



WAIS Conference



MELBOURNE
November 1999



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CSIRO Staff - CSIRO's Future

For further information about Wisenet contact:

Rosemary Sutton
National Convenor
r.sutton@anprod.csiro.au

Julie Evans
Hon Journal Editor
julie.evans@bom.gov.au

Diana Temple
02 9817 4941

Next WAIS Conference: 2002

Watch the Website:
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Or
To register your interest,
contact

Pauline Gallagher:
CSIRO Staff Association

Telephone: 03 9206 2288

Email:
pauline_gallagher@cpsu.org

WISNET Web Site: <http://www.usyd.edu.au/wisenet/>

WISNET Inc.
PO Box 647, Glebe, NSW 2037



WOMEN IN SCIENCE ENQUIRY NETWORK

OBJECTIVES

- to increase women's participation at all levels in the sciences where they are now under-represented;
- to examine the education and employment structures which currently restrict women's opportunities in the sciences;
- 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;
- to explore linkages between the different disciplines and promote communication between scientists and the community on social and environmental issues;
- to examine the relationship between scientific research and technology and promote research and technologies more appropriate for world needs;
- to explore programs for change in the sciences and support more democratic and participatory systems as an alternative to the male-dominated tradition;
- to build an active network of people interested in these issues and to liaise with other interested groups;
- 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 state branches. Regional groups, such as those based in Wollongong and Lismore in NSW have also been formed. Interest groups, such as that responsible for the historical exhibition on Australian women in science, have also been active. State and regional branches act autonomously, focusing activities primarily at a local level but also joining with other groups for more general issues. WISENET is open to women and men who are involved or interested in the sciences and 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.

WISENET Web Site: <http://www.usyd.edu.au/wisenet/>



PO Box 647, Glebe, NSW 2037, Australia

WELCOME TO WAIS CONFERENCE

SPECIAL EDITION

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Send copy for next issue (preferably in electronic form) to: Tricia Gardiner, Student Services UWA Nedlands 6907, or email tgardiner@admin.uwa.edu.au or fax on: (08) 9380 1119

Avoid sexist or other discriminatory language. WISENET reserves the right to make editorial changes. Each article is the opinion of the author and not necessarily that of WISENET
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This special edition of the Wisenet Journal is devoted to the Women Achieving in Science Conference (WAIS) which was held at Story Hall RMIT University, on 12 November 1999. The Conference was jointly organised by the CSIRO Staff Association, efficiently headed by Pauline Gallagher, together with FASTS (Federation of Australian Scientific and Technological Societies), the National Tertiary Education Union (NTEU) and WISENET .

Attendance was gratifying, the maximum number of 224 for the space available being reached well before the due date. Most of those present were of course Victorians; New South Wales had 35 representatives and ACT, Tasmania, Queensland and South Australia were also well represented.

Much ground was covered in a single day. Participants were welcomed by Michelle Smyth, president of CSIRO-CPSU and by Margaret Gardiner, an Elder of the Wurundjeri People, the Aboriginal people of the area. These opening talks were followed by plenary lectures from Professors Sue Serjeantson and Ann Henderson-Sellers. A further plenary address was given after lunch by Dr Miriam Baltuck from NASA.

Workshops were run in two concurrent sessions in the morning and afternoon. These focused on the following topics:

Scientific leadership - the uses of diversity (Nan Bray);
 Public image of science - putting women in the picture (Bernie Hobbs);
 Masculinity and the culture of science (Sue Lewis);
 Sustaining careers - must we stick to convention? (Sandra Eady);
 Science politics - daring to dream (Jan Thomas);
 Surviving and thriving in non-traditional roles (Annabelle Duncan);
 Performance pay - poison, placebo or panacea (Michelle Brown);
 Ensuring equity in performance management (Clare Keating);
 Mentoring - managed matching of minds (Michelle Smyth);
 Family friendly work - the best for both worlds (Rosemary Sutton).

Overviews of some of the workshops were presented in the final plenary session by Rosemary Sutton and Bernie Hobbs. Michelle Smyth chaired a short feedback discussion at the end of the day to wrap up the Conference Outcomes and conclusions from some of these workshops are published in this issue, or on the website:

<http://www.cpsu.org/csiro/>

Also included is a letter addressed to the conference from Fiona Krautil, the newly appointed Director of the Affirmative Action Agency and a related paper by Elizabeth Heij and Sandra Eady which was presented at a WISENET sponsored session at the XIX Pacific Science Congress last year in Sydney.

WISENET would like to thank both the CSIRO Staff Association and the NTEU for funding towards the production of this journal.

A plan was proposed for another such conference, in about two years time, perhaps to be held in Sydney. We should try to ensure that this happens (see back cover).

Julie Evans, Rosemary Sutton and Diana Temple, WISENET Editorial Team.

OPENING ADDRESS

*Michelle
Smyth*

I would like to welcome you all here today on behalf of the Organising Committee. The idea for this conference arose from our union staff talking to women in CSIRO laboratories about issues which concerned them. It was clear that women wanted more contact with other women at work, that many felt isolated. The younger scientists were particularly enthusiastic about recent appointments of women to Chief positions in CSIRO and were keen to have more role models.

We found that the best way to make this happen was to work with other organisations to make it a truly National Conference, to include the widest perspective on careers in S, T and E in Australia. The organisation of the conference became a collaborative effort between:

- FASTS (Federation of Australian Scientific and Technological Societies)
- NTEU (National Tertiary Education Union)
- WISENET (Women in Science Enquiry Network)

It was important to us that money not prevent younger women with limited funds from attending. We sought sponsorship so that we could keep the cost of registration to a minimum. We thank our sponsors for their generous contributions to the conference and hope that you will recognise their genuine and active support for women in science. Almost all of them employ women scientists/ engineers themselves. In particular I will mention

- CSIRO
- ANSTO
- RMIT University

You will see from the program that a large number of topics will be covered today, in the plenary sessions and the workshops. We have some interesting contrasts among the plenary speakers:

Sue Serjeantson spent most of her career in one University, ANU. Sue worked her way to the top while at the same time raising a family.

Ann Henderson-Sellers' work has been in mathematical modelling/computing. A feature of her career has been her mobility from one country

to another and one institution to another. Yet both Sue and Ann have found the time, and the need, to be active advocates for science and get involved in the politics of science.

Miriam Baltuck this afternoon presents an alternative view of what we can do in science careers. As a representative for NASA, she has used her expertise to contribute in this very masculine bureaucracy and reach a position of responsibility and influence. Her role in liaison throughout Australia and South East Asia is very political and is very much about promoting science for NASA.

The conference is a celebration of how far women have come. We have a lot of women in Australia with outstanding careers in science. But it is not nearly enough to say that we have gender equity. There is still much work to be done.

If there is one single message that I believe it is most important to emphasise, that message is: Women must get up, get out, do things and be advocates for themselves. They must become an independent force, not simply take the second place that is usually allotted to them.

We think the best way of doing this is for women to support each other. At the end of the day we hope to have a clear idea of what the conference delegates see as the best way and how to achieve it.

This is an edited version of the opening address.

Michelle Smyth first joined CSIRO 1960 starting as a base grade Experimental Officer, working on a survey of Australia's coal resources. Michelle continued her research into oil resources until, as a Principal Research Scientist, she retired from CSIRO in 1997.

Michelle always took an interest in many things as well as her science. She was an active member of the CSIRO Staff Association under its many labels since 1961 and held a number of official positions in the Association through the 80's and 90's. Michelle was the federal President between 1992 and 1999 – quite a challenge in yet another male dominated organisation.

Michelle is now a grandmother, having raised two children during her career in CSIRO. Neither of her children is involved in science or unionism.

THE ORGANIZING COMMITTEE

Dr Pauline Gallagher (Convenor)
Assistant Secretary
CSIRO Staff Association
Email: pauline_gallagher@cpsu.org



Dr Pauline Gallagher

Ms Jan Thomas
Vice-President, FASTS
Department of Education
Victoria University of Technology
Email: JanThomas@vu.edu.au

Dr Julie Wells
National Research Officer
National Tertiary Education Union
Email: jwells@nteu.org.au

Dr Sue Lewis
Victorian WISENET Link

Manager, National Centre for Women
Swinburne University of Technology
Email: suelewis@swin.edu.au

Dr Kate Hawkins
Former Victorian WISENET link
(formerly) Kodak Pty. Ltd.
Email: no longer available

Dr Kathie McGregor
Senior Research Scientist
CSIRO Energy Technology
Email: Kathie.McGregor@det.csiro.au

Dr Michelle Smyth
President
CSIRO Staff Association
Email: msmyth1@nsw.bigpond.net.au

Dr Gina Nicoletti
Department of Applied Biology and
Biotechnology
RMIT University
Email: g.nicoletti@rmit.edu.au

Ms Larissa Andelman (until May 1999)
Industrial Officer
CSIRO Section CPSU
Currently Telecommunications Section
CPSU
Email: larissa_andelman@cpsu.org

SOME COMMENTS ON THE WAIS CONFERENCE,

*Diana Temple
& Cathy Foley*

The Melbourne conference last November was a stimulating and rewarding experience. I was very glad to participate, to put faces to people who had been names, as well as to encounter old friends and acquaintances from interstate, such as Jo O'Neil, Sue Lewis, Edeline Wentrup-Byrne. Four Wisenet members travelled from Sydney - Rosemary Sutton, Julie Evans, Cathy Foley and I. Kirrily Moore, Wisenet's Hobart representative, was there, and Sue Lewis who had been Wisenet's member on the organising committee.

