

WISENet

Seeds of Change



Native seeds, pods and fruit at the NSW Seedbank



NSW waratah *Telopea speciosissima*



NSW waratah *Telopea speciosissima* pods and seed

WISENET NSW – Sydney Link Group

WISENET Journal
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WOMEN IN SCIENCE ENQUIRY NETWORK

Objectives

- (a) To build a supportive and active network of people interested in the objectives of WISENET and to liaise with other interested groups;
- (b) To increase women's participation at all levels in the sciences where they are now underrepresented;
- (c) To provide comment and to examine the education, training and employment structures which currently restrict women's opportunities in the sciences;
- (d) To gather and disseminate data on women in science – the sciences here including the physical, social and life sciences, mathematics, computing, medicine, engineering and associated technologies;
- (e) To explore linkages between the different disciplines and promote communication between scientists and the community on science related social and environmental issues;
- (f) To promote research and technologies for the benefit of communities;
- (g) To explore programs for change in the sciences and support more democratic and participatory systems as an alternative to the traditional models;
- (h) To support appropriate action to achieve these objectives.

Women in Science Enquiry Network (WISENET) Inc was established to increase women's participation in the sciences and to link people in different branches of science and those who are working towards a more participatory and socially useful science.

WISENET was formed through the establishment of a series of link groups throughout Australia. State and regional groups act autonomously, focusing activities primarily at a local level, but also inclusively with other groups for more general or national issues.

WISENET is open to women and men who are involved or interested in the sciences and who are interested in working for change in line with the objectives. New members are welcome. If you would like to join, please complete and return the application form at the back of this issue.



c/- Convention Associates, 13 Jeffrey St, Mt Waverley, VIC 3149

WISENET'S Web Site: <http://www.wisenet-australia.org>

Editorial

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Avoid sexist or other discriminatory language. WISNET reserves the right to make editorial changes. Each article is the opinion of the author and not necessarily that of WISNET.

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After reading and enjoying so many Wisenet journals over the years, it has been a pleasure and privilege to co-ordinate the production of this issue from the Sydney Link group. The Journal is a marvellous resource that Wisenet contributes to its members, and beyond, through making this available on the Wisenet website after publication. Like most readers, I'm also a member of other organisations, some of which provide newsletters to their members. However, I look forward to the arrival of my Wisenet journal like no other. It goes home with me the day it arrives, and is read from cover to cover the same night. However, when it came to editing an issue, these same past journals became a source of anxiety. Would we be able to produce something that I would also want to tear the wrapper off, and read cover-to-cover?? Thanks to our dedicated and inspired contributors, I hope you'll find this to be the case.

The title of this issue, "Seeds of change", was inspired by the beautiful images provided by one of our editors, Amelia Martyn, from the Mount Annan Botanic Garden. Seeds seemed to also represent many of the articles in this issue, which celebrate the work of Sydney women, discuss remaining difficulties for women working in science, and provide concrete examples of how we can collectively promote change. Sometimes my colleagues raise their eyebrows when I mention that I'm a member of Wisenet, murmuring that perhaps such an organisation isn't really necessary today. I say by reply that I really wish it weren't necessary. I don't like to think that I have any disadvantage in my chosen field due to something as immutable as my gender, but as highlighted in this issue, inequities for women do remain. For these to ultimately disappear, we must continue to speak out against gender bias, and work in constructive ways to ensure equal opportunity for all scientists. We know, after all, that this is in everyone's best interests, as we need the best talent available, fuelled by diversity in all its forms, to produce better and faster answers to the problems confronting life on earth today.

The Sydney link group has shown marvellous enthusiasm towards this journal project, and I thank all of the contributors for their time and inspiration. I would also like to sincerely thank Amelia Martyn and Gabi O'Sullivan for their dedicated editorial work, Sue Henderson for her lay-out work, and Anna Robinson, Diana Temple, Rosemary Sutton and Rosemary White for their advice and encouragement.

Jennifer Byrne
NSW (SYD) Convenor



A Passion For Australian Plants

Finding my way in the NSW Seedbank

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I work at Mount Annan Botanic Garden in south west Sydney with a dedicated team of horticultural scientists who are steadily building on our knowledge of Australian native plants. We work under the guidance of Dr Cathy Offord to 'domesticate' species such as flannel flowers, waratahs and most recently, the Wollemi Pine, by selecting suitable genetic lines and researching their requirements in cultivation. The group also plays an integral role in the conservation of plant species native to NSW by storing seeds or living plants and collecting valuable biological information about each species.

Seed storage and research at Mount Annan has recently been given a boost through the SeedQuest NSW program, which aims to collect, store and research seed of 250 species each year. SeedQuest is a partnership with the Millennium Seed Bank Project of the Royal Botanic Gardens Kew in the UK (also featured in Sarah Ashmore's Wisenet article in April 2005).

I've been working as a researcher in the SeedQuest project for about 18 months, with the task of improving germination, breaking dormancy and working out the lifespan of seeds stored at the NSW Seedbank. I feel very lucky to work with our native flora and am constantly amazed at the relative scarcity of information about species literally on our doorstep, our roadsides and in our parks and reserves.

My job is a natural extension of my long-held passion for plants, particularly Australian native plants. I was lucky to have parents who took my four sisters and I bushwalking in the Royal National Park and an extended family who encouraged our curiosity about natural things. On one memorable occasion, my science-teacher uncle helped us microwave pine cones to

extract the winged seeds, and then toss the seeds from the highest chair we could stand on to watch them 'helicopter' to the ground. My nana, the owner of the microwave, was very tolerant... It turns out that seeds played a special role in our nana's family, as her distant ancestors were American pilgrims who sewed seeds into the hems of their dresses to keep them safe as they toiled along the Oregon Trail.

After studying physics and chemistry (no biology!) at high school, I began a Horticultural Science degree at the University of Sydney. I gained a new appreciation for the complexity of plants and took subjects on native plants to supplement my knowledge of traditional horticultural crops. I investigated the horticultural potential of an Australian native pea (*Swainsona sejuncta*) under the joint supervision of staff at Mount Annan and the University for my Honours project. My task was to work out whether this beautiful but alarmingly robust and prolifically seeding species had significant weed potential. Even with the data behind us and recalling the phrase "One year's seeding, seven years' weeding", it's no easy job convincing the horticulturalists that the colourful pea is not the best addition to their garden!

I then worked as a research assistant in a mycology lab for a year and decided that I wanted to experience the full spectrum of research, from planning to collecting and analysing data and communicating results. So I returned to university, where my Honours supervisors offered me the opportunity to do a PhD study on waratahs. Commercial flower growers were concerned about a problem called "bract browning", where the bracts surrounding the waratah inflorescence turned brown prior to harvest. After almost four years, I could explain to growers that bract



Amelia examining seeds under the microscope.



Sorting waratah seed at the NSW Seedbank. Foreground to background – Amelia Martyn, Leahmyn Seed and Richard Johnstone.

browning was similar to sunburn, and could be reduced simply by shading the waratah plants before the flowers opened in spring. The physiological explanation for bract browning begins with light damage (chronic photoinhibition) leading to pigment loss, probable oxidative damage to other cell components and eventually, cell death and necrosis seen as browning.

In my work and studies, I've had great support and encouragement from my (mostly female) supervisors and have been a mentee and mentor in formal programs. I'm keen to show this kind of support to others and to encourage people to take make the most of opportunities that come their way; so I've become a Spokeswoman for Mount Annan. All NSW public sector agencies are required to operate a Spokeswomen's Program with the aim of identifying and acting on matters affecting women, providing information and professional development opportunities and increasing gender equity in organisations. This has



given me the opportunity to meet great women throughout NSW who are passionate about women's issues and conservation (Mount Annan Botanic Garden, along with Mount Tomah and the Royal Botanic Gardens Sydney are all part of the NSW Department of Environment and Conservation).

Being a spokeswoman at work and a member of Wisenet, and coming from a large family with four sisters (at present, one engineer, one camera person, one artist and one determined high school student), reassures me that I'm connected to a network of strong, intelligent and caring women. I'm optimistic that by joining together and supporting each other we can really make a difference in our world! ❖

Resources

NSW Seedbank at Mount Annan Botanic Garden

http://www.rbg Syd.nsw.gov.au/mount_annan_botanic_garden

Horticultural Research

http://www.rbg Syd.nsw.gov.au/conservation_research/horticulture_research

Spokeswomen's Program

<http://www.premiers.nsw.gov.au/WorkAndBusiness/WorkingForGovernment/EqualEmploymentOpportunity/SpokeswomensProgram/>



Conservation and horticultural research group at Mount Annan. Front L-R Cathy Offord, John Siemon, Patricia Meagher. Back L-R Amelia Martyn, Leahmyn Seed, Lotte von Richter.

