



WOMEN'S LEADERSHIP IN SCIENCE

SOPHIE MCCARTHY

Background briefing for the NSW Office for
Science & Medical Research

November 2008

CONTENTS

Executive Summary	3
Introduction	5
Women in Australian science	6
Women's leadership in science	8
Current literature	9
- Science and technology skills shortage	9
- Low representation of women	9
- Barriers to success in science - Why do women leave the workforce?	10
- What is special about women who have reached the top?	11
- Policy and programs to increase women in science	11
- Successful programs in the private sector to advance women's leadership in science	13
Consultation with leading women in science and engineering.	14
Conclusion	33
Appendix one: Australian Bureau of Statistics 2006, Census of population, occupation by sex.	34
Appendix two: List of institutions participating in interviews	34
Appendix three: Persons employed with engineering qualifications by industry, Australia 2004-05	34
Appendix four: Persons employed with natural & physical science qualifications by industry, Australia 2004-05	34
Figure 1: Industry of main job by sex 2002, ABS	7
Figure 2: Census pyramid with trend data all ASX 200companies	8
Figure 3: Industrial researchers by sex, and proportion of female researchers by institutional sector in the European Union (1999)	10
References	35

EXECUTIVE SUMMARY

A background briefing was commissioned on women's leadership in science as a preliminary step to inform future public policy and programs. It involved a brief literature review and interviewing key women working in science and engineering.

The statistics from the 2006 Australian Census report that 42% of people working in natural and physical sciences are women. Whereas in engineering women make up less than 10% of the workforce. Data on women's leadership in Australia is a bleak picture with very low representation of women in our houses of parliament, board rooms and courts, so it is unlikely that the experience for women in science is significantly different. Further quantitative research is needed to explore this.

A review of the literature on these issues points to a pattern where women enrol at university in many science subjects in similar numbers to men (not so in

physics and engineering), however, from this point there is a continuous 'leak' or 'flight' as women either leave their job or the profession entirely. The 35-40 year age group is the critical period when this occurs and coincides with the time many women are having children.

The literature suggests that the reasons why women leave science and engineering include hostile cultures, lack of career path, few role models, discrimination, and difficulty managing work and family.

The *Audit of Australian science, engineering and technology skills* in 2006 reported that many men are also leaving the sector and highlighted a skills shortage that is experienced in many other developed nations. Strategies to encourage women (and indeed men) into science and engineering careers and then retain them are of paramount importance for Australia to remain competitive in research and innovation.

Numerous reviews around the world have identified policies and programs that can address the skills shortage and increase the representation of women in science. It is unclear; however, to what extent they have been funded, implemented and supported politically. These strategies include awards to recognise women's achievement, mentoring, events to bring women together, promoting careers in science to girls, more flexible work conditions, job sharing, child care, promoting successful women in science, programs to assist women returning to work, leadership training, and paid paternal leave.

The interviews explored in more detail many of these issues and confirmed both the barriers experienced by many women and the strategies to increase women's participation and influence in a critical industry. There is now an opportunity to develop a comprehensive policy and programs to address this important issue.

The InterAcademy Council's *Women for Science* report states

“Women must have the same opportunities to contribute to science and technology (S& T) as those enjoyed by men... A more diverse workforce, which reflects a wider variety of experiences and views, can greatly benefit the S & T enterprise as well as society as a whole.

Technological innovation will broaden, competence will grow, and countries will prosper when the workforce is diversified to fully include both women and men....Unfortunately the under representation of women in science and technology – especially in senior and leadership positions - remains a world wide phenomenon.” (2006, 1)

INTRODUCTION

The New South Wales (NSW) Office for Science and Medical Research provided a brief to McCarthy Management to produce an event in late 2008 that would attract key women in science and engineering to discuss women's career paths and leadership in science. International research and local anecdotal evidence would suggest that the situation in NSW follows a global pattern that sees women under represented in science professions. If this is the case it has significant implications for NSW industry, research and innovation.

To gain a more comprehensive understanding of the issues, a background briefing was commissioned to provide an overview of women's leadership in science in NSW.

This report presents some statistics about men and women in science occupations; the literature around women's careers and the factors that hinder and support them; current strategies and programs in NSW, Australia and internationally that support and promote women's leadership in science.

To place this information in context 15 interviews were conducted with a diverse group of women in science and engineering, some in senior positions and others in earlier stages of their careers working in either the private sector, Government, universities, medical and research institutions, the Australian Research Council or Australia's leading science institution, CSIRO (see Appendix 1 for the list of organisations represented).



WOMEN IN AUSTRALIAN SCIENCE

Approximately 13.5% of employed people in Australia possess science, engineering or technology skills (SET) qualifications. This compares favourably to international examples which state that 'in 1998 between 15-20% of the population of Denmark, Germany, Ireland, France Luxembourg, the Netherlands and the United Kingdom held science and technology related qualifications' (DEST, 2006, 3).

Studies from Monash University in 2004-05 show that people with SET qualifications are dispersed across all industries in Australia. People with engineering qualifications make up more than 20% of the manufacturing industry, and more than 10% of the retail trade, construction industry and business services.

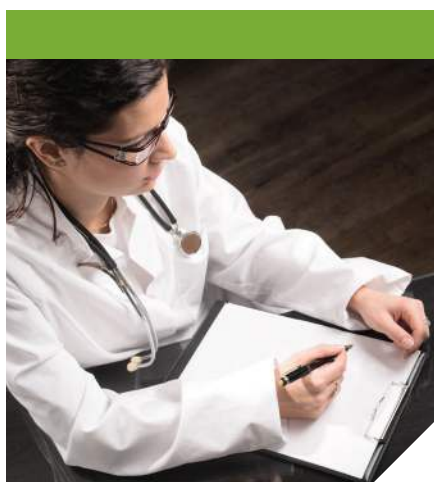
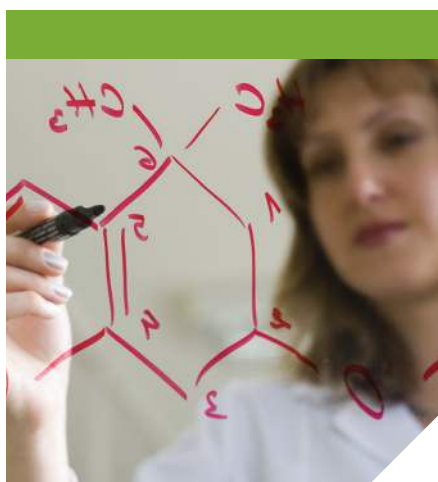
Surprisingly, people with engineering qualifications consist of only 2.8% of the mining industry (Centre of Policy Studies, Monash, 2005). Furthermore, people with natural and physical science

qualifications were concentrated in education; business services; health/community; manufacturing; and Government administration/defence respectively (see Appendix three and four for complete tables).

More recent statistics from the 2006 Census in Australia that presents data on people's occupation broken down by sex shows that there are 67 667 people working in the natural and physical science field and 42% of these are women. This data categorises people based on the Australian and New Zealand

Standard Classification of Occupations and includes employed people aged 15 years and over (2006 Census Australian Bureau of Statistics).

This data would indicate that men and women are almost equally represented in the science field, which is in contrast to much of the literature on women's careers in science. Further analysis and information is needed to establish who the key employers are, what kinds of roles women occupy and whether women are attaining leadership positions.



The 2006 Census shows a very different picture for women in engineering – the number of women working as engineering professionals is 7.8%. This is supported by statistics from Engineers Australia that ‘women engineers currently represent less than 10% of the engineering workforce – one of the lowest participation rates of women across all professions (Engineers Australia, 2007). Other occupations relating to science and engineering showed a similar trend, except for

agricultural, medical and science technicians where 61% were female.

A report by the Federal Government in 2004 entitled ‘Women in Australia’ analysed labour market data and found that ‘Compared to other OECD countries Australia has one of the more highly segregated labour forces, and this has not changed much over the last 20 years. Segregation by type of job and level (in terms of managerial responsibility) has implications for women

relating to level of earnings, employment opportunity and, more broadly, for their access to decision-making positions.’ (Office for Women, Department of Family & Community Services, Women in Australia 2004).

The graph below (figure 1.) illustrates the low levels of female representation in industries where people with SET skills are often employed such as manufacturing; construction and wholesale trade.

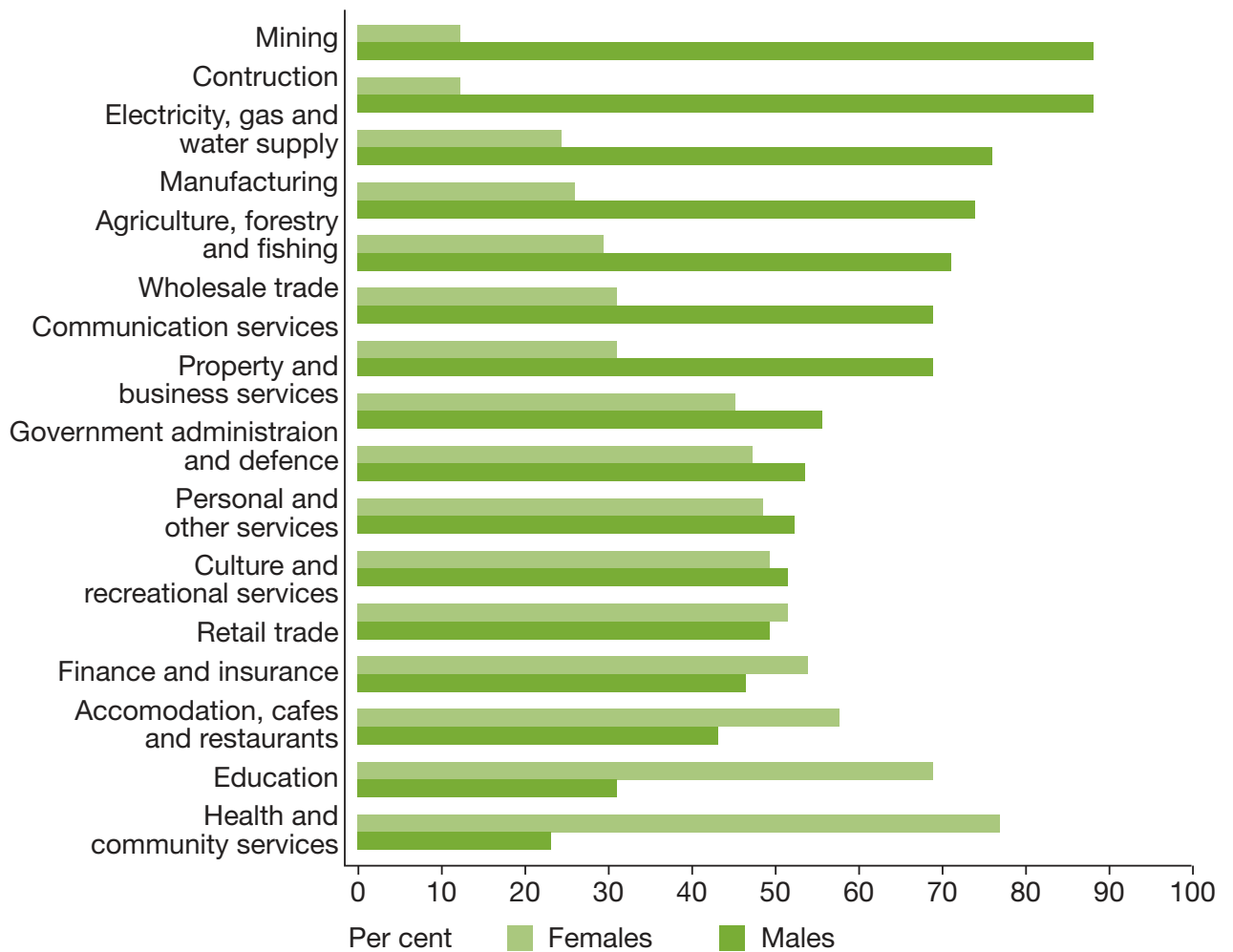


Figure 1.