The speakers represented establishments under the umbrella of each of the co-organisers - research workers, chiefs of CSIRO divisions, senior and junior academics, science teachers, and students. It is apparent that women who work in laboratories, in administration, in teaching, in post-graduate research in scientific establishments in all states have many common experiences and problems. As a retired scientist with a lifetime interest (or obsession?) in this subject, I reflect that Australian women's scientific achievements appear to be more evident now than in past generations, and to be

receiving more public recognition. But, as illustrated in Sue Serjeantson's telling account of Joan and John, we must all continue to strive for improvement in women's position in science.

Diana Temple

Register your interest for the next Women Achieving in Science Conference with Pauline Gallagher by sending your contact details to:

pauline_gallagher@cpsu.org
by phone on 03 9206 2288
or by fax on 03 9602 3270.



Last November I went with two of my colleagues to the Women in Science Day. Immediately it felt strange to be in a room with 99% women. Being a physicist in CSIRO I have rarely been in this environment. I have been deeply involved in past years with Wisenet and various Women in Science programs. Recently I have not had time to join in these activities. Moving to a higher level of responsibility as a project leader and having a job that demanded more and more of my time, compounded with children who are now primary school age and taking up more time than they ever did as babies, extra curricula activities have been limited somewhat. This day gave me a chance to meet with my old friends and make new ones.

I want to comment on a few thoughts from the conference.

It was very pleasing to see so many young women coming into science with a clear view of what it means to work in this sometimes frustrating career with often limited opportunities. It was wonderful to meet with older women who are well advanced in their careers and who are, in some cases, leaders of institutions and departments. What sad-

dened me was the realisation that there appears to be a lost generation. Where were all the 35-45 year old women? There were some but not very many. Is it because they were too busy and just not there, could they not get the financial support to attend or have they been lost to science? I wonder.

The talks were excellent. I specially enjoyed Sue Sertgen's talk about Joan and John and saw how I had at times I had fallen into the trap of not playing the science game. But I have begun to wonder if doing it the "male way" is the solution. I have been successful as a scientist (I am a senior principal research scientist- level 8- in CSIRO at the age of 42 and a project leader of a large multi-million dollar project). I have pretty much avoided playing the boys' game. It is not my style. When I tried to do this I failed badly. What I found worked for me was to give myself permission to be me. For example, when important visitors came to the lab who worked in my field, I asked them home to dinner. They read the kids stories and enjoyed being a person with a colleague rather than a high level scientist to be sucked up to. As a result I was confident to ask these people to give me references for a recent senior promotion.

The other big event for me was to meet two CSIRO chiefs who are women. What an inspiration! I enjoyed the sessions they each ran and the discussion. What was also terrific was to see these women in action. Real role models.

I look forward to the next meeting. I hope that two days will allow us to dig a bit deeper and really address the issues that make a career in science a limited opportunity particularly for women.

Cathy Foley

CSIRO Telecommunications and Industrial Physics.



A STATEMENT TO THE CONFERENCE

Fiona Krautil

Thank you for the opportunity to provide a statement to your important forum. I regret not being able to participate personally as I know how crucial it is for women in a particularly male dominated field to share our experiences and work together to find solutions to the advancement of women in science.

It wasn't until after studying Science at Melbourne University and joining the workforce that I realised that women were not given the same opportunities as men to develop their careers.

In 1978 I was employed in my first full time job as a Microbiologist at the Attwood Veterinary Research Laboratory in The Victorian Department of Agriculture. At that time there were no senior female role models to aspire to or to seek out as mentors. I can remember aspiring to be a Scientist Grade 3 – the highest level that any woman I had met occupied at the time.

In the early 80's I can still remember discussing whether we would employ our first female stock inspector (who was the best candidate on merit) and management's concerns that she would need to stay overnight with the male stock inspectors and that "she might lead the men astray."

In 1988 I worked on a team to provide a more effective promotion process for scientists and this led to me successfully applying for the EEO Manager role in Agriculture. In participating on the Scientist Promotion Panel I saw that although the process was fair and open, the barrier to advancement for female scientists was their comparative inability to "sell" their abilities. This is still a problem I encounter when sitting on selection panels in recruitment processes in the private sector.

One of the highlights of my time at Agriculture was the opportunity to attend the Mt Eliza Management School's Executive Management for Women course at which I met the most wonderful female role models – including women who were working in demanding careers with small children. The course inspired me to continue to build my career and showed me that it was possible for

women to succeed in senior roles.

To further my career I completed a Post Graduate Diploma in Management at RMIT and then decided that the appropriate next step for me was the private sector. At this time I also gave birth to my first daughter and experienced at first hand the work and family balancing challenges.

In 1991 I joined ESSO. Working with line managers, I learned how to market and implement diversity within the business context. Although continuing to be idealistic, I became more realistic in terms of practical outcomes that could be achieved within a given timeframe and business environment.

In 1995 I gave birth to my second daughter and put into practice a range of flexible work practices available to me as well as the work-based child care!

One of my EEO goals at ESSO was to provide every line manager with the opportunities to attend a workshop to assist them to value difference – which we finally achieved in 1997 – it took me 3 years to achieve – but was ultimately won and led by the CEO!

Why is it so hard to achieve such an important goal, when the benefits to employer and employee alike are just so obvious?

The barriers to recruitment, retention and advancement for women in engineering are similar to the barriers faced by women everywhere in Australian science but are exacerbated by the fact that it is a discipline that has been historically and still is dominated by men and male ways of operating.

A US Catalyst study on the barriers to advancement for women in engineering reflects my own experience as a scientist and working with female engineers at ESSO. The research found that:

Exclusion from informal male networks was a major problem for women in gaining access to critical organisational information. Added to this, even networking among women at different levels was problematic as there are so few women in management positions. Further, women themselves did

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The engineering organisational culture is often hostile to women and sexual harassment is a common occurrence.

”

not appreciate the important role of networking to enhance work performance and career advancement.

The perceptions of male engineers constituted a significant barrier. Perceptions such as - engineering requires physical strength, or that women would not want to "get dirty" excluded women from obtaining the visible work assignments and line experience necessary for career progression.

Inappropriate assumptions lead to women being expected to work in jobs such as typing, roles not expected of the male engineers. This sent demeaning messages to the women engineers.

Men tended to be promoted on the basis of their potential, whereas when women were advanced it was because they had demonstrated their ability.

There are few senior female role models, to provide inspiration to young female engineers and to help build credibility for women in this profession.

Work and family balance was a major issue to all of the research participants. This included the lack of flexibility in work schedules, part-time options and family-friendly practices such as child care facilities. Many women were concerned that if they expressed a desire to work flexibly their career commitment would be doubted.

The engineering organisational culture is often hostile to women and sexual harassment is a common occurrence.

Catalyst's recommendations for overcoming these barriers included:

- The formation of women's networks
- The creation of greater career opportunities for employees on the technical career track
- Support for employees in balancing work and family responsibilities
- Ensuring that women are well represented on visible team projects
- Developing formal mentoring programs
- Building partnerships with colleges and high schools

- Formulating, communicating and enforcing policies on sexual harassment
- Holding managers accountable for recruiting, developing and retaining women
- Providing management skills and diversity training and
- Building women into succession planning.

I would add to this comprehensive list the need to link the retention and advancement of women to the outcomes for your organisations. Holding on to female staff and utilising their talent 100% is the way Australian science is going to be able to compete locally and in the global economy.

As Equal Opportunity Manager at Esso I saw the turn-around in the retention rate of graduate female engineers from half that of their male peers to the same rate. How much did that save? \$80,000 to \$100,000 per person - the cost of recruiting each female grad, plus another \$80,000 - the cost of replacing her with an experienced hire if she left.