Photographs: Jaime Plaza, Botanic Gardens Trust Sydney.

Kick-off! A new study may change the way that Rugby League players train

Frances Morgan

Internal Communication Producer, Marketing and Communication Unit, UTS



Love it or loathe it, the popularity of Rugby League is indisputable. In Australia 86 000 adults and 71 000 children play the game, not to mention the number of people who make a sport out of watching it and shows about it. Since Rugby League's inception in the 1890s in northern England, it has become fiercely competitive and increasingly demanding on the players.

Despite the game's high profile, few scientific studies have been conducted on the movement patterns and work-load of professional players – and no recent

' The concept has applications for training in other team sports as well '

studies have been conducted to reflect changes in game rules – until now.

Long time Rugby League fan Anita Sirotic is completing a PhD at the University of Technology Sydney (UTS), on a series of studies aimed at designing position-specific training programs and more effective testing procedures. Using the Parramatta Eels team as a case study, she has been comparing the movement patterns and physical demands required of specific positions in first and second grade Rugby League.

Forwards, backs, ball players, hookers and full-back positions each have different physical demands placed on them. But according to Sirotic, training regimes do not always reflect this. "Props often play a 20-minute half, have a break and then play another 20-minute half, but their stint often involves more sprinting and fast running. Full-backs on the other hand often play an 80-minute game but do not take part in as many high intensity activities."

Sirotic and two research assistants attended all of Parramatta's home games for the 2004 and 2005 football seasons and filmed specific positions. The games were then viewed on a large screen complete with field dimensions. As she watched, Sirotic marked where the players were on the field. She then placed the player's movements into categories of standing, walking, jogging, running or sprinting and analysed the amount of distance covered using a program called Sportstrak. This enabled her to quantify the work demands and running patterns required of specific positions during competition.

Sirotic was also able to identify when players were beginning to fatigue. Her supervisor Dr

Aaron Coutts says, "This information will be useful for coaches when determining how to use the interchange of specific players."

The data is currently being analysed to produce a position-specific running protocol using a custom-built non-motorised treadmill (developed in 2003 by Coutts, with US company Woodway and the Adelaide-based Fitness Technology company) that measures force and performance in athletes.

In the early stages of her research Sirotic tested the non-motorised treadmill to make sure that it was a reliable method to measure the performance of team sport athletes. Eleven male athletes from Rugby League, soccer, AFL and hockey visited the Kuring-gai campus on three occasions and completed an identical 30-minute protocol. The results showed that she could reliably replicate the running demands of team sports in a laboratory setting. The combination of results from

this early work, are now being used to develop and monitor specific training programs for professional Rugby League players.

Using ongoing analysis from Sportstrak, Sirotic was able to identify an improvement in the Parramatta Eels' performance during 2005. "I found that the average speed of player movement in some key positions had increased during this time. We think that the most likely reasons were that the Parramatta Eels changed some players in important positions as well as training methods and tactics this year" said Sirotic.

The concept has applications for training in other team sports as well. "It's a big step in terms of sports research and training. We've narrowed it down to Rugby League for the moment but it would be of benefit to any team sport," she said.

Once the protocol has been written, Sirotic will complete a training study on Rugby League players. "Our next step is to determine training methods that are



*PhD student and long time
Rugby League fan,
Anita Sirotic*

specific to the game demands and then to develop strategies that can optimise training to improve running ability and hopefully match performance in Rugby League."

Sirotic, who has always had a keen interest in sport, completed an undergraduate degree in Sports and Exercise Management at UTS followed by an honours year in human movement, also under the supervision of Aaron Coutts.

The honours research which involved an intensive three-week training study with 18 female touch football players, focused on using the custom-built non-motorised treadmill to demonstrate that increased oxygen uptake increases athletes ability to perform prolonged intermittent high-intensity exercise such as repetitive sprints on the sports field. Sirotic and Coutts assessed the participants' fitness components, particularly endurance capacity, oxygen uptake, anaerobic capacity (exercising with insufficient oxygen in the muscles), the anaerobic threshold and other sports science measurements. The results showed that both interval training and small-sided games training were appropriate methods to increase maximal aerobic capacity in field sport athletes. Sirotic also showed that increasing oxygen uptake allows field sport athletes to perform more work during high-intensity activities such as repetitive sprints, which are important for success in field sports.

Ironically at the end of year 12, Sirotic tossed up between studying architecture and sports and exercise management, but decided against architecture because of the many years of study involved. Her honours year whetted her appetite to hone in on a more specific area of research and to concentrate on Rugby League. When her PhD is complete Sirotic hopes to continue working in this field. ❖

Women in Science

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In 2005, I was asked to give a lecture on the subject “Women in Science” as part of the “Postgraduate Lecture Series” at the Centenary Institute in Sydney. This series used to be strictly scientific, but has more recently been organised by an enthusiastic but somewhat mischievous medical graduate now doing a PhD. He decided to make the series more interesting by making the topics more controversial. The Institute Director would be asked to pontificate on “Great Scientific Discoveries of the Past 500 Years” or “Medical Progress in the 20th Century”, and colleagues would attempt to explain topics such as “How to Make Money in Science”. In 2004, I was asked to talk about “Immunological Controversies”, which proceeded without too much of the same. However in 2005, I could see “Women in Science” degenerating into an unpleasant shouting match, and it was with considerable trepidation that I agreed to take the subject on.

Upon Googling the topic (how else to start preparing a lecture on a general subject these days?) I discovered a number of sites that dealt with famous women in science — usually starting with Marie Curie. These were generally lovely homilies about how brilliant women had made it through despite prejudice (which, the articles implied, would not be operating in our more enlightened times). But I felt that this approach would not be of much help to the women graduate students at the Centenary Institute. After all, who regards themselves as being in the same league as Marie Curie? If we have problems in our careers, they could as easily be attributed to a lack of brilliance as to prejudice.

I also rather suspected that I was invited to give this lecture so that I could complain, as I have learned through bitter experience never to do in mixed company, of instances when my gender was the target of overt, or far more often covert, discrimination. I therefore dodged the issue by treating the lecture as a

purely factual exposition of the position of women in science, with a diversion into some possible contributing factors, garnered from published research in social psychology. So what follows is my attempt to describe the position of women in science today, summarised from this one-hour lecture. I have concentrated on biology and more particularly on immunology, my field of scientific study, and I have tried to find Australian data to compare to US and European data, although I would be the first to admit that this is by no means a statistically rigorous presentation. Most of the data were taken from web sites, which I have tried to acknowledge conscientiously, and I checked some but by no means all the primary papers to which these sites refer.

The National Science Foundation of the USA publishes figures showing the number of bachelor’s degrees awarded to women and men in science and engineering each year since 1966. The number of men awarded degrees has remained fairly constant since the mid ‘70s, whereas the number of women awarded degrees has doubled, and equalled that of men for the first time in 2001. Twice as many doctoral degrees in science and engineering were awarded to men as women in 2001, but once again, the curve for males had been relatively flat for many years, whereas the curve for women has moved steadily upwards. If no other factors supervened, one would expect that the number of women moving into more senior positions in science and engineering would also be steadily increasing, and that is true for 5 or so years after the award of a doctorate. After that, the women start to disappear. Those who stay take an average of 3 extra years to reach full professorship, and face an increasingly large gap in salary — up to 25% less than that of male colleagues of equivalent rank by age 60. On every measure — academic rank, years taken to achieve that rank, salary— women consistently lag behind men. Nonetheless, the US does relatively well in employing women in top-ranking university positions, with 17% of these positions being occupied by women. In the UK and Germany, these figures are 7% and 4%, respectively, although France and Italy do better, with 16% and 15% of

‘Gender.... schemas are unconscious, and operate independently of good intentions, so female colleagues will be no more conscious of this form of gender-based discrimination than men.’

top university positions being occupied by women. Even in Sweden, a supposed paradise in terms of social equality, only 10% of top university positions are held by women. In EU countries, approximately 50% of university undergraduates are female, but their representation drops progressively to 40% of PhD students, 30% of assistant professors, 20% of associate professors and about 10% of full professors.

