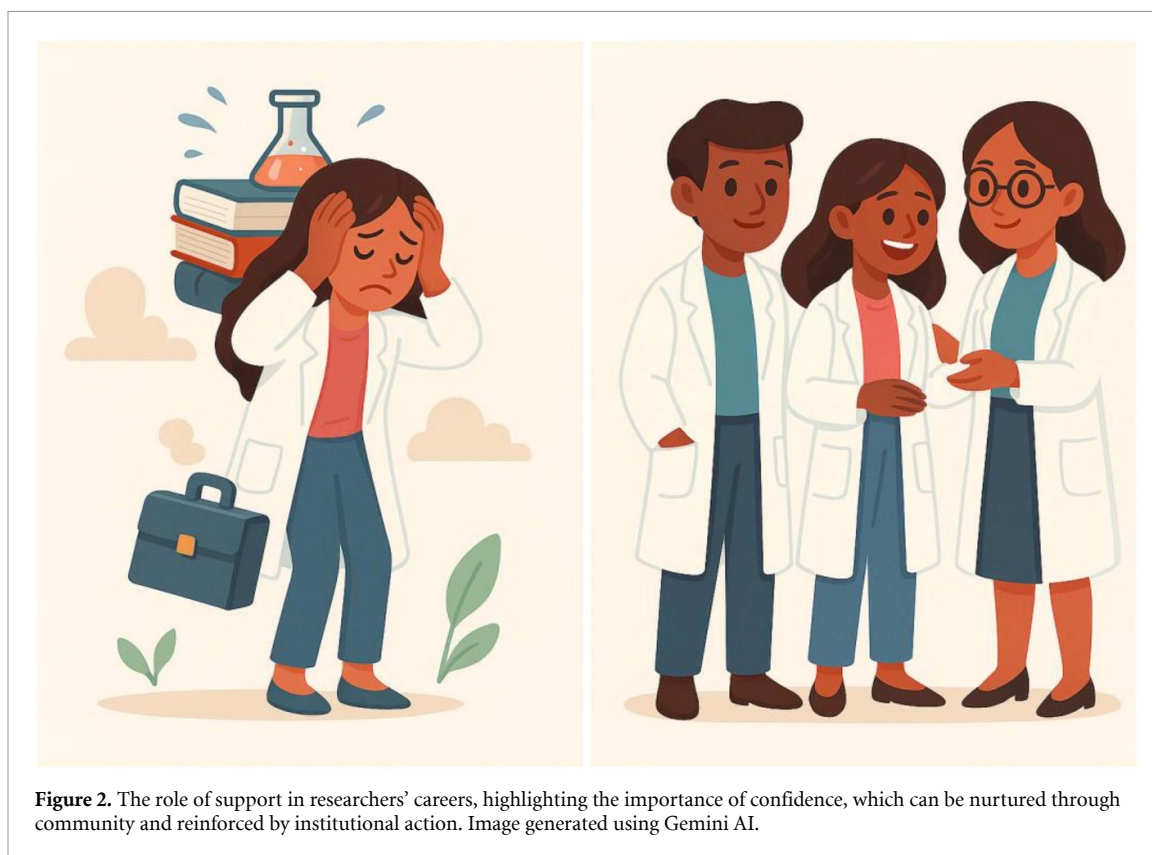
- Femincam, 27<sup>th</sup> of September 2023; and
- Women in Science Promoting Energy Research (WISPER), 21<sup>st</sup> of May 2025.

The two meetings brought together around 200 early-career women (due to space limitations, rather than lack of interest in the topic). A central aim was to celebrate the scientific work and achievements of women researchers. Speakers were invited from the broad fields of materials for electronics and energy, where many women are making significant contributions today. A few invitees outside these fields, with long experience in gender-related issues, offered broader perspectives. Early-career researchers also contributed over 40 posters. After the research presentations, open forums provided opportunities to share and discuss experiences. We gratefully acknowledge the outstanding contributors who made these events possible in the Acknowledgements.

At the Femincam meeting, high-quality research talks were delivered by outstanding early-career women researchers, with each presentation followed by a 10-minute reflection on career challenges. Many women had overwhelmingly positive experiences and were optimistic about their future careers, but others had negative stories. At WISPER, there was a slightly different focus, with one session comprising talks about career challenges and what could be done to solve them. Again, very high-quality research talks were delivered.

At both meetings, there was overwhelmingly positive feedback from participants, who said that they were inspired and felt a sense of solidarity and community, and that the informal conversations that they had were uplifting. Many were relieved to find that they were not alone and expressed a desire for more meetings of the sort. Notably, the events also proved opportunities for interesting research connections.





**Figure 2.** The role of support in researchers' careers, highlighting the importance of confidence, which can be nurtured through community and reinforced by institutional action. Image generated using Gemini AI.