Unlike many workplace initiatives that are either good for the organisation or good for employees, effective diversity outcomes mean a win/win situation for employee and employer alike.

Recent research has shown the competitive advantage that diversity can bring. For example:

- A new index on the US stock market, which follows the top 30 companies led by women, found that those companies outperformed the Dow-Jones Industrial Average for most of 1998.
- And while poor diversity performers earned an average 8% return on investment, excellent diversity performers rated a significantly higher return of 18%. (US Covenant Study which rated 500 companies)

It is true that women are not getting the experience they need in project leader, task-force and management roles and this is because of all the issues cited in the Catalyst research - the inappropriate assumptions and perceptions and exclusion from the informal networks. So when women are not getting the same opportunities as their male peers

and the workplace culture is not inclusive of their needs, they don't feel that their contribution is valued by the organisation and leave. The lack of supportive female role models in senior roles is another factor in Australia that makes it difficult for women aspiring to the top.

The strategies used by best practice organisations to achieve effective outcomes are diversity strategies which have built upon sound EEO foundations. Successful diversity programs must be tailored to the organisation and address its individual needs.

For effective diversity change to occur, initiatives must be based on:

- leadership commitment and action from the top
- accountability down through each level of management for making it happen.

Because the valuing of diversity usually requires significant culture change, it cannot happen overnight. There are no "quick fix" solutions – a long term culture change process is required. The difference between successful organisations and those that fail is not so much what they did but how they did it. This links back to the critical role of the leader in the diversity implementation process.

We need to create more opportunity in



Australian workplaces for safe, open dialogues between the senior management group and their female staff to improve the understanding of the issues. This will enable us to gain the necessary leadership from the top of all Australian workplaces to take the necessary actions to lead the realignment of the workplace culture so that all people can fully contribute.

The Agency is but a handful of people. We cannot change the mindset of every manager in Australia – we all need to work together to "rattle the cage" of equity.

Women can take advantage of our role as an educator to raise awareness of the issues. At the Agency we have access to excellent data to help women identify those organisations that are achieving equity for women in the workplace.

I encourage you to use our website (www.ewa.gov.au), our publications, such as the annual report and Action News, and our advisory service to find out which companies are achieving best practice in equal employment opportunities for women – and, indeed, which companies are not progressing. It's time for women to vote with their feet and target the 'women-friendly' organisations that provide the best opportunities and avoid those with a poor EEO record.

I hope the dialogue, networking and mentoring that will be an integral part of this important conference will inspire you to help each other make the changes necessary for women in science, technology and engineering to reach their potential to the benefit of all Australians.

Fiona Krautil is the newly appointed Director of the Affirmative Action Agency.



W W W
.ewa.gov.au

WHY ARE THERE SO FEW WOMEN IN SCIENCE?

Sue Serjeantson

Why are there so few women in science? This is the title of a debate hosted by the scientific journal *Nature* in 1999. As Nancy Lane points out in introducing the debate (*Nature*, September 9, 1999), much of the current concern about under-representation of women in science was sparked by a recent report of institutionalised discrimination against women scientists in, of all countries, Sweden.

In a 1997 study (*Nature* 387,341-343), women applying to the Swedish Medical Research Council for post-doctoral fellowships needed, on objective criteria, to be 2.2 times better than men. In Sweden, nepotism combined with sexism, was a powerful discriminator against women. We have always said that a woman has to be twice as good as a man and this study proved it!

As Nancy Lane pointed out, following publication of the study: "it was no longer possible to assume that an absence of women in science was due to women themselves, rather than the institutions to which they belonged."

Interestingly, this statement is similar to the conclusion of WISET, the Women in Science, Engineering and Technology Advisory Group established by Senator Chris Schacht in 1993, under the guidance of Ann Henderson-Sellers.

WISET identified: "the need for a paradigm shift away from asking what is wrong with women to questioning what it is about the environment of SET that it does not attract and retain the interest of girls and women".

In recent years, the environment for women in science has improved and science has attracted many young women to Australian universities.

In 1998, 53% of science enrolments were women, 39% of enrolments in mathematics and computing were women, 73% of enrolments in health sciences were women and 15% of enrolments in engineering and processing were women.

Women are increasingly represented among science PhD students, and now, about 30% of postdoctoral appointments in CSIRO are women. This is the good news.

But we have waited for more than a decade for the cohort to flow through into higher levels in research institutions and in universities, and all I can say is that it is a very, very, leaky pipe.

In this paper I recognize and acknowledge, along with Nancy Lane and WISET, the systemic discrimination of women scientists. However, women scientists often do behave differently from men, and I shall share with you some of my observations of differential behaviour between men and women that contributes to differential career progression. I believe that there is an interaction between systemic discrimination, which undermines the confidence of women, and their subsequent reluctance to put themselves forward to advance their careers.

Systemic discrimination.

As one example of systemic discrimination, I show you the mean rating of a scientific manuscript intended for publication and sent to 180 male and 180 female reviewers (Table1, p11). There were three versions of the paper, identical except for the name of the author. The first version of the manuscript was written by John McKay, the second by Joan McKay and the third by J.T. McKay. The first and second versions differed by a single letter. "John" was altered to "Joan".

Male reviewers gave John's paper an average mark of 77.5 per cent and Joan's paper an average mark of 50.0 per cent. Many reviewers thought that J.T. McKay was a woman disguising her sex, and the paper by J.T. McKay was marked down accordingly for an average mark of 57.5 per cent. Joan was dramatically under-rated, not only by men but also by other women. This study is now out of date, but the results are startling.

To what extent this systemic discrimination erodes Joan's confidence is hard to assess.

Table 1 Mean Rating Score (%) of Article

Article Authored By			
Article reviewed by	John T. McKay	Joan T. McKay	J.T. McKay
Men	77.5	50.0	57.5
Women	67.5	50.0	60.0

Adapted from Paludi & Bauer (1983)
See Billard: <http://www.awm-math.org/articles/notices/199107/billard/>

But the differential behaviour of men and women in research may well have its roots in the constant undermining of women in the rating of their grant applications, as shown in the Swedish study, and of their manuscripts submitted for publication, as shown above.

Let's look a little more closely at Joan and John and ask:

Why won't a woman act like a man?

The following story is a composite drawn from my general observations, and is not a true story. This is a story about two dedicated scientists who love their chosen careers in scientific research.

John spent the first five years of his post-doctoral career at the Malaysian Institute for Medical Research. Although being offered more prestigious post-doctoral fellowships elsewhere, he had followed his wife to Malaysia. When John was recruited to an Australian university, he was appointed at the bottom rung of Lecturer, Level B. He didn't question the level of appointment. The following year, having performed satisfactorily, he attained the level B+1.

That year, Joan, having spent three years as a postdoctoral fellow at a leading US university, was recruited to the same university department as John. Joan was offered appointment at the bottom rung of Lecturer, Level B. She wrote to the University expressing extreme disappointment at the level of appointment, implying she had competing offers from elsewhere. Joan requested two additional increments. The university compromised with an offer of one additional increment, to level B+1.

John and Joan are now colleagues at the same level of appointment, even though John has an additional three years of research experience. From this moment, Joan will be

tagged as a "high-flyer" and John will seem a slow starter.

John is asked to organize the Visiting Speakers Program. He performs this task with great efficiency and within the budget. John can rarely stay for post-seminar drinks because he needs to collect his child from day-care, which closes at 6pm. John always sends a letter of appreciation to the speaker.

The following year, Joan volunteers to run the Visiting Speakers Program. She's keen to get the very best speakers irrespective of the budget (which blows out). Joan always takes the speaker back to the airport herself, with plenty of time for a beer in the Golden Wing Club. Joan always sends a few of her reprints to the speaker and often receives a reciprocal invitation to give a talk.

A couple of years later, John is invited to give a paper at an annual Symposium in Colorado. This is an enormously prestigious invitation that has come out of the blue. John immediately rings his mother to ask if she can take care of his child.

Joan finds out who is on the organizing committee for next year's Symposium and recognises the name of one colleague on the committee. Joan sends her c.v. to the colleague, together with a manuscript that is in press and worthy of presentation at the Symposium. An invitation duly arrives. Joan immediately rings the Dean of her Faculty, to inform him of the prestigious invitation and to say she will be applying for an accelerated increment.

John is asked to be an assessor for NHMRC and ARC grants. He is very diligent about this responsibility, gives up a couple of weekends and agonizes about giving fair and consistent scores. He preserves the confidentiality of the process.

Joan is asked to be an assessor for NHMRC and ARC grants. She boasts that she can knock them over in one evening. When she writes a favorable report, with an inflated score, Joan makes sure she copies it to the applicant. After all, it's a small country and today's applicant may be tomorrow's assessor!

