Submission to the Australian Academy of Science's Women in STEM Decadal Plan by the EMCR Forum of the Australian Academy of Science

Executive Summary

Early- and mid-career researchers were surveyed to canvass their experiences, insight and perspectives on the factors that influence the participation and career progression of Women in STEM sectors. Major barriers and challenges that emerged from responses were:

- Cultural issues, including unconscious bias, and a lack of a diverse and inclusive culture at the societal and institutional level, particularly amongst senior decision makers.
- Structural barriers, such as insecure short term contracts and career-pathway-promotion stages often coinciding with career breaks for maternity leave,
- Exclusion, including a lack of encouragement for promotion, less opportunities for honorary positions, a lack of recognition for performance, discrimination, sexism, bullying and harassment.

Respondents identified initiatives and strategies that currently exist and suggested those that could be implemented. Such strategies include:

- Improved employment and promotion opportunities and conditions through gender quotas, women-only positions, and assessment of performance relative to opportunity.
- Countering cultural issues and biases through mandatory unconscious bias training for all staff (but especially those in leadership positions), leadership and development programs for women, increased visibility and diversity of women role models, greater support for victims reporting sexism, harassment and/or assault.
- Increased support and flexible work arrangements for parents, including schemes to maintain output performance during maternity leave and to boost productivity when returning to work, expansion and promotion of paternity leave entitlements, family-friendly workplace culture, and childcare support.
- Expanding measures for career recognition and progression beyond traditional outputs to include other markers of merit such as mentorship and supervision, teaching, committee service, advocacy, engagement and outreach.

In addition to these strategies, we recommend that an intersectional approach is used when developing the Women in STEM Decadal Plan to ensure that the issues affecting the retaining and career progression of women in STEM sectors, including women from minority groups, are adequately addressed and lead to more inclusive, equitable and diverse STEM sectors.

About the Early- and Mid-Career Researcher Forum of the Australian Academy of Science

The Australian Academy of Science Early- and Mid-Career Researcher Forum (The EMCR Forum) is the national voice of Australia's emerging scientists, representing researchers who are up to 15 years post-PhD (or other research higher degree), irrespective of their professional appointment. Our membership is comprised of over 4,100 individuals employed in science, technology, engineering and mathematics (STEM) research positions in academia, industry and government. The EMCR Forum engages with early- and mid-career researchers (EMCRs) from around Australia and advises the Australian Academy of Science on issues relevant to EMCRs to help inform policy recommendations to government and to support EMCR professional development and networking activities. The EMCR Forum liaises with other national organisations to positively contribute to both Australia's scientific research and the future careers of emerging research experts. The Forum provides a vital connection between Australia's most eminent scientists and future scientific leaders.

Introduction

Early- and mid-career researchers (EMCRs) are disproportionately affected by biases that currently exist in STEM sectors. A variety of factors often coincide during this period of a researcher's career, including career instability due to short term contracts, intense competition for grant funding, a lack of female role models and mentors in senior positions, and the choice to start a family. These factors collectively result in large numbers of women EMCRs leaving research and in some cases the entire STEM sector.

The biases that currently exist are due to systemic issues within the STEM sector and result in barriers that make it difficult for many women to fully participate in STEM careers. Measures and initiatives to counteract these systemic issues will likely not only ensure the full participation of women and gender diverse individuals in the STEM sector, but also benefit men in the sector, by creating a more diverse workforce enabling greater flexibility in work, greater work-life balance, and greater acceptance of taking on caring responsibilities.

To prepare this submission, EMCR Forum members were surveyed to canvass their experiences, insight and perspective on the barriers to and opportunities for achieving gender equity in STEM. We sought responses to four questions that target the aspects of the discussion paper and consultation questions of most relevance to EMCRs. These questions were:
- *What do you think are the key challenges and barriers to career progression for women in your field?*
- *What type of initiatives have you experienced, hear of, or thought of that have been/could be successful in retaining women and encouraging their career progression in your field?*
- *What measures do you think should be used to determine eligibility for career recognition and progression?*
- *Is there anything else you have not yet covered in your response which could improve gender equity in STEM?*

A total of 140 responses were received. Respondents identified themselves as working in various fields of research (over 50 uniquely identified), within academia (80%), government (13.5%), non-for-profit (4.3%), and industry (1.4%). Of the respondents, 90% identified as female, 93% stated that they have a PhD (median year awarded 2012), and 4% were PhD students.

Below, we present the major themes that emerged from the responses. We begin by describing the barriers and challenges to career progression for women in STEM, followed by some of the strategies and initiatives that respondents suggest may tackle these issues and improve retention of women in STEM and a more equitable career progression.