**Table A.** Anecdotes (common challenges articulated by participants across the meetings).

Challenge	Details
Gender bias and stereotype	<p>Different rules appear to apply to women. This bias can be unconscious and often affects other genders, making it especially dangerous and undermining to scientific contributions. Some common themes were found to resonate amongst attendees:</p> <ul style="list-style-type: none"> <li>• Women cannot underperform or make mistakes (even minor). For women to be considered professionally equal to men, they in fact must demonstrate exceptional qualities. This double standard is detrimental to the creative scientific process. It can discourage risk-taking and nurturing one's own creative research, whilst instead pushing one to imitate established models of success.</li> <li>• Another widely experienced double standard is the expectation that women are carers and helpers; not leaders.</li> <li>• Women's ideas are often overlooked, in part because confidence, persuasion, and negotiation skills are not equally nurtured or encouraged among women.</li> <li>• Leading outreach and diversity initiatives (e.g. group activities) is expected of women. At the same time, despite being required by institutions, these activities are then looked down upon and seen as less serious than research.</li> </ul>
Career trajectories	<p>Many attendants agreed that women often do not have linear careers in the same way as men do. Different paths enable new skills and often resilience to be learned. Caring responsibilities are not confined to women, but often they are the ones who work part-time or flexibly to accommodate caring responsibilities. This, of course, does not mean a lack of in their career progression, but can hurt them in promotion settings.</p>
Misogyny and microaggression	<p>90% of the audience reported experiencing misogyny; 1/3 reported receiving online bullying or sexual harassment when advertising themselves or their work via social media. Microaggressions come in many forms and sometimes done in private.</p>
Mental health	<p>Stress is prevalent. This agrees with high levels reported in PhD researchers compared to the general population. The stress appears to be higher in women researchers [7]. In science-based subjects where women are distinct minorities, they often feel isolated and fear backlash if this is raised with their line manager.</p>

(Continued.)

Table A. (Continued.)

Challenge	Details
Representation	Across speakers and attendees, it was noted that scientific culture fails to consistently recognise women as a 'normal' part of science. Early career researchers mentioned frequently being perceived in a lower role (i.e. PhD student instead of postdoc). When these truths fail to be recognised or celebrated, it can entrench biases and stereotypes in the workplace. The impact of representation cannot be understated.
Support and mentoring	Diversity is promoted on paper but not delivered (via support and mentoring) in practice. There is a lack of local or accessible support representatives. If these roles exist within institutions, their precise scope is often unclear to women researchers. As a result, the support and mentor role falls on senior women, who cannot change the system alone, and may be already overloaded by other responsibilities.
Funding disparities	Women participants felt they had a harder time getting funding. It is well known that women receive far fewer large grants [8]. This is a 'chicken and egg' situation, creating a reinforcing cycle that reduces competitiveness for future grants. Funding agencies are not as transparent as they could be on success rates by gender, preventing the identification of potential discrimination and limiting the ability to act, including positive bias measures.
Hidden barriers	Women and minorities can face challenges navigating unspoken rules in professional and academic settings, such as the hidden curriculum. Differences in communication styles and implicit expectations can lead to misunderstandings, exclusion from networks, and the undervaluation of contributions.
Promotions and Salary	There is a sense that women need to achieve more to be considered for promotion. Promotion criteria are frequently vague and are applied with gender bias. Participants reported that they were often not recognised as research leaders, excluded from research committees, and subsequently criticised for lacking the institutional contributions needed for promotion. Gender pay gaps are not openly reported, making it hard for women to detect salary discrepancies; the issue is then not properly resolved even when identified. Women who work part-time or flexibly (for example due to unequal family responsibilities) face barriers to promotion, with their contributions undervalued compared to those working longer hours.

Table B. 'Survive and thrive' guidance notes- what can and should be done better.

Positive actions	Details
<i>Personal tools</i>	
Boosting and Standing up for Yourself	<p>Succeeding in challenging, competitive environments requires self-trust, resilience, clear boundaries, and strength to navigate setbacks without losing sight of your long-term goals. All are eminently possible!</p> <ul style="list-style-type: none"> <li>• Believe in yourself and remember why you earned your position. Imposter syndrome is common; do not let it consume you. As women, we might face more challenges, so determination and passion are critical. Follow this passion. Research and scientific acknowledgement take time. Progress may be slow, but persistence pays off. Remind yourself of the great benefits of the job (flexibility, creativity, a chance to make a positive impact).</li> <li>• Do not carry the world on your shoulders. Know that you can drop the ball sometimes. Do not overwork yourself. Take regular breaks, make time to relax and look after yourself. Be assertive but polite when saying 'no,' and explain your reasons clearly. Prioritise your wellbeing.</li> <li>• Criticism will come, sometimes passive-aggressive or from those who feel threatened, regardless of gender and seniority. Do your best to remember the reasons for being where you are, stay on your course and keep going. Speak up for yourself. Document inappropriate behaviour, keep records and follow up if ignored. If you are not being heard or are facing discrimination, escalate concerns to senior personnel.</li> </ul>

(Continued.)

Table B. (Continued.)