Industry of Main Job by Sex, 2002

Source: Australian Bureau of Statistics 2002, Labour Force: August 2002, (Cat. No. 6203.0), Canberra.

WOMEN'S LEADERSHIP IN SCIENCE

Recent Australian surveys (EOWA 2006) tell us that in the top 200 companies only six chief executives are women. This hasn't changed since 2003. Less than 9% of women sit at the boardroom table. Fifty percent of company boards in the top 200 have no women directors. In NSW 30% of magistrates are women and 25% of all judges.

Is science any different? Are women represented in leadership positions of public corporations working in science and engineering, bureaucracy, research institutes, universities, CSIRO?

This analysis by EOWA does not isolate women in science and engineering careers, so it is difficult to be definitive about women in this industry. The Monash study indicates that people with science qualifications are working across

many industries so it is possible that women in the science sector assume leadership positions at a similarly low rate as those in other professions.

The positive news is that women in the Government sector have stronger representation in leadership positions and senior management than women working in the corporate sector and this sector is a large employer of scientists (Piterman, 2008)

The current picture of women working in engineering seems very different, with less than 10% of the Australian workforce being female. In addition to being in a minority position in this sector women are also in roles with less responsibility and are paid less. Thirty percent of women reported earning less than \$60,000 compared with 24% of men. At the higher end, only 10% of female engineers compared to 15% of males reported earning more than \$121, 000 (2008).

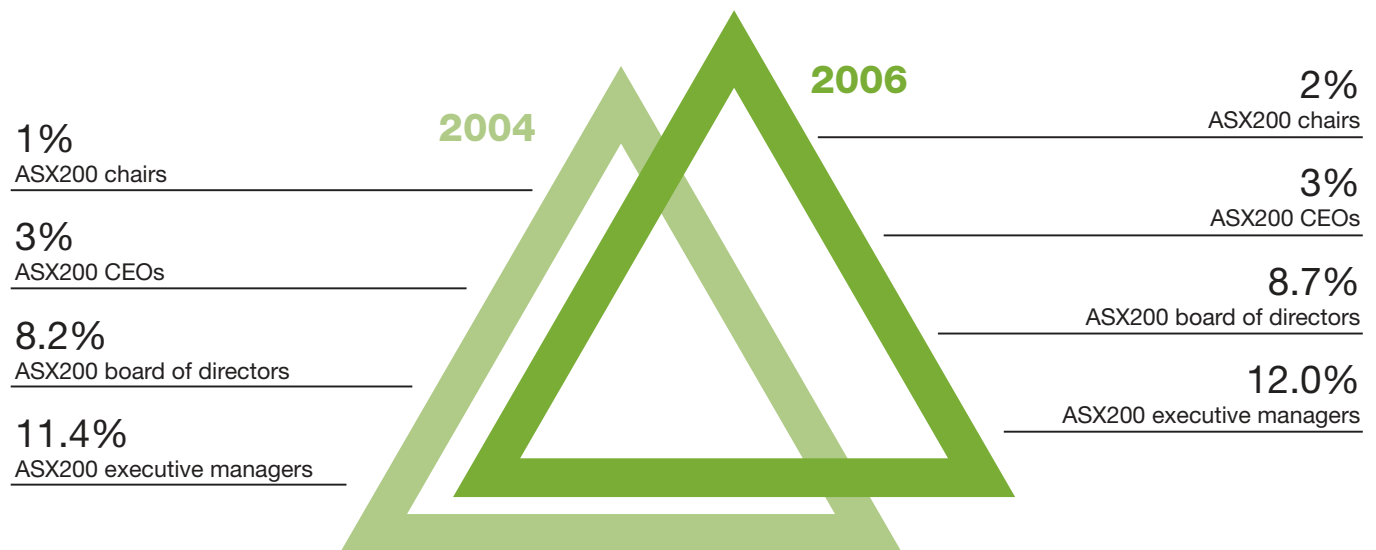


Figure 2.

Census pyramid with trend data - all companies
Source: EOWA 2006 Australian Census of Women in Leadership

7 CURRENT LITERATURE

Women for Science an Advisory Report by the InterAcademy Council in 2006 is a comprehensive summary of the existing literature that explores the reasons for women's under-representation in science at a global level, presents examples of successful projects and policies that increase women's participation in science and further recommendations to address this issue. There is no similar Australian study, although there are a number of reports that look at aspects of this larger issue.

Science and technology skills shortage

The InterAcademy Council report points to a skills shortage in science and technology in both developed and developing countries. This finding is supported by research commissioned in 2006 by the Australian Government. *The Audit of science, engineering and technology skills* raised a number of issues:

- a skills shortage in many engineering and some science disciplines,
- a static or declining proportion of participation in the enabling sciences and advanced mathematics in schools and tertiary settings,
- concerns about the quality of science education and career advice for this sector, and
- recruitment challenges as people with SET skills frequently move on to management roles or unrelated occupations (DEST, 2006, iii).

It is significant that the report did not address gender issues affecting the science and engineering sector, but it did highlight that some of these issues are limiting entry to and retention of both men and women in the sector. Other research that focuses on gender would suggest that there are additional factors causing women to leave this sector (Hewlett et al, 2008).

Encouraging women into SET professions and retaining them in these careers is a clear strategy to address the skills shortage identified by business, government and scientific organisations.

Low representation of women

The InterAcademy Council Report states:

'Extensive sociological research has identified many of the factors that contribute to the low representation of women in science and technology. They include girls' limited access to education, the demands of women's roles as mothers and caregivers, the lack of mentors and role models and the lack of leadership training (Etzkowitz et al, 2000; Glover, 2000). These culture-based norms and prejudices create pervasive, intangible barriers that hinder the inclusion of women...even when women manage to enter science or engineering they often drop out early in their careers...the drop-outs are usually caused by lack of provision for combining professional work with the family duties traditionally assigned to women.' (IAC, 2006:2)

In Australia girls' access to education is equal to that of boys at a secondary level and has surpassed them at a tertiary level with 55% of graduates from Australian universities being female (NSW Dept for Women, 2005). This trend is also seen in Canada (55% of all undergraduates are women) and the European Union, 'with 52-67% of degrees being awarded to women' (Goetzfried, 2004 in IAC, 2006:12).

In developed countries including Australia there is some gender inequity at the educational level, particularly in physics and engineering; the other sciences are more balanced (IAC, 2006: 20). A survey in 2007 by Engineers Australia reports that 'the numbers and percentage of women enrolling in engineering degrees has declined each year since 2002 and this trend is also evident in the UK, USA and Canada; (Engineers Australia, 2007). In addition, the 2007 survey and other statistics from Engineers Australia membership found that 'women are still leaving the profession at a high rate'.

A recent global study (2008) of women working in science and technology companies in the US, Russia, Australia and China did have some positive findings that 'between the ages of 25 and 30 years, 41% of the young talent with credentials in those subject matters are female. It's a more robust figure than many suspect. That's the good news.... The bad news is that a short way down the road, 52% of this talent drops out. We are finding that attrition rates among women spike between 35 and 40 -- what we call the fight-or-flight moment.

Women vote with their feet; they get out of these sectors. Not only are they leaving technology and science companies, many are leaving the field altogether'. The investigators found this pattern to be consistent with little variation across all four nations (Hewlett et al, 2008).

In Europe (see figure 3.), statistics show that women researchers make up 30% of the academic and government sectors, whereas in the business sector, which is the leader in research and development, only 15%

of researchers are women (European Commission, 2003 in IAC, 2006:15)

In the prestigious Academies around the world women scientists and engineers are currently less than 5% of the membership (IAC, 2006). In terms of awards that deliver recognition women are also scarcely represented. Of the '491 Nobel Prizes awarded in physics, chemistry, and physiology and medicine, only twelve (two to Marie Curie) have been awarded to women' (IAC, 2006: 23)

Barriers to success in science - Why do women leave the workforce?

- Hostile cultural environment
- Little encouragement from superiors
- Few role models
- Overt and subtle discrimination
- Difficulty managing work and family

The five barriers above were identified in a US report in the late 1980s (Moen, 2008: 903) and are now reinforced by the Athena project in 2008 that has identified five similar factors the researchers called 'antigens' as they repel women from the workplace:

Hostile macho cultures. Women in SET are marginalized by lab coat, hard hat, and geek workplace cultures that are often exclusionary and predatory (63% experienced sexual harassment).

Isolation. A woman in SET can be the lone woman on a team or at a site. This makes it difficult to find support or sponsorship (45% lack mentors; 83% lack sponsors).

Mysterious career paths. As a result of macho cultures and isolation, women in SET find it hard to gain an understanding of the way forward—40% feel "stalled" or "stuck" in their careers.

Systems of risk and reward. The "diving catch" culture of SET companies disadvantages women, who tend to be risk averse (35% have difficulty with risk). Without buddies to support them they feel they can go from "hero to zero" in a heartbeat. (Hewlett et al, 2008)

Extreme work pressures. SET jobs are unusually time intensive and, because of their global scope, often involve working in multiple time zones (54% work across time zones) (Hewlett et al, 2008).