The Barriers and Challenges to Career Progression for Women in STEM

Cultural issues impacting women in STEM

The key challenge identified by EMCR Forum members is the lack of a diverse and inclusive culture at the societal and institutional level, particularly amongst senior leaders in decision-making positions. Underlying this are unconscious biases within the academic culture that has led to the dominance of stereotypes when it comes to funding, awards and promotions, which is a barrier for the progression of women in STEM. For example, it was identified that carer responsibilities and the need for flexible work arrangements may be seen as a lack of commitment by some senior leaders. Additionally, paternity leave is not as widely encouraged as maternity leave, and this leads to reinforcement of biased social expectations of women as the primary caregivers.

> *"If the pipeline is leaky, I don't see how pushing more material in will help… Structural change is hard, especially for the gatekeepers and those in positions of privilege, but systemic interference is needed for eventual equality."*
>
> *Quote from EMCR Forum Survey*

Respondents also pointed out that assertive women are often perceived negatively while the same quality is seen as leadership in men. Younger women often feel they are not being taken seriously or included in a research culture

compared to their male colleagues. Furthermore, there is a lack of male leadership, role models, champions and enablers who can step up to drive a cultural, social and workplace change to support career progression for women.

Structural barriers for women in STEM

EMCRs identified a number of key structural barriers to career progression for women in early and mid-career stages. Intense competition for research funding has led to short-term contracts and long-term job insecurity for EMCRs. Additionally, transition from early- to mid-career stage into a group leader position often coincides with child-bearing years. Our members reported that women do not receive enough support to maintain their productivity during and after a career break (for maternity leave, or to care for children), which leads to difficulty in career progression.

> *"Postdocs who have children are particularly vulnerable, since the drop in research output that accompanies parental leave impacts their metrics at the very time they can least afford it."*
>
> *Quote from EMCR Forum Survey*

During these years women often work part-time, but are expected to maintain the same level of research productivity as those who have not had any career disruptions and who are working full-time. Many STEM workplaces do not offer flexible working solutions and women find themselves juggling a lead family-carer role along with long working hours, with detrimental impacts on their mental and physical wellbeing. Furthermore, women with caring responsibilities have limited opportunities to network and build collaborations due to the need to travel to attend most conferences, particularly where such events are a mandatory requirement for professional development.

It is noteworthy that some respondents explicitly highlighted the importance of not becoming too exclusively focused on women with child caring responsibilities, as many gender biases that impact women in STEM equally affect women without children.

> *"There is a large focus on child caring responsibilities when discussing career progress but studies have shown that women without children also face the same career limitations."*
>
> *Quote from EMCR Forum Survey*

The choice of words used for job applications, promotions and award nominations still often reinforce gendered stereotypes and do not reflect an inclusive culture. Women also take up more lower-level administrative tasks, teaching, supervision, mentoring, pastoral care, outreach and organisational duties, which are not recognised as merits in funding applications nor included or weighted as highly as performance indicators in promotion applications.

Exclusion of women in STEM

Women often experience discrimination, exclusion, and a lack of encouragement to apply for promotions. Despite making significant contributions, women are often excluded as chief investigators on grants and as reviewers/editors/authors on papers. Women are also less likely to receive speaking invitations, to be conference chairs, to have significant leadership roles on committees/board/panels, to receive award nominations, and to have leadership and professional development opportunities.

Other examples of barriers that result in the exclusion of women from STEM sectors include women with disability/chronic illness, those with complex carer responsibilities (e.g. for a child with disability or an elderly parents), and those who identify as part of a minority group (e.g. race, socioeconomic status and background, and LGBTQIA+). These barriers further ostracise and prevent the full participation of women in STEM, as one respondent who identified as a single mother of a school-age child with a disability wrote:

> *"No amount of money can make interstate/international conference attendance more accessible."*

Alarmingly, reports of sexism, harassment and/or assault were issues that were raised by numerous respondents. These issues are quite complex and power structured but often lead to lack of confidence, self-doubt and imposter syndrome, which hinder career progression and can have major impact on health and wellbeing.

> *"Harassment, bullying, and sexism are forcing women to leave science for their own safety and wellbeing."*
>
> *Quote from EMCR Forum Survey*

Strategies and Initiatives to Retain and Promote Women in STEM Careers

Creating and improving employment and career opportunities for women in STEM

Many respondents argued for the introduction of **quotas** to promote gender balance. Policy suggestions varied on a spectrum from fairly conservative interventions - e.g. ensuring conferences provide in-principle agreement to strive for gender balance amongst speakers, to more extreme measures - e.g. legally mandating gender balance amongst academic staff at all levels across all departments.

The creation of **women-only positions** was put forward, targeted at senior leadership/group leader roles, which tend to be dominated by men. Proper assessment of achievement relative to opportunity was seen as an essential step to supporting the progression of women in STEM.