John is asked to apply for a job at another university. He puts the letter in the bottom drawer and says nothing, because he doesn't want to cause unnecessary anxiety among his technical staff and students.

Joan is asked to apply for a job at another university. She knows she's only been asked in order to swell the number of women applicants, but is flattered anyway. She tells the Dean that she is very, very tempted by a job-offer elsewhere, and gets a market-loading.

Time passes.

The Head of Department retires and John is asked to act as Head, which he does with efficiency and style. When the position is advertised, John assumes that if he is any good at the job, he will be asked to put his name forward. No invitation comes, so he doesn't apply. Joan updates her cv, has the occasional chance meeting with members of the selection committee (and reads their publications), and gets the job.

As Department Head, Joan takes the high-flying PhD students, no others, because she's got standards and they make a great contribution to her research record. John, who does not attract young Australian male students, in part because he's a man, takes students with English as a second language and puts enormous amounts of time into their supervision and success.

Joan has some discretion with the departmental budget and organizes a conference with overseas invited speakers. She's very careful in selection of speakers, because they need to be in a position to reciprocate the invitation, including finding travel funds, in the coming years. Half a dozen overseas invitations to conferences result from this initiative.

The University announces a special round of promotions to the Professoriate. John, overcoming his instinct to wait for an invitation, applies, as does Joan.

On the criterion of international recognition, Joan is clearly ranked ahead of John. Just look at all the invitations to international conferences! John is passed over and Joan is made a Professor.

Joan and John belong to the Royal Golf Club. John rarely plays golf because the competition for the Associates is on Wednesdays. Joan plays on Sundays with Senior Officers of the university. Now it's only a matter of time before

What happens to John? His mother has grown frail and needs John's support. His child, now a teenager, is skipping school. The house is suffering from years of neglect. Work is less rewarding, because he has little time for his beloved research. Joan is always absent, at conferences or on high-flying committees, so John often does the departmental administration, acts as the token man on mundane committees and looks after Joan's students as well as his own. The departmental budget has been cut and John is the first to lose his technical support. The university is down-sizing and an early retirement is looking more and more attractive.

So these are caricatures. There ARE men who know how to play the system and who do it with as keen an eye on self-interest as Joan; and, as we know, there ARE women who have the same diligent and self-effacing approach to work as John.

I think you know this environment well. In general, only men seek merit and market loadings, whereas women (and some men) have to be encouraged to apply for deserved promotions. Women are reluctant to subject themselves to scrutiny, whereas men, with sometimes extravagantly garnished c.v.s, are not frightened to put themselves forward. You may choose not to play by the rules of the game, but it is helpful to know the rules!

You will notice that I have depicted Joan as a pleasant, sociable, well-connected person who attracts supporters and mentors. She is not a bully, but she does have a personal relationship with those who can advance her career. I believe nepotism is a more powerful obstacle to career progression of women in Australia than is sexism. This is good news, because it's easier to build up relationships than it is to change your sex!

Nepotism rules not only in research, but also in industry in Australia. A scan of the top

four executive positions in Australia's top 200 companies by David Uren (Financial Review, October 1999) shows that every one of them is held by a man. Corporate boards of Australia's leading companies are closely inter-locked and insular. Uren says the power of school ties lives on.

The role of mentoring is often cited as a key factor in the progress of a career. Mentoring cannot be contrived through artificial pairing of individuals, but must come from the supervisor, who can share his or her contacts and networks with more junior staff. Next time your supervisor goes to a conference, go too! Make his or her networks your own! Conferences such as this are an important starting point for new networks.

Women represent a great untapped economic potential in science and technology. The nation and women themselves are investing in the education that prepares them for careers in science. We must find ways to mend the leaky pipe and retain our talented women in the very jobs that they are trained to do.

Sue Serjeantson is the President of Federation of Australian Scientific and Technological Societies (FASTS). This is a modified version of an address given to the conference.



WOMEN AS WITCHES:

What Are Women Doing in Applied Science, Engineering & Technology?

Ann Henderson - Sellers

1. Just what is the problem, ladies?

I found collecting together my ideas for the presentation I gave late last year rather tricky. In some ways even the title of my talk gave me trouble – was I going to entitle it: “What Are Women Doing in Applied Science, Engineering & Technology?” or “Why aren't Women Doing Applied Science, Engineering & Technology?”. I believed that the latter was really the issue I wanted to talk about but, of course, some of us are “doing” these things already so how could I pose and then pontificate on that question. In the end I had about half my slides titled one way and half the other. This title problem captures the essence of the dilemma for me: there are effective and apparently happy, well adjusted women in the ‘male’ disciplines of the title of applied science, engineering & technology so “just what is the problem, ladies?”

In the end I tried to ask this ‘question’ – the one above - “just what is the problem ladies?” – in my talk and to answer it as best I could from

my own personal perspective. I do the same in this brief summary.

2. Who is asking the question — me

My name is Ann Henderson-Sellers. It's mostly my husband's before you ask: I could have been triple-barrelled but thankfully I opted simply to take his name back in the unenlightened days of 1974. I also promised “to obey” but I haven't really kept to that part very well.

I have a B.Sc. (Hons) in Mathematics awarded by the University of Bristol in 1973. I married Brian in September 1974, gained a Ph.D. in Atmospheric Science in 1976 while a graduate student based at the UK Meteorological Office. On my first day at “The Office” a guy, who turned out to be pretty important, stopped me in a corridor and told me that “ladies in the British meteorological service do not wear trousers”. I was wearing, for my first day, my very best outfit – a Jaeger wool trouser suit which cost a small fortune. It later transpired I

should not have been walking down that corridor anyhow; well not until meteorological services the world over begin taking women into their senior executive that is. They still don't today.

My meteorological training proved that my capabilities as a forecaster are fairly poor. So I became an academic. First a lecturer, then a senior lecturer, then a Reader, after which I was awarded a Personal Chair by the University of Liverpool in the UK. This whole period spanned 1977-1988 and took place in the Geography Department at Liverpool.

I was offered the Chair of Physical Geography at Macquarie University in 1987 and Brian & I finally managed to immigrate in 1988. Soon after arriving I created the Climatic Impacts Centre there, and became its Director from 1988 until 1995. I moved to RMIT in 1995 to take up the post of Deputy Vice-Chancellor (Research & Development) and remained in Melbourne until 1998. In September of that year we moved back to our home in Sydney and I became the Director, Environment at ANSTO. This is my current job. I am also a Director of the New South Wales State Forests – an appointment also made in 1998.

In 1999 the University of Leicester awarded me a Doctorate of Science – not one of the honorary ones – the real thing involving a three volume collection of my published research over the last 20 or so years. This was a significant honour and one that pleased me greatly.

So, if I ask myself the question “what is the problem?”, I admit to there being none. I enjoy my job and have enjoyed most aspects of my career. I like being a scientist and I reckon I'm pretty good at it. Certainly good enough to enjoy the (many) positives very much and mostly to be able to 'wing' the negatives.

3. Who is asking the question — media / men

Of course there is a problem. Women are clearly under-represented in applied science, engineering & technology over most of the world, particularly in the upper echelons of organisations. So, the question is posed by commentators (male?) “just what is the problem, ladies?”. I ventured to suggest in my lecture that the answers lie in the stereotypes women & society have yet to overcome.

These can be summarised as requiring women to fit one of the following moulds:

Wife - meek, docile and unexciting;
Waif - innocent, powerless and vulnerable;
Whore – proffering sexuality “on demand”;
Witch - independent, powerful, sexually liberated and very much “a threat”.

I admit to being a witch and rather enjoying it. After my talk, a few other witches came to confess that while they didn't possess either black cats or broomsticks, they too felt they might want to join a coven.

4. Who is asking the question – women

We know there are difficulties and obstacles to be overcome by women hoping to pursue a career in applied science, engineering & technology. We tell each other about the issues fairly clearly. For example:

“How has it happened that from being a leader in opportunities for women in the early 1960s, the computer industry in Australia is now only slightly ahead of mining engineers, the Boy Scout movement and the Anglican priesthood in the proportion of women to men?” (Sally Liggins)

“Is it possible to have more than one career rather than two jobs (home & work) as most of us do?” (Ketzia Lambert)

The wealth of feeling of difficulties to be overcome was apparent at the November meeting we all attended last year. But why? Why is it perceived to be straightforward & reasonable for a woman to take a career break and return to, say, tax accounting, which seems to change with every budget, and this year also on 1 July, but not equally reasonable for her 'sister' to rejoin a career in applied science, engineering or technology? What is thought to be so difficult? Why do we advise our daughters not to go into science? Just exactly what is the problem, ladies?

