International Journal of Gender, Science and Technology
http://genderandset.open.ac.uk

Twenty-First Century Minerva: Are there career impacts for women who receive a "Women in Science" Fellowship?

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ABSTRACT

This exploratory study examined the impact of an international award on women scientists' careers. Participants were a group of elite young women scientists at the start of their careers in a diverse range of disciplines, who had received a L'Oréal Australia: For Women in Science International Fellowship. Open-ended interview questions explored participants' perceptions of their careers following the Fellowship and of their identity as women scientists. Results indicate that the award was vital to the self-confidence and identity of women scientists establishing and consolidating their careers. Other factors, such as having children and workplace culture, had a negative impact on their career progression and confidence in pursuing a science career. Policy implications relating to institutional culture and the need for flexibility regarding child-rearing are discussed, as well as the importance of women-only awards to career progression.

KEYWORDS

women in science; science awards; L'Oréal International Fellowship; science careers.

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INTRODUCTION

Research on the role and contribution of Australian women scientists is sparse. The post-war years saw the foundation of the Australian Academy of Science in 1954 and the latest learned science academic body, the Australian Academy of Technological Science, in 1976. Fifteen women born between 1889 and 1933 were elected fellows of the learned academies in the years that spanned the establishment of these bodies. (http://www.womenaustralia.info/leaders/biogs/WLE0451b.htm)

An Australian government-commissioned report by Bell (2009) examining the state of women in science found that in the post-doctoral years of women scientists' careers there was a high level of attrition. Attrition was also evident to a lesser extent with a small number of senior women and those in leadership roles. Bell (2009) recommended that women scientists need to 'thrive and excel' in their career and not just 'survive'. From a public policy perspective, reducing the attrition of motivated women from post-doctoral programs is vital to sustaining Australia's scientific and technical expertise, developing a domestic talent pool, and diversifying the professional, academic and policy workforce (Williamson & Dunstone, 2012). Fewer women in academic ranks, research and policy leadership positions in science, technology, engineering and medicine (STEM) means fewer models for aspiring girls and women.

Bell (2009) identified programs that assist women in achieving a satisfying scientific career. She highlighted the United States National Science Foundation ADVANCE program, designed to improve the institutional climate for women in science and engineering. In the United Kingdom, the SET Fair report of 2002 resulted in the establishment in 2003 of the Resource Centre for Women in Science, Engineering and Technology (UKRC). More recently, the Early and Mid-Career Researcher Forum of the Australian Academy of Science (Williamson & Dunstone, 2013) published working guidelines for institutions to ensure greater equity in pursuing a successful science career. The guidelines are specifically for use in universities, research institutes and laboratories in Australia. They address such issues as flexible working hours, provision of parenting rooms, active mentoring for women scientists and female representatives on committees, and meetings being held in family-friendly hours.

There are also examples of international collaborations to foster career development. The Athena SWAN Project was linked with Women in University Physics Departments (Whitelegg, 2012, personal communication). The Project involved a Site Visit Scheme running from 2003 to 2005, as well as providing incentives and awards to higher education institutions to improve their record regarding women's access to science and technology courses. The access, participation and progression of women were targeted and these institutions encouraged to monitor their progress. On the basis of this monitoring and

reporting, the Athena SWAN Project would award women-friendly physics departments with accreditation. In 2012, 82 universities and higher education institutions in the United Kingdom were members of the Athena Charter as a result of the Athena SWAN Project.

Philanthropic activities on the part of some international companies have also aimed to support women in science by means of awards and fellowships. Of interest to the current study are the perspectives of young Australian women scientists who have received a L'Oréal International (early-career) Fellowship. There is limited literature on the impact of awards in science generally and, more specifically, on awards to Australian women scientists. The experiences of this pool of women may act as a litmus test for the current state of science for women in Australia.

The L'Oréal Fellowship is designed to help early-career women scientists consolidate their careers and rise to leadership positions in science. The Fellowships were first known as the Helena Rubinstein Awards and were offered to senior women scientists to denote international laureate status. To encourage early-career women scientists, international fellowships were created to assist in career establishment. The L'Oréal Awards have a mainstream public profile because of their international status and the branded identity of the donating company. L'Oréal reports that 1292 women scientists internationally have benefited from the Awards, with 72 Laureates and two Noble Prize winners from their Laureate recipients, highlighting the success of the Fellowship program.