Figure 3: Industrial researchers by sex and proportion of female researchers by institutional sector in the European Union (1999)

	Number of industrial researchers		Proportion of female researchers (%)			
	Female	Male	Business enterprise	Government	Higher education	Total
Denmark	2,218	9,074	19.6	31.1	27.3	23.9
Germany	14,414	135,735	9.6	22.1	24.8	18.0
Greece	940	2,991	23.9	37.5	44.3	40.9
Spain	3,353	13,957	19.4	37.5	34.5	32.6
France	17,787	68,428	20.6	28.6	31.7	26.5
Ireland	536	1,364	28.2	25.2	46.2	29.8
Italy	5,490	24,216	18.5	38.1	28.4	27.2
Austria	1,258	12,708	9.0	31.9	25.7	18.7
Portugal	793	2,535	23.8	54.5	44.7	44.0
Finland	3,999	18,516	17.8	37.5	41.8	28.6
EU10	50,788	289,524	14.9	30.3	30.6	24.8

Source: European Commission, 2003.

Australian research of working women across sectors would also support these findings. The Equal Opportunity for Women in the Workplace Agency's (EOWA) report released in 2008, *Generation F: Attract, Engage, Retain*, has identified that women aged between 16 and 65 years- Generation F remain significantly overlooked, under utilised and untapped. Despite record education levels and rising numbers of women entering the labour market, the EOWA research shows that employers are failing to provide workplaces that enable women to fully participate and fuel the growth in the Australian economy. Two of the five most common reasons for women to leave their previous jobs were a difficulty in progressing (17%) and lack of clear career development (15%), which they rated as extremely important when choosing a workplace.

EOWA's Generation F report also showed that men are acutely aware of the barriers that women encounter in the workplace. 'Twenty five percent of women and 21% of men do not believe that women and men are treated equally in their workplace and 43% of women and 46% of men feel that their workplace can be 'bit of a boys club'. Further, over a third of women (36%) and 31% of men recognise that it is difficult for women to balance a career with motherhood. Men are also significantly more likely than women to believe that their workplaces do not appoint women to senior positions, do not provide flexible work conditions and do not have a good record of promoting and supporting women' (EOWA, 2008).

The findings from the EOWA and Athena studies are supported in the Australian experience of female engineers. A survey by Engineers Australia in 2007 commissioned to investigate the retention, satisfaction and progression of women engineers found some improvements from an earlier survey in

1999. Nine years ago female engineers described their workplaces as female and family unfriendly and they were more dissatisfied with workplace culture and conditions than their male counterparts. In 2007 women reported an increased availability of flexible work hours, part time work, leave without pay, job sharing and paid maternity leave, however use of these provisions has not increased by as much as their availability. While these new policies are valued by employees, employers could do more to support the use of these family friendly practices.

What is special about women who have reached the top?

The *Women for Science Report* refers to a number of studies (Wasserman, 2000; McGrayne, 2001; Padilla & Santos Ocampo, 2004) that took a more positive approach and attempted to identify the features common to women who have made an outstanding contribution to scientific endeavour. These commonalities include: 'an early fascination with science; independent thinking; early rejection of the current limitations imposed on girls and women; support from parents, particularly fathers; a good education; finding mentors; marrying a supportive husband; and having access to reliable childcare' (IAC, 2006:3).

Policies and programs to increase women in science

The science and engineering Academies around the world are a key target for the policy recommendations from the *Women for Science Report* as they can influence many stakeholders such as governments, non government organisations, professional bodies, students, and companies. This "sample" policy encapsulates the recommendations of the report and provides a set of strategies to implement the policy.

Academies' commitment to full inclusion of women in science and technology.

The academy will:

- Adopt good management practice—tools for inclusiveness—in its institutions and advocate such practice across the S&T community.
- Establish a committee that addresses gender issues and ensures follow-up.
- Promote women members to decision making levels and include them in panels and committees.
- Increase the number of women scientists in the nomination pool for membership, prizes, and awards.
- Give visibility to women scientists and represent women in the academy's portrayal of science.
- Pay attention to gender implications of research sponsored or evaluated by the academy.
- Ensure that the criteria for evaluation of research institutes include organisational culture.

Key strategies to implement these policies are detailed below:

1. Formally commit to 'good management practice' – procedures designed to ensure the inclusion of women scientists and engineers - within all levels of their organisations and research institutions. Examples of these include:

- Commitment from senior levels to diversity;
- review of all policies and procedures for possible differential impact on men and women;
- transparency in communication, recruitment and promotion;
- leadership training and mentoring;
- supporting a healthy work-family balance

2. Designate a dedicated member or committee to be responsible for gender issues within the organisation. Responsibilities include proposing actions, collecting gender-disaggregated data and monitoring progress.

3. Enlarge their membership nomination pools to include more women scientists and engineers and work to enhance the role of women as senior academy officials (IAC, 2006:vi).

Recommendations from Australian audit of SET skills

In Australia the former Federal Government's audit of SET skills in 2006 did not address gender in any way, but it identified a series of recommendations to increase the number of people working in the sector, to further develop the quality of their skills and to reduce attrition from this area. These focused on:

- Improving information about and awareness of SET and SET career opportunities among students, parents, industry and the community to encourage growth in the number of school students studying SET and aspiring to SET careers.
- Enhancing the understanding of SET career opportunities among early to mid-career researchers and working with the public and private research sector to provide rewarding career paths for young researchers
- More effective staff retention strategies to reduce attrition of qualified SET workers either to retirement or to other occupations
- Improving the capacity of the education and training system to deliver high quality SET courses. An adequate supply of well qualified science and mathematics teachers is a key to success.

To be effective and engage both men and women some of these strategies need to be developed and communicated for different audiences.

International Experience

The *Women for Science Report* lists numerous studies and initiatives that have been designed to increase the numbers of women in science. The United Kingdom's SET for Success (Roberts, 2002), the United States' The land of Plenty (CAWMSET, 2000) and the Republic of South Africa's Women in Science, Engineering and Technology in South Africa (Bailey and Mouton, 2004).

These reviews led to a range of outcomes by Governments. In the UK, a small unit dedicated to the advancement of women in science was set up within Government and then later the establishment of the Centre for Women in Science & Technology; a quota system in China; and in India incentives and awards for women scientists and entrepreneurs and a biotechnology park in Chennai exclusively for women (IAC, 2006; 10). In Japan the Government has provided more post-doctoral fellow positions for women and facilitated increased access to venture capital for start-ups. The report also notes that the majority of these interventions have only occurred in the past five years and conclusive data on their effectiveness is not readily available.

Other programs include

- Symposiums to bring women together
- Websites that provide information, resources and offer networking opportunities - WISENET
- Youth education programs that target girls
- Mentoring and sponsorship programs
- Leadership training and professional development
- Re-entry grants after a career break
- Keep in touch schemes for women having career breaks
- Commissioning research into women's careers in science and engineering
- Promoting successful women in science and engineering to the community through the media
- Awards for achievement – for example, L'Oreal Australia's For Women in Science Fellowships and Queensland Governments Smart Women Awards.

Successful programs in the private sector to advance women's leadership in science

The Athena Research project details some of the areas where companies have recognized the different needs of men and women and developed interesting new initiatives:

'Expanding recruitment: Pfizer's Student Mentoring Program looks to stem losses among SET female graduate students. Google is striving to "widen the filters" to attract top-notch individuals who may not have technical credentials.

Targeting line and technical roles: Alcoa's WOVEN and Manufacturing Manager Development Program encourage women to stay in line positions. Intel's Technical Leadership Pipelines Program for Women helps to keep female engineers on the technical track and positions them to advance to higher levels. Cisco's Global Telepresence Coaching program permits more effective mentoring of key female talent.

Tackling the fight-or-flight moment: Johnson & Johnson's Crossing the Finish Line helps to promote female multicultural employees to senior management.

Microsoft's Mentoring Rings gives junior women a better shot at crossing the great divide. At IBM, female flight is combated through its Flexible Leave of Absence program. And BT's flexible work program, Freedom to Work, is helping to keep female engineers on track.

Creating on-ramps: GE in India has developed Restart, an on-ramping program designed to attract highly qualified SET women who have taken time out. J&J's ReConnections™ attempts to ensure a seamless return to work by off-ramped women, while MIT's Midcareer Acceleration professional development program is specifically designed to reintroduce offramped SET talent.

Fighting isolation: Cisco's ETIP/ETAP program is creating a game-changer at the top by hiring a significant number of senior women at the VP level and above and providing support for successful assimilation.

Leveraging Athena traits: IBM's Corporate Service Corps harnesses the altruistic attributes of women in SET by sending teams of employees to work in charitable organizations across the globe.' (Hewlett et al, 2008: 59).

Cisco's ETIP/ETAP program is creating a game-changer at the top by hiring a significant number of senior women at the VP level and above and providing support for successful assimilation.

7 CONSULTATION WITH LEADING WOMEN IN SCIENCE & ENGINEERING

Fifteen women working in science and engineering in NSW and the ACT participated in this project to discuss their lives and career paths and particularly factors that have supported or hindered them.

Participants were interviewed either face to face or answered questions online. Their names have not been listed to protect their privacy, but the organisations represented are listed in Appendix two.

Individuals were selected from a range of age groups, scientific disciplines and workplaces. For example their

qualifications include chemistry, agriculture, ecology, physics, entomology, engineering, marine biology, science communication, veterinary science and pharmacoproteomics. The women currently work in research, policy, management or teaching or a combination of up to three of these roles. Their employers are business,

Government, science agencies (state and federal) or universities. Twelve of the fifteen have doctorates and two are members of the prestigious Australian Academy of Science. Four are aged 25-30 years and the remainder 40-60 years.

People's comments have in places been edited for brevity but not altered.



WAS THERE A MOMENT WHEN YOU KNEW YOU WANTED TO BE A SCIENTIST/ENGINEER?

- I was fascinated by the potential of discovery
- I knew I wanted to be a scientist
- there are two main sources: my parents, who are science teachers and my science teacher at school
- I kind of drifted into it
- My early inspirations were teachers
- I loved the research
- lot of mentors played very significant roles
- I was told girls were not as good as boys at chess. I immediately wanted to disprove that theory.....I was fascinated with technical things, how things worked
- I was interested in maths and science and dad suggested engineering,
- I liked the problem solving
- confirmed in my determination when told "women can't be vets"

"I loved the idea of working in a lab...doing experiments, I was fascinated by the potential of discovery. I loved reading science fiction. I had good science teachers in Yrs 8-9, inspiring and enthusiastic."