The American Association of Immunologists (AAI) has run a Women’s Committee for many years. They maintain a database of women in immunology, so that meeting organisers can be reminded about candidates for invitation, and journal editors can look for associate editors. (Unfortunately, they recently decided to restrict this service to members). The AAI has collected figures on the representation of women in US Immunology Departments. The proportions vary from 30% at Stanford and Berkeley, 17% at Harvard, to 5% at the University of Minnesota. The proportion of female graduate students is between 45% and 60% at all institutions for which figures are available. The Australasian Society for Immunology (ASI) does not keep similar figures, nor is there a Women’s Committee. However by looking at membership lists, I was able to estimate that PhD students and research assistants are 70% female, post-docs are about 45% female, and full professors are 14% female. At the Centenary Institute, 69% of our students, 36% of post-docs and 11% of senior scientists are female (that’s me in the latter category, the one female laboratory head for the past 12 years).

At recent US Keystone meetings in the field of immunology, 27% of plenary speakers were female. At our own ASI meetings, which rotate around the capital cities in a 7 year cycle, we have averaged 19% female plenary speakers over the past 10 years, but some cities stand out from the mean. Melbourne, which has the largest number of ASI members of any capital city in Australia, has managed just one female plenary speaker in the last 3 ASI meetings, of a total of 39 plenary speakers. Adelaide, on the other hand, managed 7 female plenary speakers out of 30. There has been a concerted effort to increase the number of women on the editorial boards of international immunology journals, partly in response to lobbying from the AAI Women’s Committee. The average is now about 20%, up from 10% in 1994. (In that time, the

number on the editorial board of Immunology and Cell Biology, the immunology journal run by ASI, has decreased.)

One factor that is often quoted as explaining women’s under-representation in the higher echelons of science is that there is a pipeline from graduation to retirement, and it takes many years for increased representation in the junior ranks to flow through to more senior levels. However, the representation of women in senior positions has been quite stable for the past 10 years, despite the increased availability of junior women to be promoted into those positions, so the pipeline is clearly very leaky. There is also a perception, often voiced when women’s representation in science is discussed, that women “choose not to compete”. However, this could just as easily become an excuse for institutions to choose not to promote them. What are the factors that prevent women from reaching senior positions at the same rate as men? Clearly the responsibilities of childbearing and childcare are a major factor, as they are in the rest of the workforce. In science, women with children advance more slowly than those without, whereas the opposite is true for men. But even women without children advance more slowly than men. I don’t propose to go into the obvious need for more social support for working women with children in this context. This is part of a wider social problem in the distribution of work, which seems to be getting less rather than more equitable as the professions work harder.

Overriding this whole picture is the question how society treats men and women differently, and how this plays out in the world of science. In the field of social psychology, these patterns of human behaviour are referred to as “Gender Schemas”, and I am indebted to the website of Virginia Valian at Hunter College NY ⁽¹⁾ for much of the discussion that follows. Gender schemas (also referred to as gender stereotypes) describe how the differences in behaviour between men and women are self-perpetuating and self-reinforcing. These schemas are unconscious, and operate independently of good intentions, so female colleagues will be no more conscious of this form of gender-based discrimination than men.

Typical experiments supporting the existence of gender schemas have made use of self-assessment of the monetary value of work per-

‘...many molehills turn into mountains, and small imbalances add up to disadvantage women.’

work performed by college students, in the absence of any outside input. Male self-assessments can be more than 50% higher than the self-assessments of females, and when asked to perform what they judge to be a reasonable amount of work for a given amount of money, males typically perform less work, and perform this less carefully. Males and females also prefer to see men in leadership roles. In one particular study⁽²⁾ college students were shown slides displaying 5 people seated around a table and asked to identify the leader. In same gender groups, the person at the table head was always identified. In mixed gender groups, the man at the head was always identified as the leader, but if a woman was at the head, a man seated elsewhere was labelled the leader about 50% of the time. The gender of the observer made no difference to the judgements made. In another study⁽³⁾, two trained actors followed a script in which one adopted a “friendly but assertive” leadership role. The leader could be either male or female. Naive observers, both male and female, gave more positive than negative facial expressions to men playing the leadership role, and the reverse was true for women playing the same role. Virginia Valian gives another example on her website⁽¹⁾ to which many women can probably relate. This is where a woman makes a suggestion, which is ignored, as if she hadn’t spoken. Five minutes later, a man makes the same suggestion, to universal applause. If the woman mentions what has happened, her colleague, with the best intentions in the world, says ‘Don’t make a mountain out of a molehill’. But as Virginia Valian goes on to say, “...many molehills turn into mountains, and small imbalances add up to disadvantage women. Success is largely the accumulation of advantage, exploiting small gains to get bigger ones.”

Gender schemas start to operate early. In studies of perception of maths ability in American junior high school students, taken at an age when there is no substantial gender difference in high school maths performance tests, both boys and girls agree that boys’ skills are higher. Self-evaluation is lower, relative to performance, for girls, whereas the reverse is true for boys. For selecting a career path, high school girls are more influenced by marks and self-evaluated ability, the advice of parents and teachers, job opportunity, desire for career flexibility and the desire to make the world a better place. In contrast, boys are more influenced by the perceived

status and remuneration of the chosen job. Perceptions can also influence performance. When females taking an undergraduate maths test are told that females typically score lower than males, they score lower. When they are told that there are no gender differences, they score the same as males⁽⁴⁾.

Do these perceptions carry over into science, where ranking of scientific articles and CV’s is performed “without bias”? Unfortunately, they do. In one study, first done in 1968 and then replicated in 1983⁽⁵⁾, college students were asked to rate identical scientific articles according to specific criteria. The authors’ names were clearly male or female, but were reversed for each group of critics. Articles supposedly written by women were consistently ranked lower than when these same articles were thought to have been written by a male. In a similar study, department chairs were asked to make hypothetical hiring decisions and to assign faculty rank on the basis of CV’s. For CV’s with male names, chairs recommended the rank of associate professor. However, the identical CV with a female name merited only the rank of assistant professor.

In 1997, these gender schemas came to the attention of readers of the journal *Nature* when it published a study by Christine Wennerås and Agnes Wold from Goteborg University in Sweden⁽⁶⁾. The authors of the study found clear gender bias in the way in which postdoctoral research awards were made by the Swedish Medical Research Council. Women needed to be about 2.2 times more productive than male counterparts to be as successful in securing financial support. How could a selection committee that prided itself on fairness make such an obvious mistake? The committee decisions were based not only on published work, but by reference to factors that already discriminated against women, namely the recommendations of heads of department, and institutions. A subsequent UK study showed no statistically significant bias in awards, although they noted that women published slightly fewer papers, but had a higher impact per paper and overall. Nonetheless, there was a very significant difference in the percentages of men and women who applied for awards compared to what would be predicted on the basis of academic position⁽⁷⁾.

In the US in 1994, 15 women with tenure in the School of Science at MIT decided to

obtain quantitative data to either support or refute anecdotal stories of gender bias. Those 15 women represented 8% of tenured faculty. In response to their request, the Dean of Science appointed a committee made up of one tenured woman from each department, plus three tenured men who were current or former department chairs. In their landmark report, released in 1999 and endorsed by the President of MIT, inequalities were found in salaries, pensions and allocation of space and resources ⁽⁸⁾. When interviewed, junior women said they felt supported by their departments. Their most common concern was the extraordinary difficulty of combining family and work. However as women progressed through their careers, they became increasingly marginalised and excluded from positions of real power in their department. Each generation of young women, including those who were currently senior faculty, began by believing that gender discrimination was 'solved'. However, gradually their eyes were opened to the realization that the playing field was not level at all. The study concluded that bias is subtle and largely unconscious and that the most lasting correction will come only when the numbers of women have grown significantly ⁽⁸⁾.