AWARDS, WOMEN, AND SCIENCE

Frey (2007) posits that awards are intrinsic to human nature and inculcated in our society, as recognition and standing out from the crowd are powerful positive influences on individual achievement. Winning awards indicates superior talent both to those inside the science profession and to the public. Control of the supply of the awards is important, as recognition by a prestigious body has greater career value and legitimacy than less prestigious and more common awards: '…awards are external signifiers of professional achievement and impact on the positive development of the recipient's career. This includes further recognition in the form of awards, promotion and tenure' (Frey, 2007).

Reis (2006) states that confidence comes from the experience of early academic success, and from the recognition of respected mentors at critical career points. A public identity as a scientist helps early achievers persist through the demanding training and career establishment periods. Recognition by peers and the greater public also provides motivation and satisfaction (Oschse, 1990). Sonnert and Holton (1996) state that ' …women scientists who have been awarded prestigious post-doctoral fellowships should have accumulated significant advantages up to that point… such a group differed on average from their male cohorts in their estimation of their own self-confidence and ambition' (p. 67). Their research emphasized the structural barriers women scientists face in their career, which resulted in reduced expectations and self-expectations compared to their male counterparts.

Rossiter (1993) coined the term 'The Matilda Effect' after an early nineteenth-century American feminist, Matilda G. Gage, who noted that women did not benefit from their effort and received little, if any, credit for their hard work. Rossiter used the term to denote the issue that research conducted by women scientists tends to be overlooked in favor of research done by men, who are more likely to be singled out as notable. Lincoln et al. (2012) found that, between 2000 and 2010, men were more than eight times more likely to win a young investigator's award than women in the United States. More women scientists were recognized for service or teaching awards, but they were not well represented in the research, discovery and scholarship awards, where career reputations are made.

Wenneras and Wold (1997) researched women applicants for a prestigious fellowship offered by the Swedish Medical Research Council. During the 1990s, women scientists applying for these fellowships were less than half as successful as male applicants. They examined gender bias in the selection process and found that it existed. A female applicant had to be 2.5 times more productive in publications than the average male applicant to receive the same competence rating for selection.

Such research supports the notion that women-only awards that recognize women scientists as scholars and their research as important, have a place in the careers of women scientists. The rationale driving women-only awards is to assist women to overcome established impediments to recognition of their efforts in pursuit of their scientific career. Women-only awards exist to address biases inherent in the culture of science and their creation is deemed an act of balancing these biases. Such awards are also important because obstacles to the success of women scientists and engineers often go unnoticed and unaddressed because they have been embedded in the workplace culture (Steinke, 2013).

An American committee determined that progress in a career depends on evaluation of accomplishments by senior people who make reportedly objective judgments of potential to succeed in a science career (COSEPUP, 2007). Zeldin and Pajares (2000) state that what was most important '…in the enhancement of self-efficacy [for women scientists] was the confidence that significant others expressed in the women's capabilities…' (p. 239). Awards alone do not provide a guarantee of career success, but they are part of a bigger landscape and do bring recognition from other scientists. Other scientists not only assess competitive grant applications but also can affect career development through reputation, collaboration and career progression.

Despite the success of programs intended to enhance the careers of women scientists, such initiatives are disparate. There is relatively little evaluation of the impact of these initiatives in Australia, and relatively few in the discipline of science. The current study investigates the impact of the L'Oréal International early-career Fellowship from the perspective of young Australian women scientists.

METHOD

This study used an exploratory design to investigate the experiences of a group of young women who were recipients of a L'Oréal Australia Fellowship for early-career researchers.

Sample

The Australian promoter of the Fellowship contacted a sample of nine of the 15 Australian recipients from the inaugural year of 2007 up to 2011, via email. That person acted as the study's gatekeeper. Participants were selected because they represented each year of the Fellowship in Australia. Participants were aged between 30 and 40 years and had to have been post-doctoral for at least five years to meet the criteria for the early-career L'Oréal Australia Fellowship. Participants lived and worked primarily in Australia and represented various scientific disciplines, such as medical, physical, biological and environmental sciences.

Procedure

Data was collected between June and August 2012. The women were interviewed in a semi-structured style. One interview was conducted in person and seven by telephone. All interviews were recorded. Participants were asked how they found out about the award and why they applied. Questions also sought to determine why these women chose a scientific career path, what motivated them to succeed, what they perceived to be barriers to career progression (such as motherhood), what counted as pivotal career points, and their views about women-only awards in science.

After each interview, the transcribed responses were analysed using a grounded theory approach, drawing out the similarities and differences in participant responses. Grounded theory was proposed by Glasser and Strauss (1967), and modified over time with the latest development from Charmaz (2006). The use of grounded theory as a qualitative method allows for a flexible approach in which data collection, data analysis, theoretical concepts and the literature are part of the explanatory process. This approach facilitates an examination of participants' perspectives over time in specific contexts. It searches for relationships both inductively and deductively to develop themes.