"Yes when I was at school, perhaps 13-14 years old I knew I wanted to be a scientist- a researcher and I gradually focused on doing marine biology. At the end of my 1st year of Uni I can remember talking to my Professor and basically saying I wanted to do a PhD- he encouraged me."

"I didn't ever have one of those moments, an epiphany, where I thought I have to be a scientist, rather I just found that I enjoyed the scientific process at school and more particularly in the final university years. In terms of inspiration, I suppose there are two main sources: my parents, who are science teachers and my science teacher at school who is still a good friend. I was good at history and science at school so was torn about what path to follow.... This was the late 70's in a country high school and 'big' careers for women were not encouraged. So I chose to study Arts at Sydney uni, taking archaeology, history and biology (some people thought that odd). After a year, and having met other women

who were doing science and agriculture I decided that I wanted to do something that would make a difference in the world as I was worried (still am) about the way that things are going. I know this sounds bit trite, but I haven't regretted this path and feel that I am in a career where I'm making a difference to the environment."

"I didn't want to do medicine or law I thought doing science will keep my options open. My chosen field appealed to me because it was a clean area of chemistry, was exciting and changing rapidly. made a decision at each point along the way."

"I am from a working class family, neither of my parents had more than 3 years of high school, there was no expectation of me. I kind of drifted into it. I was very good at maths and science. I was dux of my school."

"My dad encouraged me to follow my interest in the environment and animals. I did science at uni and one lecturer suggested honours to further my career.

I loved the research. Was very broke, you don't go into science for the money."

"In my final years at high school I knew I didn't want to take on any of the careers that were traditionally associated with women, like nursing or teaching. I knew I was good at maths and science and I knew I wanted a practical career, so engineering was the obvious choice. It also turned out to be the perfect choice. I realised later that I had always looked at the world from an engineer's perspective – curious to understand how and why things work. I had two exceptional women maths teachers at high school. They encouraged me to be good at maths. And while I wasn't the best student at high school, by the time I was at uni I was getting High Distinction grades in all of the mathematics topics. So that success encouraged me even more. I also had a very determined mother who wanted all six of her daughters to have a university education because it was never an option for her."

"I was told girls were not as good as boys at chess. I immediately wanted to disprove that theory.....I was fascinated with technical things, how things worked..."

"My early inspirations were teachers. I went to a girls high school and there was a real tradition in encouraging take-up of science. After that my inspiration was a college mentor who at a social event discussed a scientist who solved some key research problems but never told anyone about it; the intellectual satisfaction was reward enough. I described that as crazy and said I couldn't imagine not wanting to talk about my work. At which point my mentor said, so you'll be a science communicator then..."

"I loved the idea of working in a lab... doing experiments, I was fascinated by the potential of discovery. I loved reading science fiction. I had good science teachers in Years 8-9, inspiring and enthusiastic."

"I suppose it was during high-school, where I had generally enjoyed science subjects as well as history, and somehow was attracted to science based disciplines such as clinical psychiatry or meteorology or archaeology as possible careers. I'd have to say, there was a fantastic science teacher in Year 9 who really helped inspire the possibilities of science, as she was just such an exceptional teacher and lovely person – everyone enjoyed being in her class."

"I'd say there wasn't one, it was like an evolution and a lot of mentors played very significant roles. From the age of about

13 or 14 I started to realise that I liked being able to take some fundamental concepts and then work back from those to predict things or to understand something else. This is the way science works essentially....I liked maths, physics, chemistry. Less keen about biology – the way it was taught at that time there was a lot of memorising, a lot of names of things and that was a bit more like the phone book to me..... I liked the problem solving, I liked the fact that you could work towards an answer in a structured way. That aspect of science and the way science is done was always attractive to the way I think. I always knew I'd like that sort of job, I knew I'd do something like engineering, computer science, something along those lines."

"I decided I wanted to be a vet at 14 and was confirmed in my determination when told "women can't be vets".

"I went to a typical state school. But I had some very good teachers and this helped, I think. For example, physics and chemistry I had two very good teachers who were able to tolerate my questions. I'd ask a lot of questions and I also liked to query what they'd done and show that they were wrong. They were really good about that and that made a big difference. My maths teacher was the same. He was brilliant. Those three subjects were core and I had teachers who were willing to give extra time to me because I wanted it....My father was an

engineer, my mother didn't work. I was definitely encouraged by my parents to do what I wanted. My brother is a policeman, which is what he always wanted to do."

"I was told girls were not as good as boys at chess. I immediately wanted to disprove that theory.....I was fascinated with technical things, how things worked..."

"I had my heart set on law, loved debating and languages, but family history and experience of cancer led me to oncology and research, but not medicine, I never had that passion and didn't see myself at that level. Research still had positives like travel, prestige, helping others, personal satisfaction with that, I wanted to do the research and work on the treatments. My father was a sky diver and ran an aviation business my mother a stay at home mum, now teacher."

"My mother called me the little academic. I wanted to be a zoo keeper."

"First I had the idea and then the acknowledgement of my capabilities. I remember the suggestion of me being a secretary when I was young and I thought 'I can do better than that'. I was interested in maths and science and dad suggested engineering, he is a surveyor. He said 'They need women in engineering'. I grew up with three brothers so wasn't phased by that."

HAS YOUR CAREER FOLLOWED A LINEAR PATH OR BEEN MORE UNSTRUCTURED?

- Career has been all over the place, research, government research role, now university research role and lectureship which is a sideways step.
- Yes fairly linear.
- Unstructured
- Since uni my career has been fairly linear
- Definitely unstructured, with a fair bit of luck and opportunity as part of that
- Reasonably linear and I've been prepared to have gaps.
- My career path has definitely not been linear
- Very haphazard

“Unstructured, but I chose a path as each opportunity arose – I like a challenge. Undergraduate in the UK, I decided to pursue a research career, then PhD, post doc, QE2 Fellowship to Australia, I did consider being a professional basketball player at one point. I am committed to research, lecturing is a dead end. My current budget is about \$2 million.”

“Yes fairly linear. My PhD supervisor needed to be convinced that I was serious about a job in Sydney and he must have written me a good reference as I got the job. Since then I have progressed steadily upwards to my current position as Senior Principal Research Scientist. My current role is to undertake original research on marine invertebrates, participate in (institution) activities, represent the (institution) on committees. My wonderful budget is \$5000 pa.”

“Very conventional path. Honours and PhD in the same lab, post-doc in the US two years, ANU one year to come home. Lectureship at (university) senior lecturer in '97, then Associate Professor. Then my leadership skills kicked in and I became Professor, Dean and Pro Vice Chancellor five years later. My university had fantastic leadership, they picked people very early to grow and develop. Asked me to put up my hand for 'Deanship'.”

“Unstructured for the first 10 years after graduation then more structured after I joined the Department.”

“Relatively linear, but I made a big jump to the history of science and have always worked in museums as a science communicator and curator. I'm responsible for a budget of approx \$20 million.”

“Since uni my career has been fairly linear – the two big breaks were getting the first job as a junior academic at Sydney University after finishing my agriculture degree, and getting my current job. Both environments are supportive of women generally speaking. I have had the same job for nearly 20 years and nothing about the substantive position has changed, but I have been encouraged and supported to enter in the accelerated career path for scientists in the NSW Public Service – the Research Officers award which is promotion every three years based on merit. As such I'm the only female scientist in the organisation

on the award; I don't know how many there are in NSW – very few I suspect. I was also very lucky in that I have been supported to do a PhD, during which time I also had two children. I will add that I also worked full time during this period and there were times when the support was a bit thin and I just had to crash through and ignore the comments from colleagues, but management were excellent!”

“Definitely unstructured, with a fair bit of luck and opportunity as part of that. In most areas, it is rare that anyone can map out a linear path or plan where they will be, say in 5-10 years time. I have a background in scientific research as well as government policy and management, with a wide range of experience at various organisations in Australia and Japan, Italy, UK and USA. This experience combined with my previous job in science and research policy for State Government, led to my current position in the Commonwealth Government.”

"It has been fairly unstructured. It's developed in the way it has because of opportunities. The right opportunity turned up at the right time. An example is when I took this job I wasn't thinking academic necessarily, it was one of a number of jobs I applied for, there were a few in industry as well, and a lot of what swayed me to come back to Australia was that my parents were here and I thought it's about time I came back. I'd been in Europe for about eight years at that point and lived in Japan for a year, travelled to the US quite a bit to work... I'm that type of person that I look at what an opportunity has to offer at a particular point and then go with it."

"Unstructured, but I chose a path as each opportunity arose – I like a challenge. Undergraduate at Durham UK, I decided to pursue a research career, Cambridge PhD post doc, QE2 Fellowship to Australia, Federation Fellow at 33. I did consider being a professional basketball player. I am committed to research, lecturing is a dead end.. "

"Career has been all over the place, research, government research role, now university research role and lectureship which is a sideways step."

"Reasonably linear and I've been prepared to have gaps. I did science at uni, honours and then a PhD. They were all hard phases between study and work, PhD and post-doc, post-doc and first job. There was high unemployment in the 80s, so when I graduated there were no new jobs at ANU. I got a Fulbright scholarship to Berkeley. Before and after Berkeley I was unemployed... after nine months I got a two month contract at CSIRO which then continued for a year....I have now been here for 25 years. I was asked to apply for my current job (executive role) I really wasn't ready but I knew I should take the

opportunity. You have to jump when the opportunities arrive."

"Unstructured. Medical physics at University of Wollongong, internship at ANSTO. I have targeted roles. Commissioning the reactor is a life goal and I have achieved that. I am the first Australian woman to commission a reactor and the only one currently licensed to drive it."

"Totally unstructured career: left school at Year 10 went to TAFE, pathology technician certificate, got job at university and enrolled at Sydney Uni in Biomedical science part time, six years; then to

"Career has been all over the place, research, govt research role, now university research role & lectureship which is a sideways step."

work at Prince of Wales with one of my Professors who moved there from Sydney to Head up the Children's Cancer and Leukaemia Institute. PhD, always knew I wanted to do that. Albert Einstein College of Medicine in New York City for two years on a fellowship from the World Health Organisation. I had my own funding and worked with a brilliant woman scientist, a real pioneer, Professor Susan Horwitz. I wanted a research career and I have achieved that....with 13 years part time study. I have moved up through the ranks."