> *"Advertise women-only academic roles in universities until gender balance is met by academic level, per department - even if it takes years."*
>
> *Quote from EMCR Forum Survey*

There was a call for greater **transparency** about gender wage gaps and implementation of strategies to resolve the discrepancy through targeted pay rises and schemes to facilitate promotion for women e.g. schemes targeted to specifically nominate women for promotion.

Poor **job security** was a another issue that EMCR Forum members suggested could be improved by providing more continuing positions, longer fellowships, and opportunities for continuing positions earlier in a researcher's career.

Countering cultural issues and biases against women in STEM

The theme of unconscious bias was frequently repeated, and it was suggested that mandatory **unconscious bias training**, especially for those in senior leadership positions (who are often the decision makers in recruitment and promotion), could be one solution to address unconscious bias in the workplace.

Furthermore, programs focused on **developing leadership skills** can assist in increasing the numbers of women in leadership positions. Additional **development programs on strategic planning, writing job and promotion applications and successful interviewing techniques** were also suggested as potential strategies to address the "leaky pipeline" of women in STEM leaving their disciplines.

> *"Providing free and gender-specific leadership and mentoring programs for female postgraduates in STEM fields will lay the foundation to see more women leaders in senior levels at universities and industries in the future."*
>
> *Quote from EMCR Forum Survey*

Respondents frequently argued for **increasing the visibility of successful women in STEM** and introducing programs that highlight women in STEM as role models to encourage more women to remain in the STEM disciplines. Some members pointed out that this need not necessarily focus only on women in senior positions, but could also highlight

younger or more junior women working in STEM disciplines so that women can identify STEM role models at each career stage.

Having a number of **role models at different career stages** can also be incorporated into mentoring programs that are specifically tailored to women in STEM. Mentoring programs and increasing the numbers of networking opportunities which were specifically on women were a consistent theme in responses.

There was a general call for greater support for women who reported harassment and bullying, that there are **transparent and harsher consequences** for the instigators. This is particularly the case for women working in disciplines which require fieldwork, which often involves an environment in which women can be particularly at risk.

> *"Remote field camps create a uniquely high pressured and potentially dangerous setting for junior researchers."*
>
> *Quote from EMCR Forum Survey*

Improving support and flexibility for parents in STEM

EMCRs called for **greater support and increased flexibility for maternity leave, paternity leave, and carer's leave** across STEM workplaces and sectors. This will have a beneficial flow-on effect by enabling women to return to work after maternity leave or a career break.

> *"WEHI offers a research assistant to mothers returning from leave so that the work continues full-time even if the mother is not able to work full-time."*
>
> *Quote from EMCR Forum Survey*

> *"Macquarie University had a great initiative where the father could take up to 6 months leave. The first month must be taken at time of birth while the remainder could be taken part- or full-time as long as you could show that you'd be the primary carer [...]. It provides a greater incentive for fathers to contribute more to child rearing, allowing their partners to pursue their career and makes it a more 'level' playing field by reducing the expectation that only women take parental leave."*
>
> *Quote from EMCR Forum Survey*

Many respondents endorsed **research coverage schemes**, which provide finances for employing a Research Assistant to continue work and maintain productivity during periods of leave. **Kickstart grants** for women returning to work after a career break were also recognised as a way to boost productivity in numerous ways e.g. to host a meeting to develop collaborations, build team numbers through hiring an assistant or technician, enable travel to a conference by providing child care support.

The availability of such schemes varies from institution to institution, and we recommend similar initiatives are established universally across Australian STEM workplaces and sectors. Otherwise, an Australian-wide scheme similar to that in the UK could be initiated:

> *"The Dorothy Hodgkin Fellowships in the UK, [are] designed to help researchers (regardless of gender, but it tends to be female-dominated) [return] back to work after career interruptions. Often this is for child-rearing, but doesn't have to be. It's frankly scandalous that Australia doesn't have anything like this."*
>
> *Quote from EMCR Forum Survey*

Flexible work arrangements for women returning to work also differs considerably between workplaces. Flexible working hours, job-sharing, and part-time work particularly for postdoctoral researchers were emphasised as vital policies to support and promote a women's successful return to work. The recognition of reduced hours at the workplace also calls for an adjustment of Key Point Indicators (KPIs). Practices such as reduced teaching/administration loads when returning to work may also allow for a focus on research output.

> *"CSIRO was accommodating of flexible work arrangement and allowed me a staggered return to full-time work after maternity leave. 3-days/week for 3 months; 4-days/week for 3 months; full-time at 6 months. This allowed time for me, my son and my family to readjust to the new routine."*
>
> *Quote from EMCR Forum Survey*

EMCR Forum members also recognised the benefits of a **workplace culture that promotes family friendly practices**. Examples included organisation-wide policies to limit expectations for out-of-hours work, and clarify appropriate times for meetings (e.g. 9 am -3 pm) and sending emails (e.g. 8 am - 5 pm).