The use of the interview method is justified on the basis that grounded theory is concerned with capturing the tacit knowledge that is gained from the reflective accounts of interviewees (Partington, 2000). It is a useful approach where there is scarce literature on a topic, such as women in science awards. Interviews provide the opportunity to obtain depth of information and the ability to probe for clarity. The personal style of an interview allows for rapport-building with participants.

Approach to Analysis

The Leximancer software program was applied to the interview data as a text retriever, sampling responses of participants over the seven interview questions. The purpose of using an approach influenced by grounded theory is not to develop and generate theory, but to draw out themes that are relevant to the experience of young women scientists trained and working in Australia. The eight interviews were

audiotaped and transcribed in full. Although laughter and pauses were noted, they were not factored into the data analysis. Several participants requested anonymity owing to comments made in relation to their workplace.

Ethical considerations

The study obtained approval from the Human Research Ethics Committee of The University of Queensland. The voluntary nature of the project was stressed and participants were assured that they could withdraw at any time. Given the small sample and the likelihood of being identified, participants were allocated alpha letters for coded identification. All participants consented to being identified in relation to comments made about the L'Oréal Fellowship.

RESULTS

Participant characteristics

Of the nine Fellows contacted, eight responded within a week, consenting to participate. One participant did not respond to the initial contact or to the follow-up invitation to be included in the study. The sample group represents early high achievers, with three having won a university prize for the best PhD thesis in their year.

Major themes

Motherhood

Three out of the eight participants had children – notably fewer than 30–40-year-old women in the general population and their non-science career contemporaries (http://www.aihw.gov.au/). The tension between a career in science and having a family was apparent. One participant without children commented thus in response to the question about crucial career points:

> 'I'm not sure I would just narrow it down to being a woman. I would say there are critical points for anyone wanting a career in science. I guess in some way I have it a bit easier because I'm not married… I haven't made up my mind about children… I can see it would be so much harder, once you have those obligations.'

The conflict is not exclusively a gender issue; however, she acknowledged that a women scientist has more to consider in her career if/when having children, arguably a critical career point for both genders working in science.

The demands of the early career stage can cause problems for young women scientists. One participant reported moving out of her scientific discipline because of work demands for travel that were incompatible with raising a young child. Working part-time was also not a viable option for a research and laboratory career in science owing to the demands of the work environment, such as long hours or being present during experiments.

A participant who did not have children commented on the prospect with regard to her career, saying,

> It just freaks me out, just seeing what happens to the careers of women around you – it's exceedingly difficult to manage all those things, kids, careers, your health, your relationships. I don't know of

> anyone who has managed to do all that successfully. That makes me very wary…

Another said, 'I think my scientific career has got in the way of my having children.' One participant reflected on her workplace and noted,

> … it's heavily male… in terms of where people are in permanent positions and officially higher up. I think that does reflect the conflict with families…

One participant, an early-career female health scientist, opined on critical early-career points, stating,

> The NHMRC (National Health and Medical Research Council) refer to it as a 'choke point' where you exit the first post-doc scholarship… where they are proud, I think the phrasing is they are *pleased*, to get rid of 80% of people in the system… So it's at that point where you make or break… and that coincides almost exactly with the childbearing years… So that's exactly where you go through that sink or swim thing… Getting an award that's difficult to get obviously makes a significant change on your CV [curriculum vitae].

Bias and barriers

Participants noted evidence of bias against them. Two reported negative comments in response to winning the award. Male colleagues made derogatory remarks about women-only awards, belittling them as not more than cosmetic, seeing that they originated from a cosmetic company. Another participant, also reported bias who had no family obligations, and mentioned people in her department attempting to curtail her research agenda by imposing demanding teaching schedules. Others spoke of being required to fulfil heavy administrative loads that reduced their actual research time. Still other participants commented on a lack of administrative support, and one said,

> … I would have to say the biggest thing that holds you up is the need to… fix your own computer, do your own legal stuff, your own media… not to mention finances and OH&S (Occupational Health and Safety)… we spend so much time not doing science but doing paperwork.