"Grew up in country Victoria, chose civil engineering with international studies and Japanese. I was offered a full scholarship to UNSW but went to UTS

as it offered a sandwich course, which offered an internship in second year of the course. Gives you the opportunity to look at the career options, do I want this? Is this for me? Bachelors & Diploma – six year course, one year exchange in Japan. Combined my interest in engineering and Japanese. The company are always looking to keep you satisfied in your position, find you opportunities. I was working on a prison in the ACT and then the opportunity arose to work in Sri Lanka and help rebuild after the Tsunami. They allowed me to do this...'you've earned it!'"

"My career path has definitely not been linear. I started with the then NSW Electricity Commission as an engineer and worked in power stations and later in the transmission division where I had a great time managing a transmission line construction project. From there I went to BHP Steel Port Kembla to the Hot Strip Mill maintenance area. I then had the opportunity to join Wollongong Uni Electrical Engineering Department as a PhD student working under Prof Chris Cook in the field of Industrial automation. Next came Standards Australia as a Project Manager working on cable standards and Conformity Assessment standards. I then joined GE Medical Systems and had a wonderful six years in a range of roles, culminating in two years in Singapore as the Asia Service Manager, Ultrasound. I am still in the medical devices area with Cochlear in the most rewarding role possible. I am now the Senior Vice President Quality and Regulatory for our global operations."

"Very haphazard. I haven't had much advice or counsel, I did what I enjoyed. I wouldn't have done much differently. There's no career path. You shouldn't make career decisions about money."

HOW WOULD YOU DESCRIBE THE CULTURE AT YOUR WORKPLACE?

- ultra competitiveness (sic)
- it's innovative, exciting and there is new equipment
- a strong culture of collegiality and scientific curiosity. It is a very inclusive culture that respects diversity and encourages critical thinking.
- Supportive.
- Public Service
- Very strange.
- Heavily female
- Culture of bullying and micro management.
- Culture is very blokey and male dominated, does not really allow diversity.

“There is a strong culture of collegiality and scientific curiosity. It is a very inclusive culture that respects diversity and encourages critical thinking.”

“In general it's pretty good but there is one aspect that I do view as negative and that's this ultra competitiveness (sic). Academia is a great place for women. Driven by grant income and women are good at multi-tasking.”

“I love my working environment, it's innovative, exciting and there is new equipment. Not many women, 3 out of 150.mostly they come back after the first baby but the second frequently prevents them. It is a highly regulated industry, very rigid. So many aspects of our work are not negotiable.”

“Strong family culture in the Department, partly weakened by the formation of the new Department. Used to be a lot more blokey in the 1980's. In recent years more women in senior positions – for years I was the most senior.”

“Heavily female (policy area). Good culture, Everyone is very dedicated, works very hard, efficient, focused, enjoys their work”

“Culture of senior management is appalling- no respect or trust of the researchers. Culture of bullying and micro management.”

“Feel very well supported. I am given opportunities to demonstrate my capabilities. In previous projects when there were gaps I filled them, learnt a lot, carried me into my next roles. Encouraged to put forward safety initiatives and sustainability initiatives, you then connect to other levels of the business.”

“Very strong quality culture. By that I mean a culture where every single person is committed to providing the highest possible quality product for the recipients of our products. We all realise that when you are making a device that is implanted in someone's head the reliability of the product is paramount. With this as the dominant motivation there is a strong culture of collegiality and scientific curiosity. It is a very inclusive culture that respects diversity and encourages critical thinking.”

“The people and culture are really great, when things like this work it makes a huge difference. Good corporate systems for everyone to use as well as regular development opportunities. Regular social events help build goodwill and atmosphere.”

“Culture is very blokey and male dominated, does not really allow diversity. When I joined the management team I was struck by how men constantly talked about the hours they worked. There is a bullying, competitive and aggressive nature of science that is okay for scientific debate but not for solving management issues.”

“The culture at my workplace is unusual as the organization has many aims. I find that it is generally supportive and I get back what I put in. It is a small organization and very tight-knit. Bullying and sexism are not tolerated. I should note that there is a very high female to male ration in my section, and the site manager also is female.”

WORK PATTERNS

- I work six days a week and frequently start my day at the office at 2-3am.
- I don't work weekends.
- Some of my colleagues work weekends and nights. I don't, I don't think it's necessary; I am home by 7.00pm.
- I do shift work, someone needs to be at the plant 24/7.
- I work most nights and usually one day a weekend.

"When I was on site I would often work up to 20 hours a day, seven days a week. 5-6am starts and finish around 10pm, average 16 hr days. I was discouraged from that. Now in head office: 8am-6-7pm that's what most people do here. I wanted to put the time in."

HOW DO YOU DEFINE SUCCESS IN TERMS OF A CAREER IN SCIENCE?

- Doing a job I love
- Making a difference
- Success is about enjoying the work and having the transferable skills and confidence to apply further in your work (in Science or elsewhere) – these transferable skills have been the key in my experience
- Job satisfaction, and increasingly in recent years the profile and respect of your peers.
- I was most proud when I was made a Professor and gaining membership of the Academy
- Enjoying what you're doing is success
- Good publications, obtaining grants, respect from my peers
- What are you contributing to knowledge and understanding?
- Feeling motivated and happy,
- finding balance, working with stimulating people, producing outcomes, global recognition. Feeling what you do is valuable to the world.
- always looking to push my capabilities
- Achieving the aims you set for yourself

"I was most proud when I was made a Professor and gaining membership of the Academy, international recognition is important. I have left science and moved to management where I felt I'd have a bigger impact."

“Number of different pathways: international recognition, impact, making a difference, leadership roles, having influence, bringing about change, facilitating investment in science. I've had the opportunity to do most of these.”

“Success is about enjoying the work and having the transferable skills and confidence to apply further in your work (in Science or elsewhere) – these transferable skills have been the key in my experience. Generally in science, research, publications and collaborations are supposed to be key milestones and measures of success– in order to get grants etc.”

“Job satisfaction, and increasingly in recent years the profile and respect of your peers.”

“My major successes have been in science management – identifying the best people to bring together to solve problems, maintaining momentum and enthusiasm in major programs, setting optimistic stretch targets, encouraging junior staff.”

“I was most proud when I was made a Professor and gaining membership of the Academy, international recognition is important. I have left science and moved to management where I felt I'd have a bigger impact. My science skills are good but my leadership skills are exceptional.”

“Enjoying what you're doing is success. When you get to make decisions. I want to be senior enough so I can have more influence.”

“Satisfaction equals success, everything else is a bonus. Rewards, remuneration, respect at work, relationship with peers, these are all important and the technical challenge has to be there otherwise you just come to work to socialise. I enjoy the responsibility. I'm learning all the time and there is a small amount of teaching. I love problem solving. I love playing with toys here.”

“Number of different pathways: international recognition, impact, making a difference, leadership roles, having influence, bringing about change, facilitating investment in science. I've had the opportunity to do most of these.”

“How many publications you provide, quality of publications and the amount of money you bring in through grants. ‘What are you contributing to knowledge and understanding?’”

“Feeling motivated and happy, finding balance, working with stimulating people, producing outcomes, global recognition. Feeling what you do is valuable to the world.”

“Good publications, obtaining grants, respect from my peers either within or outside (org) nationally and internationally.”

“Success...I think that's just achieving the aims that you set for yourself. I didn't have a list of aims, but in the back of my head I had things that I wanted and I've taken the opportunities as they've arisen. I've missed a lot too – but I've tried to have balance in my life. Having kids teaches you to prioritise – then you don't waste time on unimportant things.”

“Doing a job I love. Others maybe see success as a title or money, but I see it as a higher community goal. I am not really chasing success.”

“Discovering something that benefits children's cancer prevention. New treatments and improving the targeting of treatments. Making a difference. I love mentoring and training new scientists. Discovery and the sense of excitement when we are managing experiments.”

“Very subjective, always looking to push my capabilities, there's not an actual position I'm aiming for. I need to know what I'll have to sacrifice to get there.”

“Success in a science / engineering career is having the opportunity to have a role where you can make a difference and be in an organisation that values good engineering thinking.”

“Discovering something that benefits children's cancer prevention. New treatments and improving the targeting of treatments. Making a difference. I love mentoring and training new scientists. Discovery and the sense of excitement when we are managing experiments.”

WHAT HAS BEEN THE KEY TO YOUR SUCCESS?

- My success has come from taking opportunities when they have arisen and also to have the courage to take up roles that seemed initially very daunting
- Communication with people, working with great people. I worked really hard, got up in the middle of the night....obsessive.
- thick skin, networking, original research, respect from my peers, students wanting to come and work with me, other institutions valuing my contributions and an unwillingness to succumb to senior management.
- Hard work
- Passion
- Perseverance...supportive family
- Talent, ambition, support
- Look for opportunities
- Interest and enjoyment = success

“My success has come from taking opportunities when they have arisen and also to have the courage to take up roles that seemed initially very daunting. I have also been successful because I have had fabulous people working with me. I worked on making the transition from a good sole contributor to an inspiring leader of people as a priority. I realised very soon that unless you can work effectively through others there are limited opportunities for success.”

“I attribute my success to passion and perseverance.”

“Communication with people, working with great people. I worked really hard, got up in the middle of the night.... obsessive....I don't know any female scientists that need a lot of sleep. Most scientists are driven by recognition not money. Almost all could have made money somewhere else if they needed to.”

“Talent, ambition, support – personal and professional. I am pretty outspoken.”

“I think the key is to like what you're doing and then you work hard. I like working with people and I think people like working with me, I get good teams and therefore we get results.”

“My key has been hard work, thick skin, networking, original research, respect from my peers, students wanting to come and work with me, other institutions valuing my contributions and an unwillingness to succumb to senior management. It's important to just get on with the job- even though not necessarily any respect or support from senior management.”

“Perseverance, personally driven, very supportive family – husband and parents - who look after small children. Confidence very important and my skills have been acknowledged.”

“Quality and impact of your publications.”

“My success has come from taking opportunities when they have arisen and also to have the courage to take up roles that seemed initially very daunting. I have also been successful because I have had fabulous people working with me. I worked on making the transition from a good sole contributor to an inspiring leader of people as a priority. I realised very soon that unless you can work effectively through others there are limited opportunities for success.”

CAN YOU IDENTIFY BARRIERS THAT HAVE LIMITED YOUR SUCCESS?