Sometimes bias is not so subtle. At Harvard recently, the President of the University, Lawrence Summers, suggested that women fail to advance in science because they are innately less able than men. Nancy Hopkins, an MIT professor, brought Summers' comments to public attention, and the discussion once again spilled over into the pages of *Nature*, as it had done after the Swedish Medical Council Study more than 8 years earlier. Interestingly, two male professors of physics from Harvard have been in the forefront of studies highlighting gender differences in the way in which scientists perform. Gerald Holton's "Project Access" ⁽⁹⁾ studied a group of 700 male and female scientists, who had all shown great promise early in their careers. By selecting an elite group, the investigators hoped to highlight gender differences that would be even greater in more "average" scientists. Over the course of the study, 88% of men attained tenure, compared with 40% of women. However, the women produced an average of 2.3 publications per year, compared with 2.8 publications per year for men. Senior biologists from two prestigious research universities were then selected to review the dossiers of biologists selected from the

Project Access pool. The reviewers were told to assign quality ratings on the basis of CV, the bibliographies and reprints of six articles or chapters that each individual thought represented his or her best work. They used a scale of from 1 to a top grade of 5, similar to that of many granting agencies. The average quality rating given by the evaluators was 3.67 for women versus 3.27 for men. Moreover, in the annual Institute for Scientific Information (ISI) Science Journal Citation Reports, the women's articles had received substantially more citations — 24.4 citations per article, compared with 14.4 for men. "With all due caution about the use and abuse of citations in the literature, at the very least one can say that overall the women's papers had greater visibility, and, one may infer, were found to be of value to the field" said Holton.

However, the women themselves saw things differently. They reported that they considered themselves as being average almost twice as often (35% of women versus 18% of men), and men reported themselves more often as being above average (70% of men versus 32% of women). There were also differences in perceptions of gender differences in terms of how women work as scientists. Whether or not these differences are real, twice as many women believed that they exist (51% of women versus 26% of men). The same proportions held true when women were asked whether gender affected their choice of a research subject or their way of thinking in science. When asked whether gender differences exist in terms of the methods adopted to pursue a scientific project, women answered affirmatively more than three times as often as men. Among the men and women interviewed, a very frequent observation was that male scientists are more aggressive, combative, and self-promoting on the road to career success. The women were more likely to emphasize that one of the best things about research was the intellectually stimulating process. Holton believes that women scientists uphold, to a statistically significant degree, what might be called the traditional standards of good science, namely the pursuit of fundamentals, with care, objectivity, and reproducibility. When questioned, women reported themselves as more cautious and careful in their method, and more attentive to details on the way to a conclusion. Numerous women acknowledged that they were tending towards perfectionism, not only to avoid failure and criticism, but to seek a broader,



‘Just because we have a system that produces good scientists does not mean that the system is not eliminating many others who could be equally good’

more comprehensive picture, and to produce more complete and synthetic papers.

“One way to escape some of the rough-and-tumble competition of life at science’s frontier is to choose ... a niche where, with luck, one can work on a problem that is important and yet not at the center of those volcanic eruptions,” said Holton. And that is just what women have often done. As Marie Curie said when she was asked why she decided to work on what was later called radioactivity: “I chose this field because there was no bibliography.” This approach may also shed light on the finding that while in Graduate School, women are more collaborative, but after the postdoc period, they become less collaborative than men. Women are more vocal about valuing broad or comprehensive projects that are also characterized by integrity and thoroughness, rather than cutting by corners to gain career advantage. These self-reports and interviews potentially explain the productivity gap between women and men, as well as the higher citation rates of women’s publications.

Another champion of women in science is Howard Georgi, also a Professor of Physics at Harvard. He has written articles about how selection procedures for academic positions tend to also select for assertiveness and single-mindedness. Not only are the distributions of assertiveness and single-mindedness skewed towards men, but there are also very strong cultural biases that make it more difficult for women to be assertive and single-minded. We are all familiar with these hurtful stereotypes: Mr X is assertive, Ms Y is pushy, Mr X thinks creatively, Ms Y is easily distracted. As Prof. Georgi says “Just because we have a system that produces good scientists does not mean that the system is not eliminating many others who could be equally good”.

So what can we do about this? So far, the only cases where women’s representation at management level has changed dramatically come from companies which can actively manage their workforce. One example is Motorola, who made a corporate decision to increase the percentage of women in senior positions. There were complaints from men in the beginning, but after the percentage of women in management reached 40%, even the men noticed that the workplace was more pleasant and productive. Unfortunately, it seems highly unlikely that the representation of women at the more senior levels of science will reach

40% within our lifetimes, if ever. The issue of women’s career advancement seems to have slid off the agenda in Australia. Certainly, raising the issue of advancement immediately brings cries of unfairness and positive discrimination. In the US, things are somewhat different. In 2004, the NIH instituted a new award — the NIH Director’s Pioneer Award for novel biomedical research strategies. When all 9 awards went to men, there was a public outcry⁽¹⁰⁾. The sole female member of the selection committee protested that they had made their choice in an unbiased way, but that few applications had been received from women. In 2005, responsibility for the award was transferred to the National Institute of General Medical Sciences, which has more experience with grants and was prepared to redesign the program. Some 40% of referees are now female, up from 5% last year. Instead of requiring a nomination, which automatically biases against women, applicants were allowed to nominate themselves. The application form was also reworded to emphasize that women and minorities were especially encouraged to apply, and that the award was available to early- and mid-career scientists. In 2005, 26% of applicants and finalists were female, up from 21% of applicants and only 10% of finalists in 2004.

I should end this survey with a message of optimism and hope, but I have to say that I don’t believe that things are improving in Australia. This may be a reflection of where I am in my career — having survived the struggle of a young family, I have come out the other side breathing a sigh of relief, but have now found further difficulties of which I was previously unaware. Being the only senior woman in my institution does not help. There seems to be general doubt that there is a gender equity problem, and it is certainly not on the political agenda (or not to the extent that it was when I started my PhD 25 years ago). I think the problem has to be addressed at an institutional level, as at Motorola, but academia is bound by beliefs and traditions that do not sit easily with the sort of workforce management possible in a commercial organization. The concepts of merit and academic freedom are diametrically opposed to measures that take gender into account, which would not be a problem if these concepts were not gender-biased. But as mentioned above, the definitions of merit and academic freedom as usually applied, are unfortunately covertly gender-biased. We

‘The concepts of merit and academic freedom are diametrically opposed to measures that take gender into account, which would not be a problem if these ... were not gender-biased’

need more understanding and acceptance of gender schemas and their effect on our behavior, as well as the means to make the practices of institutions more accountable in terms of gender equity. Providing positive incentives for institutions or departments that actively pursue gender equity would be a good start.

Some of the areas in which the undervaluing of women’s ability negatively affects their careers are in appointment, promotion, awarding of grants, invitations to present at meetings and publications. In the first four areas at least, there is an opportunity to do something at a local level. As mentioned above, the AAI and many other US-based societies have Women’s Committees that provide publicly available lists of women scientists and their areas of expertise. In 1993, I chaired the organizing committee for a joint meeting of our own society, ASI, with the US-based Society of Leukocyte Biology. The provisional program came back from my US counterpart with a comment that the percentage of female plenary speakers was far too low — couldn’t we find more women? This was a concept that was so far off the radar here that it had not even been mentioned in our own meetings about the conference program.

One of our difficulties here in Australia is that there are also few senior women scientists to serve on numerous appointment, promotion, grant and meeting organising committees. It is hard for senior women to cover all these bases and still survive in their own careers. In addition, if senior women appointed to these committees are no more aware of gender schemas than their male colleagues, they will interpret the concepts of merit in exactly the same way as men. I don’t think we will make significant progress until both men and women acknowledge that the system does discriminate against women, and that for reasons not only of equity but also of efficiency, productivity and support for innovation, it would be better if the system did not discriminate. I hope that Wisenet can achieve something in this area, at least by providing the moral support and encouragement that we all need but often don’t get from our colleagues. I also hope that this article helps to stimulate debate, and that we can all come up with useful strategies to improve the situations of women in science in Australia. ❖

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Bio: Associate Professor Barbara Fazekas de St Groth MBBS, BSc(Med), PhD is an NHMRC Principal Research Fellow, and Head of the T Cell Biology Research Program at the Centenary Institute of Cancer Medicine and Cell Biology in Sydney. She also has two sons aged 15 and 12, and could never have survived in science without the constant support of her husband, who works part time.



Investigating Gender Equity at the University of New South Wales

University of New South Wales
Equity and Diversity Unit

Women are under-represented in senior academic and management positions across the Australian university sector. In 2002, while women accounted for 29% of academic staff at the University of New South Wales (UNSW), they constituted only 14% of Associate Professors and 11% of Professors.

The University's Equity and Diversity Unit commissioned Professor Belinda Probert from RMIT to investigate employment patterns for academic staff at UNSW and identify the reasons for the under-representation of women in academia.