5. Who is asking the question – governments

The Australian and United Kingdom governments tried to solve the riddle of diminishingly sparse representation of women in senior positions in organisations and roles in applied science, engineering and technology in studies entitled “The Rising Tide” (HMSO, 1994) and “Women in Science, Engineering & Technology” (AGPS, 1995). Both reports are worth reading.

5.1 “The Rising Tide”

There is a tide in the affairs of men, which taken at the flood, leads on to fortune (William Shakespeare). This study had as its terms of reference the following questions:

1. How can we ensure more girls become sufficiently interested in science, engineering & technology (SET) to choose to study these subjects at school, college & university?
2. How can careers in SET be made more accessible & attractive to women & how can their skills & expertise be effectively used?
3. How can it be ensured that more women are represented on boards & bodies responsible for policy on SET?

5.2 WISET: Women in Science, Engineering & Technology

The Australian study had similar terms of reference:

1. Improving the participation of women in senior science and engineering positions in both the public and private sectors
2. Improving the level of participation & retention by women in science and engineering education & training at both the vocational & academic level
3. Improving awareness of the contribution women can make to science & engineering in Australia

I chaired this study for the Keating Labour government between May 1993 and August 1995. The membership comprised 12 women & 2 men spanning expertise in science, technology, engineering, management, the social sciences & history. Our Final Report on long & short term strategies to address WISET issues was submitted to government in August 1995. Sadly, Minister Cook was “unable to act” on the findings due to the calling of the 1996 general election.

The Howard Coalition government has responded as follows to questions raised about the finding of the WISET study.

Senate Qu. No. 447 (3/3/97; Stott Despoja)

WISET provided valuable analysis; recommendations more relevant to the previous government; we prefer to create broad positive environment; and improve effectiveness of monitoring & reporting.

Senate Qu. No.687 (7/7/97; Stott Despoja)
provision of over \$5m in HEEP (HE Equity Program); and provision of 1000 HECS exemption scholarships.

6. Answering Some Questions - Issues from WISET & Rising Tide

Filters were discovered and re-discovered by both studies. These act to remove women and girls from the ‘male’ disciplines in applied science, engineering & technology at many stages. Together they provide a massive block to female progression. The main filters were found to be:

- Maths – why is this a block for girls, what are the re-entry routes?
- Computing - are home computers equally accessible, shared?
- Education – are teachers’ attitudes and student books gender balanced in the illustration of and discussion of applied science, engineering and technology?
- Training – is this offered more readily to men more than women?
- Promotion - no / little account taken of the “other skills” of women
- Parents / partner - lack of recognition of benefits of applied science, engineering and technology to society.

If a plan could be constructed to remove or at least reduce some or all of these filters there would be a much greater chance of women joining & progressing in applied science, engineering & technology. There are other issues to try to tackle also. These include:

- General problems for women – search for child care, attitudes to carers’ leave
- Broad / holistic approach - feminisation of workplaces, the reduction or removal of “gender harassment” may help both genders
- Data needs - where are the glass ceilings? How do professions/ disciplines differ?
- Awareness - who needs to know? How best to raise awareness?

Finally, there are the same old themes of societal, family & personal stereotyping :

- Social - women are treated differently “outside” work; wives or partners - not colleagues. Here is the wife or waif syndrome again.
- Sex – there is a genuine fear of apparent sexual compromise; can men & women ‘be friends’? One can always become, or be viewed as having become, a whore.
- Networks – there are too few of us; we have no locker room equivalent; our lower tolerance of alcohol seems to inhibit social equality; there are many fewer role models; there seem to be too few mentors.

I asked the conference attendees whether witches network. Sadly, I fear we do not, or rather we do not do it very well.

7. Some Very Personal Observations

All organisations take their culture from their Chief Executive Officer. My advice to those at last year’s meeting was don’t believe what anyone tells you. All experience shows that if he’s a bastard, the organisation is too. This applies even if there are women in deputy positions; in fact even more so, sometimes. Maybe becoming 2IC to a bastard turns witches into bitches.

On the positive side, as is the case in so many fields, the most effective way of changing culture is to do it. A female at the top really works! Adrienne Clarke is the one we all think of in Australia. There is Di Yerbury of Macquarie University: Australia’s first and longest serving female Vice Chancellor who has encouraged

and supported science & technology throughout her terms of office. Helen Garnett, of ANSTO, my current boss, is another really terrific example of an effective female who runs technology & science naturally and holistically. Mary O’Kane, Vice Chancellor of Adelaide University is another true technologist whose career proves that you can be a woman from the ‘hard’ science disciplines and make a great job of running a very complex organisation.



The inverse is true of course. Men who are interested in women’s success help immensely. In my case my husband has been a terrific support. As was my Ph.D. adviser, Jack Meadows, and a mentor with whom I have worked throughout much of my research career, Bob Dickinson. None of these guys have been particularly overt about pushing or even wanting women in applied science, engineering & technology. They have simply supported me when I have needed it and held me back when I’ve needed that too.

We can help ourselves too, and I believe that we should. We can encourage systemic, as opposed to systematic, thinking; provide & support holistic, rather than pragmatic, approaches; and enter into dialogue, not debate, in all deliberations.

The preferred female ‘type’ is still the ‘wife’. It’s all too easy to slip into the “yes, dear” role at work as well as in other settings. Even the alternatives of “waif” or “whore” can be tempting sometimes. How often have we become overly winsome or ‘winning’ in order to achieve a particular end? In my opinion most successful women are ‘witches’.

Perhaps what we really need in order to advance the progress of women in applied science, engineering & technology is more covens!



Professor Ann Henderson-Sellers, the Director Environment at ANSTO, trained as a mathematician with a Ph.D. in atmospheric science. In 1999 she was awarded a D.Sc. for research excellence & leadership. Author of 413 publications, including 13 books, she is an elected Fellow of the American Geophysical Union and the American Meteorological Society and an Affiliate Scientist at the National Center for Atmospheric Research. Ann served on the Australian Science and Technology Council, has chaired the Australian Academy of Sciences’ National Committee on Climate and Atmospheric Science and is currently a member of the Greenhouse Science Advisory Council. She is a company director and Fellow of the Australian Institute of Company Directors.

WOMEN ACHIEVING ...

*Compiled by
Diana Temple*

...In the Academies of Science

New Fellows of the Australian Academy of Science for 2000 include:

Professor Julie Campbell, a cell biologist, who is Senior Principal Research Fellow at Queensland University Centre for Research in Vascular Biology;

Professor Jennifer Marshall Graves of La Trobe University who works on sex chromosomes.

Professor Lesley Rogers, a neurophysiologist who works on development of the brain, and is Professor of Neuroscience and Animal behaviour at the University of New England, Armidale;



Professor Lesley Rogers

Professor Cheryl Praeger (Maths, University of Western Australia) and **Professor Marilyn Renfree** (Biology, University of Melbourne) are among Fellows appointed to the Academy Council for 2000.

Dr Leanna Read has been elected a Fellow of the Australian Academy of Science, Technology and Engineering. She is the Chief Executive Officer of the CRC for Tissue Culture and Repair.

Women comprise fewer than 4% of Fellows of the Academy.

...In Science Communication

Robyn Stutchbury received the Eureka Prize for the Promotion of Science on behalf of the Australian Science Communicators, for Science in the Pub (<http://www.scienceinthepub.com/>). Robyn runs the Sydney branch of Australian Science Communicators and has promoted Science in the Pub successfully in Sydney and in country centres with its aim of bringing science to the public.

No other women were winners at this year's Eureka prize-giving.

...In winning academic medals

First class honours and the University Medal was an achievement for **Piera Taylor** when she graduated in Dentistry in Sydney in 1992. She later enrolled for a medical degree while practising dentistry part-time. In her final year of medicine, she took two weeks off to have a baby, then graduated this year with first class honours and the University medal, again. She is to continue studying to become a surgeon. (Source: Sydney University News, 18 May 2000)

...In academic posts

Margaret Shiel's appointment to a personal chair at the University of Wollongong makes her the first female professor of chemistry in Australia

Elizabeth Deane, formerly University of Western Sydney, has been appointed as Head of Life and Environmental Sciences at Macquarie University.



SCIENCE CAREERS FOR WOMEN: GOING IN WITH EYES OPEN

Elizabeth Heij &
Sandra Eady

Science careers can be played out in universities, in public-sector research organisations, or in the R&D departments of private-sector enterprises. Our own collective experience, however, has been in universities and the public sector. Therefore, in what follows, we will refer principally to these environments, drawing especially on our experiences over the last seven years with CSIRO, Australia's Commonwealth Scientific and Industrial Research Organisation.