- I don't feel there have been significant barriers in my career.
- Geographic isolation
- running out of energy or deliberately missing opportunities knowing that I couldn't follow through.
- Some reluctance to support females
- Lack of continuity in grants or project work are a real barrier in research.
- Having a family
- Never acknowledge blockages.
- Not really....family responsibility, hours I am prepared to work
- Women don't tend to put themselves forward
- Affordability and access to childcare is an issue.
- Uniforms not made for women, no toilets for women
- I have overcome great obstacles. Men have tried to intimidate me
- The years you are supposed to be having babies are the years you should be publishing. Not physically possible to do both.
- The workplace is not very accommodating in research. We work long hours,
- I've noticed among some women that there's a sort of fear that you're not capable, or the need to really prove yourself because you're female.
- Seem to be high enrolments from girls at university courses in science, and the lecture level they are equal but from here they drop off

"I don't feel there have been significant barriers in my career. Each time I have taken on a new role I love the work I am doing and that is such a wonderful feeling."

"The only limits to success have been personal ones, running out of energy or deliberately missing opportunities knowing that I couldn't follow through."

"Working in a niche field you are limited by opportunities to move on without making major changes, for instance I've moved across continents to take this position. Not everyone can/will do that."

"Geographic isolation, the action in my area is in the US especially when I started my career, no email then. Being taken seriously coming from (institution)."

"Mainly personal – time management, work / family balance, over-commitment at times have led to stress and poorer performance than I might have achieved otherwise."

"Lack of continuity in grants or project work are a real barrier in research."

"Having a family, but that is only a short term thing. If I was single I'd be further along in my career, but my life is more enriched with husband and kids."

"Not really....family responsibility, hours I am prepared to work.... I am not

"Women don't tend to put themselves forward and Heads of Department don't promote them."

prepared to compromise balance. These could be seen as things that have limited my success."

"Some reluctance to support females. Still some resentment against successful woman. But normally your hard work and competence will win over such critics"

"I personally have not had any, but when I was younger I would often see young men get more attention, more assertive. We don't have that culture here but there clearly are barriers. I've been lucky to have good people around me."

"I think the toughest barrier is having young families – takes up time, financial burden and women bear the brunt of the load. The workplace is not very accommodating in research. We work long hours, at least 60 hrs a week. Work at home, usually a day on the weekend."

"Women don't tend to put themselves forward and Heads of Department don't promote them. "

"Affordability and access to childcare is an issue."

"I have overcome quite a number of obstacles. Men have tried to intimidate me. I was working with a group of men once, they were older than me....'You're a woman, you know nothing. I was bringing equipment online when you

"I have overcome quite a number of obstacles. Men have tried to intimidate me."

weren't even born.' They tried to intimidate me... I have learned, I now get quiet, calm and more articulate when people behave like that. You need to constantly prove yourself or over prove. A woman from NASA once told me that technical competence and food wins them over."

"Sometimes harder with your peers. I tend to get singled out for lots of things, even the media because I am a curiosity, the only woman, this extra attention is resented by peers. My nickname is 'Koala' I'm a protected species. I work at sharing this responsibility around now... Trust is very important, incidents do happen."

"Uniforms not made for women, no toilets for women, it is really difficult when the Manager either male or female doesn't know how to manage people, particularly when you're the only woman working with 1000 male construction workers."

"Lack of confidence to lead, women seem to stumble after post-doc. The men

are more critical, dominant, women don't go after the leadership roles"

"In my mid 20s I was in Antarctica with five other women and 200 men - that had its challenges."

"If I don't operate the reactor for a year my licence expires and then you have to get the licence authorised again and this means waiting for enough participants for a course to be provided."

The years you are supposed to be having babies are the years you should be publishing. Not physically possible to do both. If you want to lead projects you're competing against guys and they don't take a few years out to have kids. You need to be a lot more methodical and planned to have kids and have careers."

"Seem to be high enrolments from girls at university courses in science, and the lecture level they are equal but from here they drop off. Awards for women would be beneficial."

"I haven't had personal experience of it, but I've noticed among some women that there's a sort of fear that you're not capable, or the need to really prove yourself because you're female. Women tend to put in the extra hours for it to be noticed, sometimes try to be more masculine in management roles. Men might be good talkers, but they may not produce much."

"My first boss had 30 years more experience than me and I could tell he thought 'Oh great a graduate and a woman'. I demonstrated that I had something to contribute. I don't have a confrontational style. Seems to be a drop off in engineering after graduation and then again a few years into work, lots go to banking, risk management - it pays well... few unknowns around returning after kids. I'd like to be in a position to encourage others, but the earlier I move into management then I'm moving away from the technical area. There are risks around promoting people to fast, sometimes they then leave"



A RECENT EOWA REPORT FOUND THAT WHEN LOOKING FOR A JOB WOMEN ARE LIKELY TO CONSIDER ADDITIONAL FACTORS SUCH AS THE PROMOTION AND SUPPORT OF WOMEN, FLEXIBLE WORKING CONDITIONS, WOMEN IN SENIOR POSITIONS AND THE PROVISION OF PAID MATERNITY LEAVE TO BE SIGNIFICANT. ARE THESE FACTORS IMPORTANT TO YOU AND HAVE THEY BEEN AVAILABLE TO YOU DURING YOUR CAREER?

- I gave these factors no consideration when choosing a job. I'm a scientist, that's all I cared about.
- These factors were mostly not available to me early in my career
- Paid maternity leave is very important to me and flexible leave
- We lack flexible working conditions, no working from home or anything
- I've always worked in Government organisations where these are a given
- all those factors are important for work life balance and long term security

"I gave these factors no consideration when choosing a job. I'm a scientist, that's all I cared about. Having said that I took maternity leave with both my daughters, breast fed both of them. I have always worked full time but flexible hours and have left work when I needed to attend kid's things. I felt I was entitled to do that."

"Definitely, the switch from research to policy was a very considered decision; all those factors are important for work life balance and long term security. The hours, flexibility, unpaid leave, while still having career momentum. This is very difficult in a research career."

"These factors were mostly not available to me early in my career (apart from paid maternity leave which was extremely helpful) but I have tried to support their introduction into the Department whenever possible."

"I made the decision very early not to have children so the need for maternity leave and flexible working conditions to assist in raising children hasn't been a factor for me. I have concentrated on the intrinsic interest and opportunity in a role as the key considerations."

"All of these things are important and have helped me greatly. It is really difficult in the workplace however and there is an enormous amount of guilt – no amount of schemes can overcome that for ambitious women. This is particularly difficult in situations where deadlines have to be met, but a baby has come along – we want to be in two places at once."

"Not specifically, but then I've always worked in Government organisations where these are a given. So, I've tended to take them for granted."

"Paid maternity leave is very important to me and flexible leave."

"Flexible working conditions are helpful for health and family issues. Very supportive here, we have access to computers at home, lap tops. "

"We lack flexible working conditions, no working from home or anything. I have not taken advantage of maternity leave."

"I gave these factors no consideration when choosing a job. I'm a scientist, that's all I cared about. Having said that I took maternity leave with both my daughters, breast fed both of them. I have always worked full time but flexible hours and have left work when I needed to attend kid's things. I felt I was entitled to do that."

"They are important, and in general have been available since joining government."

HOW DO YOU MANAGE FAMILY RESPONSIBILITIES WITH WORK COMMITMENTS?

- With as little guilt as possible... You can't have everything but I grew up thinking I could.
- It's not hard to be successful in science as a woman, but it is hard to be a wife and mother as well. By not having a family
- Not sure how I'll do that
- I have a very supportive husband who has adjusted his work pattern and career over the years to be complementary to mine.
- Structured chaos!
- A bit of a juggling exercise, especially combining extensive field work with family commitments.
- You can do both, sometimes messily
- Generally not a problem, a few occasions where I was not able to help sick family members, but these are one offs rather than a daily juggling act.
- Family always comes first.
- I took six weeks off after my first baby, two weeks the second.... People expected me to take time off....I didn't. It is a struggle, I feel guilty a lot. I want to be identified as a scientist.
- There's never a good time to have a baby, it is always disruptive, but very important to me.
- Carefully
- You can do both, sometimes messily

"It's not hard to be successful in science as a woman, but it is hard to be a wife and mother as well. I should have had kids during my PhD. The critical time is between PhD and post-doc, it's highly competitive and need to secure that position quickly. I got pregnant so I have missed that opportunity. By then we had a mortgage."

"With as little guilt as possible. You can't have everything but I grew up thinking I could. Always thought I'd go back to work, put kids in day care. I find it hard and challenging to be at home, but when I'm at work and I don't what know what's happening in her day I miss her, I'm in tears, I feel guilty. Something has to give. It's not hard to be successful in science as a woman, but it is hard to be a wife and mother as well. I should have had kids during my PhD. The critical time is between PhD and post-doc, it's

highly competitive and need to secure that position quickly. I got pregnant so I have missed that opportunity. By then we had a mortgage. A post-doc salary can't cover that. I knew I was at a fork I knew I had to make a decision and wanted to prioritise work, I could have gone to UK or Borneo for post-doc, would have loved that. We needed to marry hair dressers; it's hard having two ambitious people.... My husband was never willing to be the primary care giver."

"By not having a family. I've always been more interested in a career than children."

"I have a very supportive husband who has adjusted his work pattern and career over the years to be complementary to mine. This included his spending a lot of time working from home when our daughter was still at school, at a time when I had a great deal of responsibility and was travelling a lot."

"I have a great partner and that makes the difference for me. I know I'm lucky in that respect. He does as much if not more than me – and he's in a corporate job. Still there is a lot of compromise and we also pay out a lot for help so that our non-work time is family time and not all cleaning and washing (although there is still a lot of that). Having access to excellent childcare was essential when the kids were little and our kids are now at the local school....Grandparents have also been exceedingly giving of their time and resources."

"Structured chaos! With my children my husband and I managed six months paid

leave and my parents look after the kids three days a week. Technology helped."

"A bit of a juggling exercise, especially combining extensive field work with family commitments."

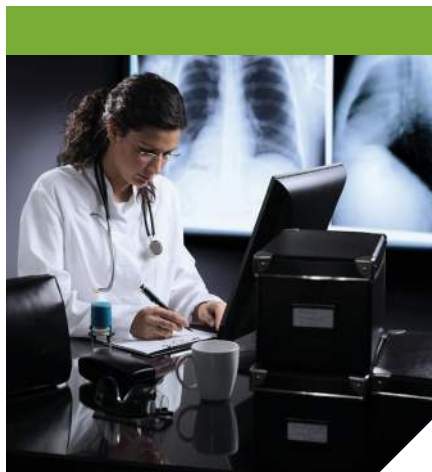
"Generally not a problem, a few occasions where I was not able to help sick family members, but these are one offs rather than a daily juggling act."