The main findings of the Probert Report challenged a number of traditional assumptions:

- There was no evidence of systemic discrimination, but there was considerable variation in local management practices and cultures, which had a differential impact on gender equity.
- Women academics had lower 'human capital' than men: fewer women had a PhD upon commencement of academic employment; men had, on average, five more years work experience in higher education and women had, on average, lower productivity rates in publications and successful grant applications.
- While women were just as successful as men overall, when they applied for promotions, men applied earlier and more often.
- Family responsibilities had a major impact. Women academics' careers tended to plateau at senior lecturer level, with significant numbers of women in their forties finding their career options closing down because of the cumulative effect of past

and present family responsibilities. The challenges of 'teenage care' and elder care, rather than just baby care, emerged as a substantial demand on women's time, in an organisation where 66% of academic women, compared with 8% of academic men, identified themselves as primary carers.

In response to the report, the University established the Gender Equity Project in 2002, to improve its understanding of how gender operates at all levels within the organisation and to explore mechanisms for better supporting gender equity in employment.

The Project implemented a range of initiatives, across three main areas.

1. Centrally administered initiatives such as *Women's Promotion Workshops*; *Staff PhD Completion Scholarships* for academics who faced difficulties completing their doctorates for reasons such as family responsibilities; a *Career Advancement Fund* to assist women academics re-establish their research careers upon return from maternity leave; an *Academic Women in Leadership program* in 2006; parking and childcare initiatives and a *Gender Equity Speaker Series*.
2. Gender equity awareness integrated into mainstream practices, such as examining the impact of gender in the organisation's review of the role of the Head of School; re-establishing the women in research program and developing more effective recruitment search processes to ensure that women are represented on short-lists.
3. Local level research and strategies. In addition to some collaborative research projects with schools and

faculties, the Equity and Diversity Unit established the *UNSW Equity Initiatives Grants* program, which funded schools and faculties to undertake research and develop initiatives to enhance student and staff gender equity at the local level.

The following is a selection of the range of projects which have been undertaken under this latter program:

- The *Network of Women* (NOW) in the School of Material Sciences, connects undergraduate, postgraduate, academic women and women from the material sciences industry. The work has received national attention and is creating important links with industry. There is already evidence of improved confidence, and higher retention rates, among female postgraduate students.
- The School of Physics undertook a detailed audit that revealed significant gender related differences in academic profile and workload distribution in the School. The final report contained a wide range of recommendations, developed through a very consultative process within the School, which are being implemented. Some early achievements include: the establishment a School-based Gender Equity Committee, the success of several women in recent applications for SSP, start-up research grants, and in gaining promotion.
- The School of Biological, Earth and Environmental Sciences Project has only one female academic staff member. Here a ‘distinguished women scientists’ visitors program has provided role models and mentors for post-graduate and post-doctoral women. Comments from young women who attended include “*Made my research career much more real and attainable*” and “*I’ve always wanted to follow this career path, but I think deep down I didn’t really think it was possible.*”

Further information on the University of New South Wales’ Gender Equity Project is available from the Equity and Diversity Unit website <http://www.equity.unsw.edu.au/>



After yesterday, I believe that it is”.

- The School of Civil and Environmental Engineering Project has explored means of better attracting and retaining female students. This is another school with only one female academic. In addition, a joint project with the School of Mechanical and Manufacturing Engineering has started an informal internal ‘Women in Engineering’ network.
- Following a meeting with the five Equity Initiative Grant recipients in the Faculty of Science, the Dean established the Dean’s Gender Equity Advisory Committee in April 2005 to advise the Faculty on gender equity matters and to further investigate gender equity across the Faculty.

The Grants also appear to be an important way of promoting understanding and generating change across the organisation through such things as:

- increasing awareness of gender issues for staff and managers at the local level;
- establishing active networks and communities of interest for women academics, especially important for those working in more isolated, male-dominated areas;
- increasing confidence among the women involved in the projects ; and
- generating interest in the Project in other areas across the University.

A colloquium on this Program was held at the end of 2005 and a collection of papers from this seminar is currently being prepared. ❖

My Career in Science

Bronwyn
Relf



If you are reading this for inspiration from an award-winning career, then stop now. I have certainly taken the scenic route, not the expressway! It has always been a compromise between my desires for establishing a satisfying career, keeping my marriage together, raising healthy children and earning enough to live. It has been an interesting trip so far, and I have learned many things along the way. Sometimes it is the journey, as much as the destination, that makes the trip a success.

My initial degree was a Bachelor of Rural Science (Hons) from The University of New England. Whilst there I met my future husband, and developed a passion for genetics, particularly genomics. After graduating in 1990, we both found jobs in Sydney. We both had definite career goals, one of mine being to complete my PhD and work for CSIRO. We also planned to marry in early 1991. I was initially employed in the Department of Animal Science at the University of Sydney. When I learned that the grant would not be continuing, I applied for a PhD scholarship offered for the first time by the University of Western Sydney (UWS) and the then Division of Animal Production at CSIRO. When I became the inaugural recipient of this scholarship in 1991, I was ecstatic. Not only was I going to do my PhD, but I was going to do it at CSIRO — two career goals in one hit! My project was to examine gene expression in the wool follicle, by screening a sheep wool follicle bulb cDNA library constructed using RACE (rapid amplification of cDNA ends).

My PhD was an interesting experience — not at all how I imagined it would be. Firstly, I was not based at UWS but at CSIRO, a more commercial setting, where I was treated more as a research scientist than a student. Secondly, I found it

daunting to be surrounded mainly by men. However, two women helped me a great deal. One was Rosemary Sutton, who introduced me to Wisenet and the support of other women in science. The other was one of my three supervisors, Elizabeth (Liz) Deane from UWS (now at Macquarie University). When I began my PhD, Liz had 4 children already, and soon became pregnant with the 5th.

During my first year I encountered many technical problems, and at times, I felt quite despondent. However, I learned a lot about molecular biology, particularly PCR and RNA extraction, which proved valuable experience. I soon found that I could work more efficiently by planning experiments ahead of time and running them in parallel. This however led to friction with other lab members, who spent longer hours at the bench. Liz's support was important at these times — she argued for the result, not the process. She also argued that my decision to get married would not affect my ability to do my PhD. Liz got me through some sticky times, when quitting seemed to be the best option.

While my experiments ran more smoothly after this first year, these early set-backs meant that I could not complete my PhD within my scholarship's time-frame. This wasn't a problem, as I had been earning extra money by tutoring at university. However in 1995, 4 years into my PhD, I became pregnant. This was unplanned, and a great shock. However, Liz Deane had had twins whilst doing her PhD and her third child shortly after finishing. With her and Rosemary Sutton's help, I made a plan of attack, booking child-care centres, and planning to work until just before the baby was born. However, my body had other ideas. At 28 weeks, my blood pressure was raised and by 32 weeks, I was in hospital on complete



Bronwyn's other half, Tim Geerarts

bed rest. My first daughter Madeleine was born 3 weeks early, with breathing difficulties, and spent a week in intensive care. This was a sobering experience — it really hit me that this little baby was completely reliant on me for her health and well-being, and that my wants needed to become secondary for a time. Reality also hit in terms of childcare — there were no places available for another 7 months. We could not afford a nanny, and had no family close by, so I took 6 months off, and earned money through tutoring.

When I was finally offered 5 days of care, I found that I neither wanted nor could afford to return to full-time study. I therefore returned part-time, studying 2 days per week and teaching for one day,

Reality also hit in terms of childcare — there were no places available for another 7 months'

in order to cover my childcare costs. Of course, Maddy picked up every bug imaginable during those first months at day-care. During this time, I took more days off than I worked. There were many days

when I left the house exhausted, with my clothes on backwards, or inside out. Finally Maddy developed resistance to all the germs, and the next challenge became fitting my experimental work into the time available. My unscheduled hospital

stay meant that I still had experiments to finish. My husband was travelling a great deal overseas and unable to help with childcare, but I had put too much into my PhD not to finish. With Maddy in childcare, every day in the lab became a race against the clock, and the Sydney traffic. At the end of 1997, I had finally finished my experiments — those planned for the last 10 weeks of my pregnancy had now taken one year to finish! I then accepted a part-time research assistant position with Liz Deane studying antibacterial proteins in marsupials, while I was writing up my thesis. I also continued teaching. I finally submitted my thesis 5 days after my daughter's 2nd birthday. I did not see her on her birthday, except when she was asleep — this was one the hardest days of my life.