This paper is not a quantitative assessment, although it will draw on some quantitative data from other studies. Rather, it seeks to leave the reader with food for thought and, hopefully, a stimulus to look further at a number of critical issues for women entering science.

Initially, we will look at the main career pathways in science, and examine how attractive and rewarding they are likely to be for women. Our argument will be that there are still some fairly serious roadblocks, especially for those women with the highest creative ability and the best leadership potential. We will suggest that some of the factors involved relate to changes in the way science is being carried out, while others are more widely active throughout Australia's corporate culture. The end result, however, appears to be accelerated loss of talented women from our science system in mid career when they are most productive. This is a loss we cannot afford if our future is to be based on knowledge, innovation and technological advance.

Starting at the entry point of a career in scientific research, what factors might be influencing women's choices from that point on? CSIRO illustrates fairly well the employment conditions in Australian public-sector science, so we will draw initially on observations made by one of us (Eady 1999¹) in a study of gender issues within CSIRO.

Postdoctoral fellowships are a common transition mechanism between Ph.D. research and an established research career. Of postdoctorals working in CSIRO in 1998, 30% were female, which is not too different from the 34% of women completing postgraduate

degrees in science. Presuming the proportion of women applicants for CSIRO positions is in line with their graduation rate, this suggests there is little if any gender bias in postdoctoral appointments. Immediately beyond the postdoctoral level, however, the proportion of women drops from 30% to only 22%, suggesting that a lower proportion of women are translating their postdoctoral "apprenticeship" into an established career pathway. Furthermore, once appointed as research scientists, twice as many women (25%) as men (12%) are employed in short-term rather than indefinite positions.

The reasons for these two types of appointment bias are not clear. While we might want to question managers' perceptions of "risks" associated with women employees, and other intangibles such as preconceptions about "goodness of fit" to existing predominantly male research teams, caution is needed. A number of young women do actively choose to subordinate their early career to spouse or family, making career breaks, part-time employment, and term positions more frequent active choices among women.

Once into a research position in CSIRO, be it a term or indefinite appointment, women researchers, assessed on their science performance, are promoted at a rate equal to that of men and, since they spend fewer hours on their work, we could claim they are actually more efficient. Nevertheless, although a recent CSIRO staff poll showed that women have the same aspirations as men for long-term careers, and the same desire and willingness to be promoted to senior research management positions, only one woman has ever been promoted from within the organisation to one of the 22 Divisional Chief positions. The first two female Chiefs of Division were both recruited from outside.

Also of concern for women in mid career within CSIRO is the fact that high-profile recognition for scientific achievement has been almost exclusively focussed on men. No woman has received a Chairman's Medal although there have been 47 male recipients since these awards began in 1991. In addition, since their inception in 1986, CSIRO



Elizabeth Heij

medals have been awarded to 88 men but only one woman. Does a score of one medal in 136 really represent the relative quality of science done by women in CSIRO? We don't think so!

Over at least the last four years in CSIRO, there has been a higher turnover rate of women scientists compared to men (8.6% cf. 6.8% per annum). Since redundancy rates are the same for both genders, and fewer women exit because of sickness or death, the difference lies in women's higher rates of resignation and non-renewal of term appointments. Considering only resignations, across the more senior levels the resignation rate for women is almost twice the rate for men (4.8% cf. 2.6% per annum). In addition, of those high-performing staff selected to go through the CSIRO Leadership Development Program (LDP) since it began in 1989, 82% of men but only 25% of women still work for CSIRO. The actual numbers are small (71 men and 8 women) but the trend is a concern for the loss of talent it represents. Since CSIRO has not to this point conducted exit interviews for resignations, it is difficult to draw conclusions, but there have certainly been individual cases of women who felt they were constrained from reaching their potential, while others found irresistibly greener pastures elsewhere.

What causes our more senior women scientists to resign at a higher rate than men, and what are the possible factors that may consciously or unconsciously weigh on their decisions? This does not appear to be simply related to family responsibilities or a "trailing spouse" effect. If it were, we would expect resignations to be unrelated to whether the individual was sitting on a promotion bar or not. The proportions of women and men resigning at the top of a promotion level are, however, almost identical – around half of all resignations for both genders (women 52% cf. men 55%). It appears, therefore, that perceptions of opportunity and job conditions in the next level up have more to do with women's decisions to resign than unrelated events such as family responsibilities or spouse transfer.

What is going on here? Why do we see this lack of recognition, and a higher resignation rate for women? Are they linked?

As we see it, science essentially has two divergent career paths. They can be coupled for varying periods, depending on the indi-

vidual and circumstances of their job, but essentially one track leads in the direction of intellectual status and Nobel prizes, while the other leads towards CEO status and socio-political clout. How does a scientist choose whether to concentrate on becoming ever more skilled and eminent in a chosen disciplinary field, or to switch into the management stream and seek personal achievement (and usually a higher salary) through supervising the work of others? And what does this mean for women?

A number of women scientists, such as Marie Curie and Barbara McClintock, who achieved high science honours in the past, did so via the intellectual eminence track as relative loners, often working from lower status positions on the fringes of the science establishment. They bypassed altogether the potential gender bias problems that we know prevailed in the science organisations of the day.

Theoretically, this career path is still available. The fact that we observe, in CSIRO at least, that women are promoted through the ranks on scientific merit at least as fast as men should make it attractive – shouldn't it? But what about the lack of recognition, displayed in CSIRO for example as the almost complete lack of women receiving in-house science achievement medals. Do our women scientists expect to be relegated to the same role as Rosalind Franklin in the Watson-Crick saga?

And what about the fact that establishment science is becoming progressively less hospitable for brilliant loners (of both genders). Increasingly, in CSIRO and even in universities, we are working in larger, multidisciplinary, and commercially driven teams to connect science with business outcomes. The objectives may be in the national interest, but this is hardly the conducive environment for a future Marie Curie or Barbara McClintock. Many of our most eminent science intellectuals actually spend most of their time as entrepreneurs, marketing their science to secure funding for an army of postdoctorals and junior scientists who actually do the work under intellectual guidance.

It is clear that today's trends to "big science" and big collaborative joint ventures are increasing the covert competitive forces acting on the personal-achievement pathway, making it more like the management pathway which has always been competitive,

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The corporate world has to grasp that people are human beings not human resources.

”

entrepreneurial, and political, with few women out in front as role models. So what is life like for women in the middle ranks of science organisations? Why are they resigning faster than their male colleagues?

With the reader's indulgence, we will digress for a few minutes out of science into the general business world where a number of surveys and case studies have looked at why women actively opt out of apparently good positions on the track to the top². A case in point is a 1997 study of the banking industry by Professor Leonie Still³. The study showed that for more than 50 women managers resigning from one major corporate bank over an 18-month period, the main reasons for opting out were not poor pay or family-career conflicts, but frustration over lack of appreciation and understanding of both their particular skills and the processes needed for good organisational culture. These women were, not surprisingly, uncomfortable competing in a male-dominated corporate hierarchy, and frustrated by their inability to change things to produce a more gender-neutral working environment.

It seems that talented women who reach middle management levels in big organisations often want to run things differently and are giving up and opting out when thwarted for too long. The relationship between higher rates of loss of talented women out of middle management in big business, and the higher frequency of business start-ups headed by women⁴ is certainly no accident. A couple of recent case studies from the popular press⁵ are quite illustrative:

A former barrister and solicitor says of her old occupation: "The legal profession is a boy's club where you are not supposed to give a damn about people. Many of the people who run the profession are just there to make money, even if it means treating the people they pursue with extreme viciousness. I knew there had to be a better way to resolve legal disputes than to treat the world as a battlefield and destroy people's lives. The corporate world has to grasp that people are human beings not human resources." This woman now runs her own highly successful small business as a Dispute Resolver.

In another example, a skilled real estate saleswoman bailed out of mainstream real estate to run her own, very differently organised business. She says "I left the mainstream real estate market because I wanted to do some-

thing different. I was confined by the corporate rules and it was almost impossible to deviate from the rigidly defined norms of how to do business. I wanted to do business ethically, without hard sell, and I wanted to make work a pleasure rather than a soul-destroying activity. My belief was that you did not have to resort to lies, manipulation or pressure to get clients." She also wanted a business with a feminine touch: "Women have better interpersonal skills, and people feel less threatened by us." In her own business, this woman has abolished traditional hierarchies and works in the same room as her staff at an identical desk. Not one of her agents had left in the four years since she started her business.