"I took six weeks off after my first baby, two weeks the second.... People expected me to take time off....I didn't. It is a struggle, I feel guilty a lot. I want to be identified as a scientist."

"Not sure how I'll do that, I am passionate about having children."

"I have no children and my husband and I share household responsibilities and both are good cooks."

"There's never a good time to have a baby, it is always disruptive, but very important to me. I have two daughters. My husband is very supportive and reorganised his working life when I got the big job. I had easy pregnancies and submitted papers during maternity leave, so I kept up my publications. You can't be at the bench so keep up your publications. This way I continued to establish myself internationally."



ARE THERE WOMEN IN LEADERSHIP POSITIONS IN YOUR ORGANISATION? ARE THEY ROLE MODELS TO YOU?

- I am very proud that in my time as chief the number of women in my section grew from 17-28 %. I think it does make a difference having women in leadership positions
- If there's a lack of women on the board I see that as an opportunity to change....there are no women on board at present.
- No women in leadership positions
- for many years.
- Yes a few at the university
- No women here in senior positions
- There are now

"There are now. Until about five years ago I was the first female in every position I had ever had."

"Yes a few at the university, Head of School Ann Green (physics). Maths Head of School is also a woman, Dean of Science at Cambridge is a woman."

"No women here in senior positions (university)."

"Not directly, but there are women in leadership roles in the state Government; and at other major museums."

"There are now. Until about five years ago I was the first female in every position I had ever had. I spent some years as patron of the (government agency) program, and tried to give advice or mentor wherever appropriate."

"There are a lot of women working in the organisation, quite a few in management positions. Interestingly, many of them either don't have children or have only one. I have noticed a really large difference in the way that these women operate in the workplace. I admire a few of them, particularly the older ones as they have had more battles and less opportunities than I've had."

"Yes definitely, some are. It is important. The Head of my Division is female, gives you hope, it's encouraging."

"One stand out in my field – Agneta Rising, First Head of World Nuclear Association. Next year there will be no female Directors at (institution)."

"Dean - Margaret Harding (UNSW)"

"Yes, my boss."

"I am very proud that in my time as chief the number of women in my section grew from 17-28 %. I think it does make a difference having women in leadership positions; you are a role model, junior women feel more legitimate in those roles, more comfortable."

"As you become more senior you are required to become a leader of people, takes a while to understand that, you need to leave the coalface. There are three challenges for leaders: doing the science, managing people and having a family, I knew I could only do two of the three, I gave up actually doing the science."

"If there's a lack of women on the board I see that as an opportunity to change.... there are no women on board at present. There are women in senior positions, mainly in legal, marketing, sustainability."

"I am one of two senior women in the organisation at the executive level. I have actively worked to encourage other women in the organisation to aspire to leadership positions, and I know they see me as a role model. My peers and the CEO are role models for me."

"No women in leadership positions for many years. I was the only female researcher – currently the only female Senior Principal Research Scientist. Prior to this was the only female Principal Research Scientist for many years."

"There are, and they actively form a network inviting new female staff to join the group for pre-work breakfasts every month to support and foster staff."

If there's a lack of women on the board I see that as an opportunity to change.... there are no women on board at present.

AS A LEADER IN SCIENCE CAN YOU IDENTIFY POSSIBLE STRATEGIES THAT COULD INCREASE WOMEN'S REPRESENTATION IN SCIENCE?

- I think that more flexible work practices including job sharing and some working from home could play a greater role
- Leadership training to encourage women to reach senior roles. Informal mentoring.
- Good school education in science
- More role models, mentoring, events bringing women together.
- The key strategies are to create more opportunities and then for women to have the confidence to take advantage of them
- Mentoring could help provide a more realistic picture, what the demands are, how to plan your career, help you see the many opportunities
- Science teachers need support, career counsellors need to promote these career options for girls.
- More flexible ways of assessing performance, incentive schemes should be changed.
- Schemes where woman can stay connected after having children – I see my peers once they leave work to have kids they really lose their confidence.....
- Extra supports for women to publish.
- Look at structural impediments, how performance is measured, role models are not the key.
- More accessible & affordable childcare.
- Awards for women would be beneficial. In the US they have three year fellowships to re-enter the science sector at post doc level.
- Funding for women to help them re-enter the workforce.
- Mentoring program for young women scientists, post-doc would be the ideal time,
- Exposure, increased profile

"I think that more flexible work practices including job sharing and some working from home could play a greater role than currently in helping women stay in the science workforce especially during their child-bearing years."

"Skills shortage should drive improvements and increase family friendliness."

"I think that more flexible work practices including job sharing and some working from home could play a greater role than currently in helping women stay in the science workforce especially during their child-bearing years. Overall availability of permanent jobs has also decreased in science, and this is likely to disproportionately weed out women from the workforce."

"More role models, mentoring, events bringing women together."

"I think skills that are associated with women, such as facilitating, team work, communication are all skills that are

being increasingly recognised. The key strategies are to create more opportunities and then for women to have the confidence to take advantage of them. Women I meet often tend to 'hold back'."

"Mentoring could help provide a more realistic picture, what the demands are, how to plan your career, help you see the many opportunities. Women do bring something to science, they see and solve problems differently. Any field that is dominated by one sex is limited."

"Starting with good school education in science for all."

"Leadership training to encourage women to reach senior roles. Informal mentoring. If you are pregnant keep your options open."

"Raising the profile of women in science as role models for the next generation coming through."

"Mainly an attitudinal change is required across the board. I have a boss (male) who is very family friendly and agrees to almost anything. However, I know that when he asks me or my staff to do something – we will just do it. Mutual respect and support in the workplace is what we are aiming at – this goes for men and women, and works for us at least."

"They are not getting women into science and engineering at school, therefore uni. Science teachers need support, career counsellors need to promote these career options for girls."

“Increasing women’s representation in science/ engineering has to start by keeping girls interested in science and maths. Investing in schools programs and educating teachers on opportunities in science and engineering is important.”

“Really need to keep women in the industry, there is a big leak when people have kids.”

“Female engineers need more industry experience more scholarships, uni doesn’t give you the courage to cut it. Many go to desk jobs because the culture is too hard.”

“More flexible ways of assessing performance, incentive schemes should be changed.”

“Schemes where woman can stay connected after having children – I see my peers once they leave work to have kids they really lose their confidence...”

“Restructuring roles, for example, more part time opportunities that provide meaningful work. Extra supports for women to publish.”

“Look at structural impediments, how performance is measured, role models are not the key.”

“Fellowships.”

“More accessible & affordable childcare.”

“Women are moving into science. My classes and my PhD students, there are lots of women (biology), but this is not translating into senior positions. Very competitive to rise up the ranks,

publications, women need to be encouraged to apply for grants and the big jobs.”

“Seem to be high enrolments from girls at university courses in science, and the lecture level they are equal but from here they drop off. Awards for women would be beneficial. In the US they have three year fellowships to re-enter the science sector at post doc level.”

“Funding for women to help them re-enter the workforce.”

“Mentoring program for young women scientists, post-doc would be the ideal time, supervisors can do some of this, but someone more removed could be useful.”

“Role models going to schools, eg YTP, young women at school don’t see barriers.”

“Networking forums.”

“Leadership training, promotion and encouragement. I can’t believe more women don’t want to achieve and get to the top.”

“Exposure, increased profile”

“Increasing women’s representation in science/ engineering has to start by keeping girls interested in science and maths. Investing in schools programs

and educating teachers on opportunities in science and engineering is important. Unless there is a strong and steady flow of girls and young women into science and engineering fields it will not be able to increase the representation of women in science/ engineering roles.”

“For the women who do enter science/ engineering careers some will find it useful to know that success is definitely possible. So setting up forums where they hear about the successes of other young women and get to see successful senior women leaders will be important. For women who choose to have children then child-care and flexible hours are likely to be needed. At (organisation) the majority of women who take maternity leave return either on a part-time basis or full time. (Organisation) actively supports their decision and will structure their responsibilities to account for their availability.”

“While plenty of females undertake PhD in marine biology relatively few go onto to continue research, perhaps joint positions, too often female biologists marry other biologists and trying to find two jobs in the same place is very difficult. Certainly promotion being based on publications can mean that when females are having children, the time when males are being promoted, still think that the few females which do make it have to be better than the average male in order to progress.”

DO YOU THINK THE GOVERNMENT OR BUSINESS COULD DO MORE TO PROMOTE AND SUPPORT WOMEN'S CAREERS IN SCIENCE?

- investing in education and teacher training is important.
- Showcasing achievements of women in science.
- opportunity and support. The opportunities are there for women now, especially in science. Support is still somewhat lacking.
- Career breaks can be deadly and there needs to be ways for women (and men) to reengage with their career.
- there are systematic problems with careers in science for both men and women that also need addressing. I regularly hear stories of good scientists of both sexes giving up on careers in science because of limited opportunities.
- Government and industry could develop a CEO Toolkit using the CEW (Chief Executive Women) "CEO ToolKit" as a model to develop a similar program but aimed at women in science and engineering.
- Many industry bodies are already working on promoting women in engineering and science,

"Support is still somewhat lacking – mainly in affordable childcare, for many people this is either just not available or is prohibitively expensive. I also understand that many people don't, or are not able to reenter the workforce after having children. Career breaks can be deadly and there needs to be ways for women (and men) to reengage with their career."

"It comes back to the basics: opportunity and support. The opportunities are there for women now, especially in science. Support is still somewhat lacking – mainly in affordable childcare, for many people this is either just not available or is prohibitively expensive. I also understand that many people don't, or are not able to reenter the workforce after having children. Career breaks can be deadly and there needs to be ways for women (and men) to reengage with their career. In my section there are two staff (a male and female) who have young children. We have tailored their projects and work programs to accommodate their needs and adjusted and employed other staff to ensure that our targets are met. This is more work at a management level – but it is worth it for a balanced, happy workplace."

"Recognising the complementary skills women often bring to the workplace,

such as their people skills and complex organisational skills, and creating teams / management structures with both males and females would be very helpful. Showcasing achievements of women in science and emphasising the value of diversity in schools presentations."

"For the Government investing in education and teacher training is important. With younger people using all forms of internet based communication and collaboration tools, then hosting a site with an Australian flavour would be effective. Many industry bodies are already working on promoting women in engineering and science, for example, Engineers Australia have had a year-long focus on Women in Engineering."

"Government and industry could develop a CEO Toolkit using the CEW (Chief Executive Women) "CEO ToolKit" as a model to develop a similar program

but aimed at women in science and engineering rather than the broader area of women in leadership."