Participants discussed barriers to their applying for the award as well as ongoing career barriers. The Australian L'Oréal promoter advertises in the mainstream press and at universities and research institutes, requesting applications. Few participants heard about the Fellowships via media channels; most learned of them from departmental emails, and from colleagues and bosses who recommended they apply for the Fellowship. Six out of the eight were encouraged to apply by colleagues and supervisors. They were not actively seeking to apply and needed encouragement from senior people to make an application. Awareness of the Fellowship among later recipients came from knowledge of the women scientists who had won it previously and the high regard in which their work was held. All

participants needed encouragement to apply. An unwillingness to put one's self forward was noted, as one participant said:

> One particular thing of course is that women, including me, don't apply. It's still probably the only thing of its kind that I have applied for. [Women] tend not to apply for awards because they think it's either too hard or that competition will be too tough, and I would say that I applied for it in part just because it was an award only for women.

Commitment to science

Participants reported that their primary motivation for continuing in a science career was a passion for their scientific discipline, specifically to do research and help develop the next generation of scientists in their field. They reported that being an Australian L'Oréal Fellowship recipient enhanced their sense of being a scientist. The external validation of their research efforts from both peers and the public was significant. The award allowed them to identify as scientists in their respective disciplines and to have a public role in promoting greater public awareness and understanding of their area, as illustrated by the following quotes:

> I've joined up with the 'Scientists in Schools' program and I have a school with whom I'm working … and I do lots of public speaking. I think what I like about the [Fellowship] is how they try and take science to the general public – I'm a big fan of that. We should be making it acceptable so that people understand what we're doing and why… we love what we're doing and what we do is important. You want them [the public] to be interested in what we're doing and why we're doing it. It wasn't around in my day… I love giving talks in schools. Seeing people that are just fascinated because the more you know about something, the more interesting it is.

The importance of the award for confidence, self-esteem and identity as a scientist was highlighted. The participants in this study are an elite group of women who have persisted through secondary school, university and post-doctorates in science to compete for and win a L'Oréal early-career Fellowship in Australia. Notably at the early-career stage, they reported a lack of confidence. Winning the award had a significant impact on their career development by providing recognition of their achievements within both the scientific community and the public arena. Participants considered that the women-only award was necessary in order for them to develop as early-career scientists and be able to put themselves forward. As part of the Fellowship, they each received a day of media training. They found this beneficial for handling their public profile and promoting the public understanding of their scientific discipline. Money from the award could be used flexibly, a rarity in academic research. The funds were utilized to provide childcare, fund conference attendance, organize workshops or employ staff.

The award also facilitated networking opportunities. The young women scientists enjoyed meeting each other at the award ceremony and learning about each other's areas of scientific expertise. There were comments about a sense of isolation in their respective careers, where they may have senior mentors and junior staff, but

few if any other young women scientists struggling with the same issue of finding an identity as a scientist.

Career impact

Seven of the eight participants stated that winning the Fellowship had brought them recognition from their peers and the public and was an important achievement. One participant expressed the direct impact of winning the Fellowship saying:

> This was a gateway prize for me; it was the first stepping-stone in my career. These sorts of recognitions on your track record give you some sort of credibility. Winning the award was even better than I could've expected, in terms of the recognition I got for it. You do get recognition from your peers within science but I think it's probably one of its strongest attributes… [It] gives you a more public profile.

Four participants subsequently applied for and were successful in winning further science prizes in Australia, such as the Young Tall Poppy Award, the Australian Museum Eureka Award, Australian Research Council Fellowships and a University Foundation Research Excellence Award within their own discipline. In addition to these recognitions, participants all reported obtaining permanent positions and progressing in their career, with promotions. They were consistent in their positive response to the effect of the L'Oréal Fellowship on their careers and for young women scientists in Australia. One said,

> They [L'Oréal Fellowships] have a really important role in going, 'Hey, women are really doing amazing stuff in science' and we should celebrate that and recognize that. I think they're really important in the attempt to try and even things out and improve the culture.

Another said,

> I think it is very important to have these early type prizes… their role in both boosting morale of people who are otherwise a little bit worried about their futures in research, and whether they're going to get one.
>
> …we do have a bottleneck where we have a lot of female – women coming up but not getting to a higher level, so I think anything that promotes them and helps them get there has to be a fantastic thing.

As regards factors in career success in science, participants achieved the imprimatur for a successful career, attainment of permanent employment, leadership positions, attracting and mentoring the next generation of young scientists to their laboratory or research area, independence, publications, awards and further funding.

DISCUSSION

An international awards program is one response to the under-representation of women in science generally. This study points to the importance of recognizing the work of women scientists through awards such as the L'Oréal Australia Fellowship

from the perspective of talented, high-achieving young women scientists in Australia.