What about the women in our large science organisations like CSIRO? Are some of the same sorts of factors behind the higher resignation rate of senior women?

By national standards, CSIRO offers women good conditions to meet family responsibilities, such as maternity leave and flexible working hours. However, most high-level training opportunities are still off-site residential and, also at higher levels, the frequency of expected interstate travel to meetings becomes punitively high for primary care givers. These factors clearly make internal advancement more difficult for women. Only 5% of men have primary responsibility for childcare as opposed to 50% of women.

A recent CSIRO staff poll showed that over 37% of women but only 7% of men believed they had been unfairly treated in the previous year because of their gender. The same poll asked staff to comment on the underrepresentation of senior women in CSIRO and suggest how it might be addressed. Some of the responses are quite illuminating. The following are not identified to a particular gender:

"This is a difficult issue – there needs to be a change in attitude, not so much towards women, but towards what you have to do to succeed. The long hours and unbalanced lifestyle needed for most of us to succeed is unsatisfactory to both males and females, but much more restrictive for females because of the time commitment needed to raise children. I think this shift will only come when more women are present in the workplace and we stop playing the

same male dominated power game to succeed.”

“Women usually have a different approach to communicating and problem-solving. This is often not well understood by men (who are making the appointments). This different approach is often seen as inferior rather than simply different. At an unconscious level, the men making the decisions feel more comfortable choosing another man, whose style they understand and whose performance, as a result, they feel more confident in predicting.”

“The major problem is the “old boys club” which excludes women from informal mentoring networks, and promotion criteria and evaluation dominated by a male philosophy of competition rather than a female philosophy of cooperation.”

And numerous other comments in similar vein. Amongst the feedback, however, were a number of comments that hint at the negative attitudes encountered by some of our women scientists. Again, the examples are not identified to one gender or the other:

“There are possibly sex related factors, perhaps related to such things as aggressiveness, ruthlessness and stamina, and a far greater interest in home making that make women (thankfully), on average, inherently less competitive for such work.”

“I don’t believe that in senior positions within CSIRO that women can do the job as well as a man because women are too emotional and not hard enough.”

“I don’t think you need to do anything if women have not done the training and men have well that’s the way things are.”

“Attract women from overseas countries where women’s attitude is more ready to work in a man’s world.”

“It does not concern me in the least, in fact CSIRO is probably better off without them.”

“

I wanted to do business ethically, without hard sell, and I wanted to make work a pleasure rather than a soul-destroying activity.

”

“Is it necessary to have proportionate representation? I can’t imagine there will be enough capable women.....”

Faced with the latent resistance generated by such attitudes, would it really be so surprising that some of the capable women finally give up? Women are, after all, less likely to see their job as defining their personal status, and more likely to see life as presenting a number of diverse options rather than a single career pathway. The business world is snapping up talented, well-trained, experienced women, and those businesses that do it best will be well ahead.

Of the large public- and private-sector organisations in Australia, we are confident that CSIRO is one of the better employers of women. The problems unearthed by the CSIRO staff poll and the study of gender balance are not specific to CSIRO. They are largely symptomatic of a latent cultural problem that, in a subtle way, pervades our entire corporate culture, including big science. It certainly appears that this latent cultural malaise could well be responsible for leakage of female talent out of science as well as corporate workplaces. If so, this is a flaw we must address. With women now making up at least 30% of the entry-level research workforce, we stand to lose a significant element of science talent; and we stand to lose in other ways as well. Women generally tend to be more focussed on teamwork, outcomes and social benefits rather than status and political power-plays. This, increasingly, is the focus science needs for the future. We are supposedly the clever country. The future of our whole society technological. We simply cannot afford to miss out on the vital catalytic role that women can play in science.

So – for a woman entering science, one of the most valuable tools for carving out a career may, in fact, be not her scientific ability per se but conscious knowledge of the interpersonal skills needed to achieve her objectives and be valued for her own qualities in a male-dominated environment.

Certainly, she needs to go into science with her eyes open.

1. Eady, Sandra J. (1999) *What women have to offer Australian science. Internal Report to the Chief Executive, CSIRO.*
2. Burton, Clare (1997) *Women in public and private sector senior management: A research paper for the Office of the Status of Women, Department of the Prime Minister.*

<http://www.dpmc.gov.au/osw/meburtm.htm>

3. From an article entitled "Female bankers bale out at glass ceiling" reporting on a study by Professor Leonie Still, Edith Cowan University, Perth, on reasons given by women managers for leaving the banking sector. *Weekend Australian* 8-9 March 1997 pp 1, 6.

4. *Women business owners: Emerging market seeks cash infusion. Trend Letter* 10 June 1999, p4.

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A version of this paper was presented by E. G. Heij as the Joyce Allen Memorial Lecture, (ANZAAS) XIX Pacific Science Congress 4-9 July 1999, Sydney.

Elizabeth Heij is Chief, CSIRO Division of Tropical Agriculture in Brisbane. She was born in Hobart,

Tasmania, in 1943. She received a B.Sc.Hons. in Botany at Victoria University of Wellington, New Zealand, before completing a Ph.D. in Plant Genetics at the University of Wisconsin, USA. As a mother of four children, she worked part-time for much of the early part of her career and is today a strong supporter of continuing education for women and flexible working arrangements for parents. She also has an interest in fostering innovation in the areas of sustainable agricultural production through multidisciplinary teamwork.

Sandra Eady is a SRS at CSIRO Animal Production in Armidale. Her background is included in her article on page 27.



PERFORMANCE PAY: POISON, PLACEBO OR PANACEA?

Michelle Brown

Discussion in this session focussed on the impact of performance based pay systems for women employees. A performance based pay system is any system that attempts to link pay of an employee to some measure of individual, group or organisational level performance. The decentralisation of the system of industrial regulation from the late 1980's has provided organisations with greater responsibility for the development and implementation of organisational level pay systems.

Evidence was presented that showed that the gender wage gap was widening under a decentralised system of pay. At least two factors have contributed to this widening differential between the pay of male and female workers. Firstly, women are less likely to receive paid overtime and secondly women are less likely to receive performance-based payments.

Concerns have been expressed by the Human Rights and Equal Opportunity Commission about the level of discretion that performance based pay provides an employer. For example, performance criteria such as 'zeal' and 'enthusiasm' can be highly subjective. There is also growing evidence of employers using hours of work as a performance indicator. This however can be discriminatory: it works against those who manage their work effectively and those unable to spend long hours at work due to

domestic responsibilities

Evidence from a survey of CSIRO employees was also presented. In late 1998 a survey of all employees (union and non-union) was undertaken by the presenter to determine their pay system preferences. One particularly notable finding was the high level of interest expressed by women in individual performance based pay. Various interpretations of these findings were discussed. It would appear that professional women employees feel that the current pay system does not adequately recognise their contributions. This raises a number of challenges for unions. Unions have expressed concerns about the subjective nature of many performance based pay systems but need to find ways to appeal to women workers are they are currently less likely to be members.

Michelle Brown is a Lecturer in the Department of Management at the University of Melbourne. She specialises in pay system research, especially into the effects of performance based pay systems on employees, unions and organisations in Australia and the United States. She recently participated in an evaluation of the existing pay system within CSIRO.



SURVIVING AND THRIVING IN NON-TRADITIONAL ROLES

*Annabelle Duncan,
Chief, CSIRO
Molecular Science.*

Until I was asked to run this workshop I had never really thought of myself as working in a non-traditional role. I had ended up in such a role by default, not through any proactive plan. I had trained as a biologist and biology is a field which attracts a large number of women. In my undergraduate years there were more females than males in my classes. This changed as I progressed through my postgraduate studies and now I find there are usually very few women at any of the meetings I attend. But I certainly never planned to take on a "non-traditional" role. So how did I end up working in a role which, for whatever reason, does not have a high female participation rate? Like many people, much of my career has been serendipitous, if I have had a guiding philosophy it has been to "give it a go" and to take on things that looked like they might be fun. I always figured that I could leave if I found I didn't like a job.

I guess a lot of things have helped me in my career, including a lot of luck. Opportunities came my way which have had an enormous influence. Some did not seem like such a great advantage at the time. Take the time for example when I failed all my courses in my second year of university (no need to go into reasons, my mother did not believe my excuses either). While I was repeating the year, I was offered a job in the research laboratory of one of the senior lecturers. There were two important aspects to this opportunity, firstly, I got to work in a research lab, an experience that not many people are lucky to have at this stage of their education. This experience was important because until then I had planned to complete my Bachelors degree and find a job. Women did that didn't they, well women like me anyway. It was different for the really bright ones. This job showed me that I might have a future in research and that a higher degree wasn't totally out of the question. Furthermore, I was very lucky, my boss was a great person to work for and importantly she was both a role model and a mentor.