"Basically we need to support the concept of having specialists, rather than administrators, we need people with a long term commitment to a particular field. It takes a long time to build up expertise. Governments need to realize that science must be supported for both males and females not sure I believe in positive discrimination, females must be of good quality they must not be a token."

"Yes, of course. But I think there are systematic problems with careers in science for both men and women that also need addressing. I regularly hear stories of good scientists of both sexes giving up on careers in science because of limited opportunities."

WHAT ADVICE WOULD YOU GIVE YOUNG WOMEN TODAY CONSIDERING A CAREER IN SCIENCE?

- Be yourself. Do what you love and get on with it.
- Science is one of the most enjoyable careers, but it's not for everyone
- Pick something you like, enjoy what you do, publish constantly
- Lots of opportunity to make a difference in many different and incredibly important areas.
- It is a fantastic career to be paid to do something you love.
- Find a role model or potential mentor
- and start a conversation with them
- Get work experience, so you know what it's like in the field. Find people who will support you

“Pick something you like, enjoy what you do, publish constantly but be discerning about where you put your article. Communicating what you do to your peers, your superiors, funding bodies and the community is very important.”

“Science is one of the most enjoyable careers, but it's not for everyone. Take the time to think about what you like: you can have a career that matches your interest. Don't worry about what other people think. Reevaluate often – if you don't like it, change. We are lucky these days that careers evolve and are not fixed from the outset. Take the opportunities, but don't feel bad if you miss out – there will be others.”

“Go for it! Lots of opportunity to make a difference in many different and incredibly important areas.”

“Women offer a unique perspective that is valuable. Place yourself in a position to be rewarded. I've got a lot out and I've put a lot in. Don't put too many obstacles too soon so you give up, be realistic, find support.”

“Pick something you like, enjoy what you do, publish constantly but be discerning about where you put your article. Communicating what you do to your peers, your superiors, funding bodies and the community is very important.”

“Get work experience, so you know what it's like in the field. Find people who will support you. Networking can help with or lead to grants, jobs, presentations, who has done similar work? Be proactive about finding a mentor, you need to sell your science, projects and yourself. You need passion and courage. Work on public speaking skills.”

“Find a role model or potential mentor and start a conversation with them. Use their experience to help plot a path for yourself.”

“It is a fantastic career to be paid to do something you love.”

“I'd ask them questions: why, where do they see themselves, money?”

“Definitely consider engineering/ science as a career. You don't need to have been building radios, pulling apart your family's appliances or mixing chemicals in the back shed to be a successful engineer as an adult. You do need to be numerically literate and be a good thinker. Engineering and science will only benefit from having

a diversity of participants, so be proud of the perspective you bring to any company and any role and give it a go.”

“Exciting opportunities, but be willing to work hard and long hours and be really committed, otherwise find another career. Don't expect to necessarily be reimbursed financially very well but the excitement and satisfaction of undertaking original research is what must drive you, and also one needs to believe in one self have confidence in yourself.”

“If you really enjoy doing something it shows, and you will do well in it. A science education offers a great springboard to a career in science research or other areas like education, environmental management, policy, or industry. Be prepared to follow new opportunities in your career – even if as you can't always predict them.”

“Be yourself. Do what you love and get on with it. Have children when they turn up, it may never be an ideal time but it's worth it. Long hours don't necessarily lead to success.”

7 CONCLUSION

The comments and stories of these 15 women are inspiring and passionate. They are committed to their professions and are motivated by the excitement of discovery and the potential for their work to make a difference to the world.

Most of these women share the factors common to successful female scientists that are identified in the InterAcademy report and many have reached leadership positions in their fields. Some have not experienced limits to their careers due to their gender, however nearly all have seen this occur to peers and acknowledge that many women are not realising their potential in science and engineering. The barriers to women's careers in science identified in these interviews support the literature findings. Discrimination, 'blokey' and often threatening workplace cultures, the burden of family responsibilities in a key career stage, and lack of career path are all factors that "push" women from this sector and prevent women reaching leadership positions in science.

If there is to be a commitment to increasing women's representation and leadership in science the following 16 points that were identified in the international literature and confirmed by these interviews would be the starting point for an informed public policy response.

1. Ensuring an adequate supply of well qualified science and maths teachers,
2. events to bring women together,
3. websites that provide information, resources and offer networking opportunities – WISENET,
4. science education programs that target girls,
5. promoting careers in science to girls,
6. scholarships to facilitate international networks for women,
7. mentoring and sponsorship programs,
8. leadership training and professional development,
9. an inclusive and diverse work culture,
10. flexible work conditions,
11. paid parental leave and flexible child care,
12. re-entry grants after a career break,
13. keep in touch schemes for women having career breaks,
14. commissioning research into women's careers in science and engineering, particularly collecting gender disaggregated data at key science agencies, institutions and Government Departments,
15. promoting successful women in science and engineering to the community through the media,
16. awards for achievement.

APPENDIX

Appendix One

Australian Bureau of Statistics 2006,
Census of population, occupation by sex

Appendix Two

List of institutions represented in interviews (in some cases two people were interviewed).

- Australian Museum
- Australian Nuclear Science and Technology Organisation (ANSTO)
- Australian Research Council
- Bovis Lend Lease
- Cochlear
- University of Sydney - physics
- University of NSW – physics and biology faculties.
- Children's Cancer Institute Australia
- CSIRO - Canberra
- Department of the Environment, Water, Heritage and the Arts
- NSW Department of Primary Industry
- NSW Royal Botanic Gardens

Appendix Three

Persons employed with engineering qualifications by industry, Australia 2004-05.

	Number (000's)	Proportion by industry (%)
Agriculture	30.3	2.8
Mining	30.3	2.8
Manufacturing	231.6	21.4
Utilities	21.6	2.0
Construction	143.9	13.3
Wholesale trade	59.5	5.5
Retail trade	162.3	15.0
Hotels/hospitality	19.5	1.8
Transport/storage	69.3	6.4
Communications	28.1	2.6
Finance/insurance	16.2	1.5
Business services	130.9	12.1
Government administration/defence	44.4	4.1
Education	23.8	2.2
Health/community	26.0	2.4
Cultural/recreational services	18.4	1.7
Personal Services etc	28.1	2.6
Total	1082.2	100.0

Source: Centre of Policy Studies, Monash University, 2005.

Appendix Four

Persons employed with natural & physical science qualifications by industry, Australia 2004-05

	Number (000's)	Proportion by industry (%)
Agriculture	6.1	3.1
Mining	4.5	2.3
Manufacturing	15.6	7.9
Utilities	2.2	1.1
Construction	5.5	2.8
Wholesale trade	6.7	3.4
Retail trade	12.6	6.4
Hotels/hospitality	3.0	1.5
Transport/storage	5.9	3.0
Communications	3.4	1.7
Finance/insurance	7.9	4.0
Business services	35.3	17.9
Government administration/defence	14.8	7.5
Education	36.9	18.7
Health/community	24.3	12.3
Cultural/recreational services	6.3	3.2
Personal Services etc	5.9	3.0
Total	197.4	100.0

Source: Centre of Policy Studies, Monash University, 2005.

REFERENCES

- Australian Bureau of Statistics, *Australian Social Trends* 1998, (Cat. No. 4102.0), Canberra.
- Australian Bureau of Statistics 2002 *Labour Force* (Cat No. b203.0) Canberra
- Bailey, T., and J. Mouton. 2004. *Women in science, engineering and technology in South Africa*. Stellenbosch: Stellenbosch University.
- CAWMSET. 2000. *Land of plenty: Diversity as America's competitive edge in science, engineering and technology*. A report by the Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development; www.nsf.gov.
- Centre of Policy Studies, Monash University, Melbourne 2005.
- Department of Education, Science & Training, *Audit of science, engineering, and technology skills, Summary Report, July 2006*
- Department of Family and Community Services, Office for Women, 2004 *Women in Australia, Canberra*
- Etzkowitz, H., C. Kemelgor, and B. Uzzi. 2000. *Athena unbound: The advancement of women in science and technology*. Cambridge: Cambridge University Press.
- Engineers Australia, *Valuing the Difference: An update on the progress of women in the engineering profession*, April 2008.
- Equal Opportunity for Women in the Workplace Agency (EOWA) *Generation F: Attract, Engage, Retain- Key findings*, April 2008
- EOWA 2006 *Australia Census of Women in Leadership- the status of women in the workplace*.
- Glover, J. 2000. *Women and scientific employment*. New York: Macmillan.
- Goetzfried, A. 2004. *Women, science and technology: Measuring recent progress towards gender equality*. Eurostat; www.eurostat.gov.uk
- Hewlett, Sylvia Ann; Buck Luce, Carolyn; Servon, 'Stopping the Exodus of Women in Science' *Harvard Business Review*, June 2008.
- Hewlett, Sylvia Ann; Buck Luce, Carolyn; Servon, Lisa J.; Sherbin, Laura; Shiller, Peggy; Sosnovich, Eytan and Sumberg, Karen, 'The Athena Factor: Reversing the Brain Drain in Science, Engineering, and Technology', Research Report, *Harvard Business Review*, June 2008.
- Hewlett et al 'Off-Ramps and On-Ramps: Keeping Talented Women on the Road to Success,' *Harvard Business Review*, March 2005.
- Hewlett et al 'Stopping the Exodus of Women in Science,' *Harvard Business Review* June 2008.
- McGrayne, S. 2001. *Nobel Prize women in science: Their lives, struggles, and momentous discoveries*. Washington DC: National Academies Press.
- Moen, Phyllis, 'Its constraints not choices' *Science*, vol 319, 15 February 2008.
- Padilla, C., and Santos Ocampo, P. (eds.). 2004. *A century of women in the health sciences*. Manila: National Academy of Science and Technology; Institute of Human Genetics, National Institutes of Health, University of the Philippines Manila.
- Piterman, Hannah, *The Leadership Challenge Women in Management*, March 2008.
- Roberts, G. 2002. *SET for success: The supply of people with science, technology, engineering and mathematics skills*. Final report of Sir Gareth Roberts' review. London: HM Treasury; accessible at www.hm-treasury.gov.uk
- Stone, Pamela, *Opting Out? Why women really quit careers and head home*, University of California Press, Berkeley, 2007.
- The InterAcademy Council, *Women for Science - An Advisory Report*, June 2006.
- Wasserman, E. 2000. *The door in the dream: Conversations with eminent women in science*. Washington, DC: Joseph Henry Press.