The prestigious reputation of the Fellowship is in large part due to the quality of the women who are recipients and their career trajectory following receipt of the award. All participants reported a career benefit, career progression and increased recognition within the Australian scientific community.
Some participants had not decided whether they would have children. One stated that her science career had deterred her from having children; another worried about the implications of a family for her career, and most had delayed having children for the sake of their career. From their individual perspectives, this problem was not supposed to happen to them, as one stated that they were 'the lucky ones'. Participant comments suggested that discrimination took many forms and ranged from blatant through subtly present to often unconscious. These various forms of bias against having a family created barriers for this group of women scientists trying to establish their careers. One study investigating the retention of post-doctoral fellows at the University of California showed that women who had children or planned to have them were more likely to consider leaving research (Shen, 2013). This would suggest another reason why women are under-represented in science research.

Another less positive side of the narrative is that, from the perspective of these talented young women scientists, their careers were not always progressing as fully or as easily through the academic structure as their potential indicated. As noted by Dewandre (2002), 'For women to feel at home in scientific research, there will need to be profound changes in thinking and behavior, both from men and women' (p. 278). The findings of this study have implications for policy for young women studying science and seeking to have a satisfactory career from their endeavors. The Australian women scientists consistently and enthusiastically spoke of the personal benefits of the L'Oréal award. All participants' careers were reportedly enhanced by the award experience. There are many threads to the issues of awards and their impact on the early career of women scientists, and this study has reinforced the complexity of this field of research. As Sonnert and Holton (1996) comment, 'The current status of women in science is a blend of decisive advance and unfulfilled promise'. The positive message that can be derived from this study is the significance of the L'Oréal Fellowship in promoting the cause of young women in Australia (and in 2012 in New Zealand). L'Oréal's philanthropic philosophy is to be smart not grand, and from the perspective of the Fellowship winners in this study, L'Oréal has achieved that goal.

LIMITATIONS

The findings of this study are limited to a single country and a small sample from a small possible participant base. There are relatively few Australian L'Oréal Fellows and the study was limited to a restricted amount of data. Furthermore, it was not possible to pilot the interview questions because of the small potential sample population. The participants represent an elite group of early-career scientists who would be primed to benefit from the L'Oréal Fellowship. It is reasonable to

extrapolate that the issues facing an elite cohort of women scientists could be investigated with their colleagues struggling from less advantaged positions.

RECOMMENDATIONS

The focus of this study was to explore the career perspectives of early-career Australian women scientists in receipt of an international fellowship. The premise was that such awards enhance the career prospects of their recipients. While confirming this premise, the study also explored the overall context of the women's science career, in which other factors come into play. The literature lends a sombre perspective to women scientists' careers, with bias and barriers being experienced by women in science disciplines of all persuasions.

The advent of guidelines for university and research institutions from the Australian Academy of Science is a step in the right direction. Other employment policies such as childcare places also offer support for women scientists. Shirley Tilgham, President of Princeton University in the United States of America, believes that such initiatives provide crucial support for women, but that other solutions are needed. 'I don't think there's a single obstacle,' she says. 'I think there's a whole series of phenomena that add up' (Shen, 2013, p. 24).

Australian policy makers would do well to consider instituting an accreditation scheme such as the Athena Charter in the United Kingdom, which recognizes departmental efforts to support women scientists.
Fully addressing career development concerns for women scientists will take time. In the meantime, some women scientists will persist in a less than advantageous workplace and others will not. It is our loss as a society if we do not seriously attempt to address these issues, allowing the contribution of women scientists to be integral to our society. As Tilgham advises (Shen, 2013), we must be eternally vigilant while noting that women are in a better place than they have been as scientists.

CONCLUSIONS

Recognition received within both science and the public sphere reportedly boosted the self-confidence of recipients and their self-identity as scientists, and these are both important factors in a successful science career (Shen, 2013). Awards in science for women are therefore important in the quest to retain talent and potential in various fields. While these gains are a source of encouragement for women entering science as a career, this study also highlights recurring themes of bias and barriers to women pursuing a career in science. The findings of this explorative study support the literature on the career experiences of women scientists. The award is seen by the participants as good for women scientists and perceived as promoting their careers. Other factors explored in this study reveal that the receipt of a prestigious scientific award alone is not sufficient to progress a scientific career on any traditional linear pathway. The participants perceived that workplace culture issues negatively influence young women scientists' career progression. These factors included work–life balance with the advent of children, and opportunities to participate fully in their research, due to other non-research work commitments (Wachs & Nemiro, 2007).

The results of this study are encouraging from the perspective of high-achieving young women scientists who are able to benefit from awards to enhance their careers. Even this elite group, however, was not guaranteed a pathway to career success in their middle and later years. There is evidence of culturally embedded discrimination and lack of confidence among women scientists because of this work environment.

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