The availability and affordability of childcare, after-school care, and holiday programs is an area currently lacking adequate support. While this is a universal area beyond the STEM sector, action here will have significant benefits to retain women in STEM careers. **Childcare subsidies and more flexible leave arrangement** could assist in this regard. **Grants to support women in STEM with caring responsibilities** to attend scientific workshops and conferences were highlighted by our respondents. Initiatives include family friendly conferences, remote delivery of conferences, on-site parent rooms or creche/nannies, and financial support so a parent/carer can join at conference, or to cover expenses while the parent/carer is absent.

> *"Personally, travel funding for dependent children has been a game-changer for me, and has allowed me to maintain visibility while caring for a small child."*
>
> *Quote from EMCR Forum Survey*

Measuring excellence and determining eligibility for career recognition and progression, assessing funding

Traditional outputs of research excellence (i.e. publications, research grant funding, patents, conference presentations, awards, collaborations etc) are acknowledged as important and significant measures of performance, but EMCR Forum members consistently reported that **other markers of merit - namely teaching, mentorship, the development of students and junior researchers, service to their institution via committees, advocacy, engagement and outreach - should be recognised, valued and rewarded**, as such work *"held the institution together"* and builds cohesive, productive and flourishing communities, including creating inclusive and diverse working environments. Multiple respondents called for the removal of student evaluations for use in the evaluation of teaching excellence in promotion processes, as such evaluations are subject to notable bias that directly penalises female educators.

> *"Diversity in the* [sic] *key for a functioning workplace, but we do little to reward the multitude of roles that encourage diversity."*
>
> *Quote from EMCR Forum Survey*

There were frequent calls for the evaluation of output "relative to opportunity" to encompass the impact of interruptions that extend beyond a fixed period of absence - e.g. the disruption associated with the early years of parenting, which has impact on research productivity beyond the initial period of parental leave. One suggestion was for funding councils to initiate a standard career-disruption allowance for a period of parental leave e.g. 3 years career disruption for new parents. External roles, responsibilities and circumstances other than parenting impact on career progression, and respondents also called for an expansion of what constituted a career interruption to better encompass the impact of personal illness, other caring responsibilities, and the impact of socioeconomic factors. Such interventions may better level the playing field in how output relative to opportunity is assessed and compared.

Opportunities to address this include the introduction of pre-determined promotion review schedules, in which staff are assessed at set time points, rather than the more common *ad hoc* structures that rely on people to be championed by others or to self-nominate. Evaluation of merit must be flexible, to better assess and reward non-traditional career pathways, demonstration of leadership, engagement and impact.

It was argued that unconscious (and potentially conscious) bias could be avoided in some circumstance by blind reviewing of applications for jobs, funding proposals and promotion applications. It was also suggested that assessment for funding should place greater emphasis on the merits of the proposed project, rather than track record, which particularly disadvantages women who have had career interruptions.

> *"I think grant schemes that focus more on the science and project without regard for track record are very helpful for scientists with families."*
>
> *Quote from EMCR Forum Survey*

An Intersectional Approach

Successfully retaining women and supporting their career progression within the STEM sectors will require changes in multiple facets of the current system. The barriers and challenges we have presented should be addressed when developing the Women in STEM Decadal Plan and we strongly encourage the Australian Academy of Science and the Australian Academy of Technology and Engineering to take an intersectional approach when doing so.

The cost of not taking an intersectional approach in developing the Women in STEM Decadal Plan is that the issues impacting underrepresented women will not be addressed. Non-inclusive STEM work environments will see women continue to leave STEM careers and negatively impact the diversity and productivity of STEM sectors.

Developing the Women in STEM Decadal Plan with an intersectional framework will ensure that issues impacting on women in STEM who are also members of other minority groups - e.g. Indigenous women - are addressed within the roadmap. This should involve consultation with a wide range of minority advocates as the process proceeds, creating environments where underrepresented women feel safe and supported to speak up about the issues they face. Furthermore, mechanisms should be put in place so that the broader community is not relying on those who are affected to do all the work. Minority groups need to be represented on steering committees and working groups - and they should be appropriately compensated for their time. We would be happy to assist with this from an EMCR Forum perspective.

By extension, we encourage the Government to strive for transformative change with its Women in STEM National Strategy (which will be informed by the Decadal Plan) and recognise that broad cultural changes are required to facilitate greater participation of women in STEM. If applied judiciously, this could positively impact the inclusiveness of STEM and society more broadly.

This submission was prepared by Dr Adrian T Murdock, Dr Michael Bowen, Dr Gina Ravenscroft, Dr Róisín McMahon, Dr Vanessa Wong, Dr Onisha Patel and Dr Jana Phan on behalf of the EMCR Forum Executive.