Positive actions	Details
Career trajectory	Have confidence in yourself: put yourself forward for promotions or new roles, even when you do not 'tick' all of the boxes. If you are navigating a non-linear career trajectory, know you are not alone in this experience and be sure that you can achieve anything. The workforce is adjusting to flexible work times, academia and industry should focus on enabling this. Be open and express your requirements: knowing your priorities is a skill that we all work on. All will work out in the end, even in a better way.
Personal and professional networks	If or when you lack the confidence to boost yourself sufficiently, seek support. <ul style="list-style-type: none"> <li>• Build a personal support network of people who understand your challenges.</li> <li>• Build a professional network to gain visibility in your field: attend conferences, meet people face-to-face (where possible), and follow up. Seek out collaborations.</li> <li>• Do not wait for others to open doors. Remember, advancement is more about what you do as an individual than what your boss and co-workers do for you.</li> </ul>
<i>Institutional changes</i>	
Representation and diverse role models	Success in all its forms should be celebrated meaningfully, and ideally with financial rewards. Institutions play an important role in recognising diverse role models, across career stages, and backgrounds. There can be no neutral ground: when institutions choose not to participate, they actively set back the cause. They can do so through annual events like WISPER, for example.
Code of behaviour	Misconduct is common, and women are often the targets. While institutions have codes of behaviour, they might be poorly enforced and ineffective, allowing bad actors to persist. This can happen in various settings, including conferences for example. Conflict resolution can help if carefully mediated, but bias can worsen the situation for minorities. A university that invests in empowered leadership to support codes of behaviour can inspire meaningful culture changes. Leaders must take responsibility, model good behaviour, and receive manager-level compulsory training to handle these issues effectively.
Fair structures	Workloads must be distributed transparently, with agreed weightings for different tasks so that responsibilities are clear and fair. Research should be gold standard for professors at universities and salaries should primarily reflect research quality and output. This needs to be independent of age or gender.
Equality measures	Institutions need independent mechanisms for addressing complaints: personnel departments are often conflicted, so impartial ombuds offices should be standard in institutions and well-resourced. They must have real authority, have proper training in inequality trends, and receive salaries that match the complexity of their work. Diversity issues should be addressed openly, not hidden in paperwork or closed meetings.
Mentoring	Mentorship is critical for professional growth but often takes shape in unpaid work, particularly from senior women. Institutions should provide (or incentivise) formal, well-supported mentoring structures to provide early-career staff with guidance, networks, and confidence, while ensuring that the burden does not fall unfairly on underrepresented groups.
Transparency of committees and funding agencies	Committee membership and decision-making should be transparent, with clear terms and recorded reasons. Women must be included and their input valued. Research councils should publish gender-based funding statistics, encourage resubmissions, and address any bias in referee comments.
Salary openness	All salaries at state institutions should be reported openly to make gender pay gaps transparent. Decisions should also be properly documented.

(Continued.)

Table B. (Continued.)

Positive actions	Details
Funding assistance	Funding is hard to come by. Research proposal writing is a real skill that takes years to perfect. Often junior researchers are not helped; they should be. Women may face challenges in being believed in what they are proposing. The funding process is not a level playing field under many aspects, for example the hidden curriculum plays a role in determining the success whilst not rewarding pure scientific aspects. Institutions would gain massively by funding grant writing assistance.
Support for parental leave	Research groups need funded cover during parental leave. Without it, research is seen as less important. The absence of leadership can create stress, safety risks, and mental health issues for the PI and teams. Administrative jobs do have parental leave cover; similar cover should be provided for research jobs.
<i>Inclusive communities</i>	
Healthy, diverse research communities	Much of the meetings' focus was on academics and career researchers. However, present-day science tackles large problems and is a team or even community effort. These 'teams' or 'communities' will include people with scientific backgrounds who have become research enablers, such as instrument scientists, technologists, research-support staff, or technicians. To build a successful and sympathetic science community, the same principles of diversity should apply to such careers. In instances where there had been an effort to recruit (for example) women technicians with varying life experiences, there had been a palpable improvement in team or departmental atmosphere, morale, communication and productivity.
Communication	In fields as diverse as philosophy, social sciences, medicine and theology, differences in the verbal communication methods practised by women and men (and their consequences) are acknowledged and studied [9][10,11]. Little attention seems to have been paid to this issue in subjects such as physics and engineering, where historical patriarchal models persist. One such tendency is to hold infrequent, large and long meetings, in which a "leader" issues instructions to the group or department, with little opportunity for feedback, discussion or dissent. In a diverse community, it is better practice to have frequent, small and short meetings. New ideas or research directions can be gradually socialised and discussed, ensuring that all feel fully involved and invested. This acknowledges that science is a team effort where every member contributes.
Attrition	Retention of early-career scientists and engineers is a serious and worsening problem [12], especially amongst women. Intent to end a career path is often concealed (few will admit that they are considering leaving) until it is too late. However, perhaps science can learn from other disciplines. For instance, research is being applied to medical careers concerning the use of annual questionnaires that are accurate predictors of risk of leaving, giving supervisors and mentors time to act before it is too late. Novel discussion topics in performance appraisal exercises are also studied as a means of detecting early career obstructions and overcoming them (refocusing, change of mentor, advice on funding applications, etc.) [13]

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