After the struggle to finish my PhD, I seriously wondered whether I was suited to a research career. My PhD had taken much longer than planned, was characterised by multiple experimental failures, and did not result in the publication of any research papers. Moving overseas or interstate to do a post-doc, with my husband and daughter in tow, was now not a viable option. My husband earned much more than I did. Financially it was unviable for him to take a lower paying job, or stay at home looking after Maddy, while I poured time into my career.

I began looking for work outside the agricultural area. I had amassed a good array of molecular techniques and could trouble-shoot effectively — the upside of having experiments go wrong. In 1999, I applied for a job at the University of Sydney with Dr Karen Waters, examining gene expression in Sudden Infant Death Syndrome (SIDS) victims. I was interviewed for the position, but was initially unsuccessful. I was however impressed with the group and its work — it had a relevance to which I could now relate after Maddy's birth. I therefore contacted Karen after the interview, and was finally offered a part-time, one year contract to establish non-radioactive in situ hybridisa-



Bromwyn's father and daughters with Oliver, the mad Burmese cat. Maddy is at the back, Lexie is in the middle and Katrina is at the front.

tion on brain tissue from SIDS victims. A part-time position suited me, as I wanted to have another baby, and Karen was aware of this. Karen encouraged me to write grants to secure funding for future projects, and like Liz Deane at UWS, was results-focussed and not process-focussed. I became pregnant with my second child, to be born at the end of my contract, and before any grants might be funded. I was aware that I might be unable to work during my third trimester, but unfortunately caught the flu in my second

trimester, leading to pneumonia and a partially collapsed lung. I then developed blood pressure problems and spent the last 10 weeks of my pregnancy in bed. Alexandria was born in January, 2000. I arranged to take 12 months maternity leave, as I could not afford to have 2 children in long day-care, and my husband was still travelling overseas much of

'I attended conferences.... to keep up to date.'

the time. However I remained in contact with the lab and attended conferences, to keep up to date.

In January 2001, I returned to work again. The lab had successfully established non-radioactive in-situ RNA hybridisation on formalin-fixed brain tissue, and we could publish a paper reporting this success. I began writing this paper, and further grant applications for projects to begin in 2002. I was also helping to supervise a PhD student, and teaching part-time. However, 3 months after I returned to work, my husband accepted an overseas posting, close to his immediate family, that required him to be away for at least a year. After some deliberation, I decided to move with him. In retrospect,

it was a good year to have spent near my husband's family — my mother-in-law became ill with cancer and received much joy from having her only grandchildren close to her.

We returned to Australia in 2002, in time for Maddy to start school. There was no funding for me to work in Karen's laboratory, so I found a research assistant position with Associate Professor Maria Byrne in the Department of Anatomy and Histology at the University of Sydney. I would be working with starfish, extracting RNA and amplifying homeobox genes from radial nerve cord. Whereas the previous post-doc had been unable to isolate undegraded RNA consistently, I achieved this within a month, and our work has since been published. Maria was another woman with whom I enjoyed working — she had children of her own and understood the need for flexibility. Unfortunately during that year, my mother died after a short, intense battle with cancer, which was a devastating experience. She had always been available for emergencies when my husband was away, or when I was ill myself, so I was unsure how I would cope without her.

Towards the end of 2002, Karen Waters was successful in obtaining grant funding, and offered me a post-doc position. This would be part-time for the first 2 years (until my youngest child went to school) and then full time. The project involved searching for genes associated with metabolic disease and sleep apnoea, and my position was to oversee and organise the genetic studies. My husband had changed jobs again and was now more available to help with the children, so this seemed the ideal time to give my career the kick-start it needed. Then, between accepting the position and starting work, I unexpectedly became pregnant again. I started work regardless, planning to take only 4 months leave after the baby's birth, after which time my husband and I intended to both work part-time. Then my father had a massive



stroke, 14 weeks before my third daughter was born. Although Dad survived, he was not in a position to retire, or return to running the business that he operated in Newcastle. My husband took over the business, and began commuting between Sydney and Newcastle. I again had to finish work when I was 30 weeks pregnant, and spent the remaining time at home in bed. My third daughter Katrina was born in November, 2003.

With my husband working in Newcastle, it was now out of the question for me to return to work after 4 months maternity leave. It was now totally financially and

‘Sometimes I have needed to think outside the square a little to keep my career going.’

physically unviable for me to work. I would have had to drop 3 children at 3 different places, drive an hour to work, do it all in reverse 6 hours later, and pay for the privilege. Nonetheless, it took some time for me to come to terms with the loss of my working identity. In mid 2004, after a year of my husband commuting between cities, we decided that we needed to be a family again and moved to Newcastle. Karen’s research group had also undergone changes, with Karen relocating overseas to the USA. However, 12 months after Katrina was born, I contacted Karen and offered to analyse and write up the genetic data that we had collected. We came to an arrangement where I worked from home 1-2 days per week, and I would also travel to Sydney to participate in video conferences. We have continued this arrangement for a year now, and while it is slightly unorthodox, it gets the work done. I aim to complete the paper by the middle of 2006, and hope to continue to collaborate with Karen after this time. However if this proves impossible, I am sure that I will find work elsewhere.

Science is a poorly paid profession, and my dilemma has always been the cost of childcare. My husband and I never quali-

fied for any childcare assistance because of his wage, but while this could support us without me working, I never earned enough to cover the cost of childcare essential for my career. The cost of living in Sydney was also high, both in terms of money, and commuting time. In this sense, I feel extremely fortunate to have had the support of women such as Liz Deane, Karen Waters and Maria Byrne, who recognised the dilemmas of working mothers, and were willing to provide flexible working conditions. I have always put my family first, and always will. I have also been fortunate in having a husband who has been so supportive of my career.

Wisenet has also been an invaluable source of support, and whilst I do

not get to meetings anymore, I still love to hear about what is happening.

There are times when I think that I have failed my career in science. There have been no overseas post-doc stints, and not enough papers published or committees served upon. However at other times, I feel strangely satisfied with what I have achieved. I have excellent technical skills in a number of molecular techniques, and have been able to establish techniques where previous employees had failed to do so. I have experience in writing grants, ethics applications and papers, and in teaching and supervising students. Sometimes I have needed to think outside the square a little to keep my career going. But my career is still there, just waiting for the day when I can devote more time to it — and I will — one day soon. ❖

Bio: Bronnyn Relf (married name Geerarts) currently resides in Newcastle with her husband Tim, three children and two mad Burmese cats. She is also working part-time with Dr Karen Waters of the University of Sydney and the Children’s Hospital at Westmead.

Shipping News

A reflection on changed means of travel, and taking higher degrees in science

Diana Temple

In the mid-twentieth century, PhD degrees were still a novelty at Australian universities, and it was said that research facilities at the 6 or 8 universities then functioning were inadequate, which was perhaps a bit of cultural cringe. Master's degrees were more highly regarded than now and were not uncommon, but academics with the title "Dr" had all acquired this qualification by study in Britain or the USA, or sometimes Europe. As Australia was "more British" in those days, many Australian academics at that time were themselves graduates of English universities, so England was the usual destination.

Inevitably, travel abroad for research degrees was by sea, because international air travel in the 1940s and 50s was prohibitively expensive compared with today, whereas it was possible to sail to Europe



SS Moreton Bay

relatively cheaply. The cheapest ships were packed with young people, travelling to see the world. In the twenty-first century, sea voyages mean cruises and are for the wealthy, usually older retired people indulging themselves in luxury, and overseas budget travel is by air, so the whole mode of travel has been reversed.

Sea voyages were very slow, but enjoyable and exciting the first time. I travelled in 1949 on the Moreton Bay, a small shabby

liner nearing the end of its useful life. A friend and I were with others in a 4-berth cabin deep down in the bowels of ship, stifling during our passage through the tropics without air-conditioning, so that sleeping on deck with a blanket was sometimes preferable. The bathroom was along the corridor and had bathtubs served by salt water, for which special soap was required, plus a jug of fresh water for rinsing off the salt; no showers. The dining room had two sittings, of which we chose the later. Food was plentiful but hardly gourmet – I recall curries and salads for lunch, roasts and steamed puddings for dinner. Alcoholic drinks and cigarettes were duty free, all unhealthily cheap. We knew other young women on the ship, most of whom were aiming to "see the world" — to find suitable work in England and travel in Europe — as we were. Among the passengers were some of both sexes with literary, theatrical or musical ambitions, a few of whom later became well known. Our male counterparts were sometimes on the way to enrol at English universities, but there were more females than males.

There is no doubt that at that time clever young women were given less encouragement than clever young men, this being the post WW2-era when women were expected to marry and forfeit their careers. For example, the Australian public service immediately re-classified women employees as "temporary" when they married. Higher education was believed by some to be wasted on women, and few women won overseas scholarships. It is surprising the extent to which I accepted this status quo, in view of my lifelong feminist attitudes! It can be seen as a waste of human talent that half the population were encouraged to believe that to be a happy housewife and mother was their most suitable goal, and saddening to think of several generations of bright women

graduates with A-level results who, having made suitable marriages, spent their most productive years in domesticity. Of course this was not true of everyone.

The young men travelling to England at that time, and since, were more likely to be career-motivated, aiming to gain overseas experience, to spend time at the London headquarters of their firms,



Diana and a friend on deck, with a lifeboat.

taking up scholarships to study for higher degrees at the great or even lesser British universities. It is often still true today that men in general are more career-motivated than women. Most of the men I knew who went to the UK had scholarships to study for PhDs at British universities or to further their careers at the “Centre of the World”; Australia was still very much a British appendage. Many young men of my generation or older were ex-service-men who had held government grants from the Commonwealth Reconstruction Training Scheme to study for their Australian degrees, and some of these also later studied overseas. Medical graduates went to Britain to study for memberships of the important Colleges of Physicians and Surgeons.



Shipboard activities included deck games, splashing in a primitive pool, sitting on deck in groups reading or chatting, music and dancing on deck in the evenings. We looked forward to days ashore visiting ports of call: the Moreton Bay called, for a day each, at Colombo, Aden, Port Said, Valetta and Marseilles, which were eye-openers to young visitors. On one of the last evenings, the Captain spoke to the younger passengers on the dance deck and gave advice on how to behave in England! This was before the days of Barry Crocker and the Aussie ocker. We thought it hilarious, but it was patronising.

This voyage to the other side of the world was something we all felt we had to do. There was a gap of knowledge of grandparents’ or great-great-grandparents’ “home” country. Shirley Hazzard, in her book *Transit of Venus*, has her Australian heroine in the 1950s say: “London is our achievement. Our career for the time being. Having got here is an attainment, being here is an occupation”.

Nothing like this happens now. Young Australians travel more readily, and get there in 24 hours with their worldly goods in their backpacks. This is a good thing. Apart from a few, we scientists now tend to do our PhDs in Australia. As I did. ❖

Bio: Diana Temple is a retired Associate Professor in Pharmacology from Sydney University. She has been a Wisenet member since it began, and is a former National Convenor of Wisenet and Sydney Convenor.

Stop Press

Professor Jenny Graves has been awarded a 2006 L’Oreal-UNESCO Award for Women in Science, which celebrates the work of leading women scientists around the world. Jenny is a Professor and Group Leader at the Comparative Genomics Group of the Research School of Biological Sciences in Canberra.

Congratulations Jenny, from all at Wisenet!

Open Spaces

Jennifer A. Byrne

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As editor of this issue of the Wisenet Journal, I spent some time wondering whether or not I should write an article for the same issue. Like most scientists, I spend a lot of time writing, and often writing the same thing in many different ways. As I had recently written a lengthy “careers manifesto”, outlining ways to enhance career progression for basic scientists working in hospital environments, I thought that I could trim this into a kind of “careers advice” article. The fact that this proved harder than I thought, made me reconsider whether this was really what I should do. After all, the Wisenet articles that I enjoy tell about people’s own career trajectories in personal, rather than general, terms. As I’ve also recently gained some insight into how I work, I thought that it might be more useful to share this with other readers. Ultimately, improved self-awareness might be just as useful as any number of worthy recommendations about committee representation, job titles, salary scales, and the like.

I currently live in Sydney, and like many laboratory scientists, I have spent much of my life in cities. This was in order to

attend boarding school, and then University, and to later study and work in various medical research institutes. However my childhood was very different, and indeed different from that of the vast majority of Australians, who grow up in urban environments. I grew up on a property in south western Queensland, in an area called the Western Downs. Our nearest town was some 70 km away, and I travelled around 100 km a day, mostly on dirt roads, in order to attend my first years of school. My first year was a composite class of years 1-7, with the year 1 children sitting on the floor. School days involved taking off my thongs as soon as I was on the school bus, and then putting them on again just before leaping off in the evening (the state of my feet meant that no-one was fooled by this). Bus trips to school involved breakdowns, getting bogged while crossing creeks, and occasional stops to allow children to chase wild piglets by the side of the road. Lunchtimes involved playing marbles in the red dirt, or building cubbies in the bush.

Farming life in this area was often hard. Although the average rainfall was sup-



Jenny’s first school in western Queensland. The 1973 year of the Hannaford State School is shown, with Jenny (plaited hair) in the centre. There were no uniforms worn at the time, and not too many shoes are in evidence, even on photo day. The small boy on the far right is biting his lip, as this was the first time that his photo had been taken, and he thought it was going to hurt. Jenny’s mother (also Jennifer Byrne) provided this photo.



Jenny in the laboratory at the Children's Hospital at Westmead (a rare event these days). Photo courtesy of Paul De Sensi, from the Children's Hospital at Westmead.

posed to be sufficient to sustain crops, we were almost permanently in drought, and most crops ended up as sheep or cattle feed. Some properties had also been subdivided such that they were barely viable, and overstocking to

make ends meet exacerbated the effects of drought. The weather was hot in summer and cold in winter, and to the untrained eye the landscape seemed flat, dry and monotonous. However, as a local I was very aware of many subtle variations in our landscape. This included areas of red soil, grey clay, and occasional rocky outcrops, and the trees and vegetation varied greatly between these areas. The landscape could also change dramatically after just a day of rain. Like most local children, I was taught to recognise birds, snakes, spiders, mushrooms, as well as poisonous and flowering plants — both for my own education, and because life could depend upon knowing what to avoid. I was taught to notice small things, such as even subtle inclines in the land, which eventually point to creeks and possibly life-saving water. The horizon was also a great source of information, and was constantly scanned for clouds, storms, whirlwinds, and bushfires. Living in isolation, we knew the value of gathering our own information when we were in a black hole in terms of weather reports and emergency services.

One day recently, I had what seemed to be a flash of insight about my scientific career so far. While medical research usually involves living and working in cities, I realised that I have always ended up working in areas that were sparsely populated in terms of published literature, people, and ideas. Nowhere has this been truer than in my current area of research, where I study a family of genes (the tumor protein D52 family) which I and my co-workers have discovered. This is an area that we have built up from scratch, and particularly at

the beginning, required venturing into the complete unknown. So on this ordinary Saturday, I suddenly realised how much my mental academic landscape resembles the physical landscape of my childhood. Open space and the freedom that comes with this, a sparse landscape which requires patience and keen observation to decipher — this is what I see when I visualise my own work. I also realised that these influences have perhaps allowed me to notice overlooked details in publications, and to piece together stories from often limited and apparently unrelated data. Of course, there could be downsides to these early influences as well. Independence can lead to someone going too far out on a limb, and I'm very aware that only hindsight decides whether a scientist was a pioneer, or just completely self-deluded. However with this improved self-awareness, I can actively try to work in more collaborative ways, rather than always striking off on my own.

So what of my own children? I realise that by becoming a medical researcher, I have not allowed them the kind of open-air childhood that I experienced. My husband has always been a city-dweller, so this is not really an issue for him, but I find myself often comparing my childhood with the very structured lives of city children. So when it came to choosing a local school, we of course chose one which had a friendly atmosphere, good facilities, and an interesting list of extra activities. However, I was happiest to see an open grassy area out the back, plenty of big and small trees, drier areas for fossicking, and different kinds of birds. This way, although perhaps on a different scale, they'll also have the space and time to notice the small things. ❖

Bio: Jennifer Byrne is a Cancer Institute NSW Fellow and Head of the Molecular Oncology Laboratory within the Oncology Research Unit at the Children's Hospital at Westmead. She is also a conjoint Senior Lecturer and Deputy Postgraduate Co-ordinator within the University of Sydney Discipline of Paediatrics and Child Health.

More entries needed from women for the Australian Museum Eureka Prizes

Be part of the Australian Museum Eureka Prizes by entering yourself or nominating someone for one of these prestigious prizes. Entries in all prizes close on Friday 5 May 2006. <http://www.amonline.net.au/eureka/>

Roger Muller

Manager,
Australian
Museum
Eureka Prizes

The Australian Museum Eureka Prizes are Australia's premier and most comprehensive science awards. About to enter their 17th year, the prizes acknowledge and reward outstanding science, leadership and innovation, education and science communication. The largest single group of prizes on offer are those focussed on specific areas of research.

And it is here that women have performed particularly poorly. In 2005, only 3 women were represented among the winners of 11 research prizes. In 2004, the position was worse, with only 1 prize out of the 8 research prizes on offer being won by a woman (though women were involved in winning teams for 2 other prizes). In the past 6 years, only 6 women have won a Eureka research prize, out of a total of 39 prizes awarded!

"There is simply no way this track record of Eureka wins adequately or accurately reflects the role and importance of women in Australian science", said Frank Howarth, Director of the Australian Museum. "There is a desperate need to correct this imbalance by encouraging women in science to stand up and be counted alongside their male counterparts by entering the Prizes" he said.

Defying this trend is Professor Veena Sahajwalla of the University of New South Wales, who was awarded a Eureka Prize for Scientific Research in 2005. Veena is Director of Sustainable Materials Processing Research in the School of Materials Science and Engineering and her research focuses on the sustainability of materials processing, including recycling of waste plastics in steelmaking and lowering of energy and emissions in metals processing. A passionate communicator in the area of science and engineering, Veena actively encourages women to consider materials science and engineering as a career path and established the Materials - Network of Women (NOW) at UNSW in 2004.

The 2006 Australian Museum Eureka Prizes will be launched early in 2006. Among the 20 or more prizes that will be on offer are \$10,000 awards for biodiversity research, water research, medical research, environmental research, scientific research and research in ethics. It is time that a determined effort was made to ensure that the 2006 Eureka Prize winners more accurately reflect the input being made today by women in science. ❖



2005 Eureka
prize winner
Professor Veena
Sahajwalla

The World-Wide Day in Science

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■ What were you doing on 15 April 2005? What will you be doing on 12 April 2006? Research, writing, organising, holding meetings, teaching, mentoring? All of the above? When you were in high school did you have any idea that is where science would take you? Your account of a day in the life of science, a typical day or an extraordinary day, can make a student's career choices clearer.

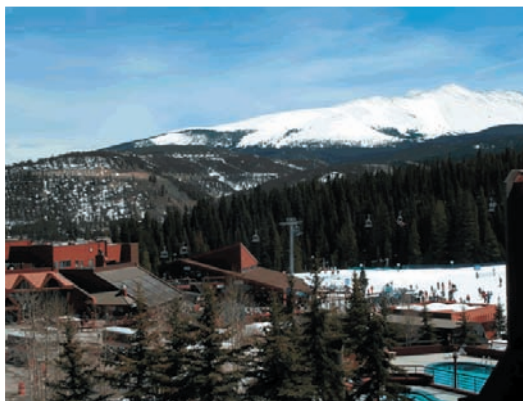
An aim to help students to see "inside" science and feel more a part of the scientific community sparked the World-Wide Day in Science project (WWDS). WWDS captures "a day in the life of science" once a year as seen through the eyes of scientists and students. These snapshots fill our website (www.science.unsw.edu.au/worldwide). As the Day in Science experience is typically one-on-one and followed by a report published on the web, we term it a "virtual event."

Here is a sample from a range of the women in science involved of what emerged from the WWDS virtual event of 15 April 2005.

■ ■ **Natasha Tian**, second-year PhD student working in brain development at Edinburgh University, wrote:

'The promise of freshly-brewed coffee and sweet temptations from the bakery have nothing to do with my enthusiasm for Friday morning lab meetings. I usually look forward to these informal gatherings of three main labs as it gives us a chance to find out what everybody is working on in the lab. Today I require an extra caffeine injection to counteract lingering jetlag from a conference in Colorado'

Natasha Tian reflected on the view from her hotel window in Colorado, site of a conference from which she had just returned



■ ■ **Marina Pi** works in the quarantine room of *l'Aquarium de Barcelona*. According to science communication students from Pompeu Fabra University who shadowed her, she and colleagues "prepare the phytoplankton that will be used to feed zooplankton. At the same time, zooplankton feeds bigger fishes. Marina feels very proud when a newcomer fish leaves the quarantine room and goes to its aquarium. Her work has been worthwhile!!!" The students note the irony, "her name — Marina — comes from Mar, the Catalan name for Sea..."



On the Day in Science, Marina Pi of l'Aquarium de Barcelona.

■ ■ **Jeannie-Marie LeRoi**, Science Communicator, University of Tasmania, described her day as:

7.30am Read Terry Pratchett's *Science of Discworld* over breakfast. Great book. Links science theory with a *Discworld* story - my sort of writing...

9.00am Arrived at office – Faculty of Science, Engineering & Technology, University of Tasmania. I'm the "Science Marketing and Communication Officer," full-time, as of this year.

Checked and replied to email – heaps as usual.

Paid Australian Science Communicators registration. Have to set a good example, particularly as I've just taken over the role of Tasmanian branch co-ordinator.

Booked accommodation for Future Moves, a travelling course and career program that visits schools and colleges on the north-west coast of Tasmania. Heading off mid — May for 4 days.

Edited article for University's newsletter on the winning science teacher for the 2005 Prize for Science/Maths Teaching in Secondary Schools presented at the Research & Teaching Awards Evening at Parliament House.

Jeannie-Marie LeRoi tests the protein and glucose content of foods with visiting school children

11.30am Faculty meeting – planning and review.

12.30pm Time for lunch break today – yay! This doesn't happen very often.



■ ■ Thirteen-year-old **Yvonne Chan** of Pymble Ladies' College in Sydney described her Day in Science:

Yvonne Chan watched her sister, Isa, complete another day's research on crystals in the School of Chemistry at UNSW.

'It all started 3 days before 15th April. My 21 year old sister came home and asked me if I was interested in shadowing her around her uni, the University of New South Wales (UNSW), for a day and report to all the other high school students around the world on what being a scientist is like for the World Wide Day in Science. And since I was on my Easter break, this was excellent opportunity. Of course, along the road, I've always been interested in science because of various reasons. Reasons such as how my Dad does engineering and excels in Physics. And my sister chose to do a degree in Chemistry because, 'my family has always been pursuing occupations that are more practical, and Chemistry is definitely one!' So with all that, I pretty much have my life planned out. And to be what, you might ask? For me, I want to become a successful doctor!'



■ On 12 April 2006, the third World-Wide Day in Science will take place and you are invited to become involved in the project as much or as little as you wish.

On this day, university science students world-wide set out into laboratories, offices, forests, fields, and deserts to shadow a scientist of their choosing. High school students shadow university students and a range of scientists take a few minutes to write up a diary entry on their own day. Using written accounts, photos, audio and video, these observations are presented on the World-Wide Day in Science website.

Students participating in the World-Wide Day in Science become part of an active global network of scientists-in-the-making employing the very observation, organisation, and communication skills that they will need as scientists in the future. They learn what botanists, psychologists, and astrophysicists do all day and ultimately, they deliver a professional product – an online, global career guide in science that is available to students like themselves the world over.

The participating scientists act as "virtual role models" for the students and become their mentors for the day, without the formal, public presentation that is demanded by so many science outreach events. They gain practice in explaining their work in simple clear terms.

To learn more about getting involved, please contact us at wwds@unsw.edu.au, or Dr Will Rifkin (willrifkin@unsw.edu.au) or Pippa Shuff (pippa.shuff@ntlworld.com). Visit our website (<http://www2.science.unsw.edu.au/worldwide/whatis.htm>) and ask us to send you WWDS fridge magnets. We can provide teaching materials and support as required. ❖

Bio: Will Rifkin PhD is Director of the Science Communication Program in the Faculty of Science at the University of New South Wales. He is an engineer trapped in the body of a sociologist, who once turned down an offer to become a co-inventor of the computer mouse. He is a leading educational innovator in Australia.

Bio: Pippa Shuff, originally from the UK, is currently living in Prague, Czech Republic, where she is promoting the WWDS in Europe and the US. She also works as a freelance researcher, for a UK based consultancy, investigating a variety of science and technology topics for multi-national clients.

Membership Application / Renewal Form



APPLICATION FOR MEMBERSHIP / RENEWAL

Women in Science Enquiry Network, Inc. (ABN 56 210 013 744)

Annual Membership fee (for calendar year, including WISENET Journal) Please tick the appropriate box

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 Group or institution: \$200
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