This was important to me. I have never really considered whether to chose between career or family, though I know there was a time when this was a consideration. I had a

role model from this time who had a good career and a happy family. If she could, why couldn't I. Which brings me to one aspect of role models which is very important. Your role models have to be relevant, you need to be able to relate to them, to get to know them. We can read biographies of people like Jill Ker Conway, she is a great role model, but if you are like me you think "Yes that's all very well, but she is different, I couldn't do that." When you get to know the people who have achieved in your chosen field and you realize that maybe they aren't all that different at all, then you have a role model you can relate to.

I have also been lucky in that I have had not just this one, but four, very good mentors in the course of my career. These people have also been important not only because they each taught me so much, but also because they put opportunities my way which have helped to shape my career. These opportunities have given me a breadth of experience which has been invaluable. While it is important to focus on a core discipline when getting established in a career, I think it is also important to realize that science is not enough. You need a broad experience and you should take every opportunity to broaden your experience. Whether this is serving on committees, working in different environments for periods of time or working in totally different fields, all the experience helps. Another thing to remember, is that opportunities never seem to come at the "right" time. They also don't usually come twice. Grasp them when they are presented and make it the "right" time. But equally, if you take something on and then find you don't like it, drop it. If its not fun, don't do it. By taking advantage of a range of opportunities if they come your way, you also enlarge your networks and support structures.

I guess, as I analyse my career there are a number of factors which I think have been instrumental in enabling me to survive and indeed to thrive in the roles I have taken on. I have had a broad range of experience, this has given me relatively large networks involving a diversity of people. It has also given me some skills which have been a big help to



Annabelle Duncan

me over the years, some political appreciation, negotiating skills, delegation skills (don't underestimate this, you can't do justice to a new role if you are unable to give up the previous responsibilities and you can't look after a family and have a career if you can't trust others to look after your children).

The nature of science and technology is changing, it is now imperative that we get research adopted to show an economic return on investment. This requires skills far broader than just scientific skills and net-

works broader than your discipline base. Network widely, take the opportunities as they are presented to broaden your experience and appreciate the need for diversity, whether it be discipline, ethnic, gender.

Annabelle Duncan is Chief of Division at CSIRO Molecular Science, the first woman to have been appointed to that role internally. She is an adviser to Dept of FA&T on biological weapons control and has been a Biological Weapons Inspector for the UN Special Commission on Iraq.

FAMILY FRIENDLY WORK: THE BEST FOR BOTH WORLDS

Rosemary Sutton

Pauline Gallagher's invitation to organise a workshop on family friendly practices at the WAIS conference was a great opportunity for

me to collect together my thoughts on this subject, assisted by feedback from members of the CSIRO email discussion group focussed on women in science, and information from Pauline herself. On the day, the workshop participants raised lots of issues and the discussion flowed freely. Lesley Adams wrote an excellent summary of the outcomes, that is posted on the web and can be accessed via the CSIRO staff Association or WISENET web sites (see left margin). In this article I have used some quotes from email responses I received and I have drawn on some CSIRO statistics, to illustrate some of my points.

What are family friendly practices

Family friendly work practices are work policies and work cultures or attitudes which enable staff to meet their family commitments. Some practices relate specifically to the care of newborn babies, and others also provide options to facilitate caring for parents, partners, children and other family members. A list of many such policies is provided in the text box.

Family friendly work means much more than maternity leave and part-time work for new mothers in the workplace. We all have families.

Many of us at some stage of our lives have a role taking care of others, that conflicts to some degree with the demands of our science based careers. Increasingly, men as well as women are choosing to care or share caring for babies, children, aging parents, and family members including same sex partners with disabilities or illness.

Carers may want a few hours, a few days, a few months or a few years or a regular arrangement of shorter hours or longer vacations to cope with

their commitments outside the workforce. Workplaces which are flexible enough to willingly provide a range of options to solve common stumbling blocks, reap in the long run the benefits of a loyal and contented, less-stressed workforce.

Profile of CSIRO carers

A survey of staff in CSIRO in 1998 by Falls Corporate Research Pty Ltd, showed that over 40% of staff have carer responsibilities, with a summary of results shown in the table. Surprisingly, the largest group -a fifth of all staff- are men who share equally in the responsi-

Family friendly practices

- Special leave (eg for sick dependents)
- Flexible workhours
- Permanent Part-time
- Job sharing
- Leave without pay
- Long service leave (full or half pay)
- Extended holidays with pro rata pay eg 40/52
- Holidays on half pay
- Community Service hours
- Paid/unpaid maternity leave
- Paid/unpaid parental /paternity leave
- Work based childcare (salary packaging)
- Nanny service for sick children
- Re-entry- 5 year internal applicant status
- Return to workforce fellowships
- School holiday programs

WWW
[.usyd.edu.au/wisenet/](http://usyd.edu.au/wisenet/)

WWW
[.cpsu.org/csiro/](http://cpsu.org/csiro/)

bility for the care of their dependent children. This group grew significantly between the EEO census in 1989 and the 1998 survey, with care shifting in about 10% of families from mothers

ty was an issue of key importance to both the CSIRO and WAIS groups. A hobby horse of mine – namely providing a 6 to 12 week paid parental leave period for men who undertake to

Carer responsibilities for	Men			Women			Total	
	No.	%	%all	No.	%	%all	No.	%all
Dependent children	<u>1222</u>			<u>428</u>			<u>1669/3712</u>	
-mostly you	62	5%	1.7%	214	52%	5.9%	286	7.7%
-mostly other person	376	32%	10.4%	14	3%	0.4%	405	10.9%
-shared equally	736	63%	20.3%	185	45%	5.1%	942	25.4%
Others	<u>212</u>			<u>120</u>			<u>340/3534</u>	
-Aged	137	65%	3.9%	80	67%	2.3%	222	6.3%
-Disabled	34	16%	1.0%	18	15%	0.4%	53	1.5%
-Other	47	22%	1.3%	26	22%	0.7%	75	2.1%

to both parents. Of those with dependent children, men reporting that they shared equally in childcare increased (52.0% to 62.7%), and women reporting they were mostly responsible decreased (61.3% to 51.8%). The second largest group are mothers of dependent children (11% of total staff) which includes roughly equal numbers of women in primary and shared care roles. Not surprisingly, primary caregivers are still largely women. The third largest group is the 9.5% of staff who reported responsibility for caring for aged, disabled or other family members, with similar profiles for men and women. Any changes to family friendly work practices should reflect the diverse nature of these carers.

Improving policies

The workshop at the WAIS conference raised a few issues relating to the actual policies in place in different organisations. The group was largely women from the universities, CSIRO and CRCs and expressed the view that the most problems lay not in the policies per se but in an inability or reluctance to use them. One exception raised was the need to provide alternatives to overseas postdoctoral experience and sabbatical leave, which some women forgo because of family responsibilities. Another was the need for more organisations to provide re-entry fellowships for women who have taken extended career break to care for children. In developing policies to address these issues, I believe that it is vital not to exclude those men who are caught in the same dilemmas that traditionally women face.

About half the responses I received from the CSIRO email group focussed on new family friendly policy options; the other half raising issues of organisational culture. I have included direct quotes from replies which cover some options raised. The high cost of child care and need for government subsidy or tax deductabili-

be primary caregivers to their newborn children within say the first 15 months - generated mixed reactions within CSIRO, but was well supported at the conference.



“Recreation leave on half pay is another option that would not cost CSIRO much. “

“ Fellowships to facilitate re-entry to the workforce for those who’ve had lengthy career breaks are also a good idea.”

“ It would be particularly valuable for women if CSIRO supported scholarships for retraining after a break”

“I think a re-entry scheme (with multiple entry points) is long overdue for CSIRO.”

“The nanny for sick children would take a lot of stress out of child raising too, often children are quite well but have to be kept at home suddenly which disrupts work arrangements.”



Improving attitudes

Both the workshop participants and the CSIRO email respondents saw a need for change in people’s attitudes and organisational cultures that restrict the practical use of the existing policies. They perceived a lack of acceptability - with breaks and working part-time for example being interpreted by colleagues and managers as a lack of career commitment or seen as unwarranted perks, resulting in unspoken tensions and a reluctance to use them. The need to support

women taking these options was expressed. Men are perhaps restricted to a greater extent by prevailing attitudes. I do however feel encouraged by the progressive improvement I've seen over the last 20 years in reactions to maternity leave.

What else can we do?

The workshop came up with a number of recommendations on what we can do, and what our employers and government can change to make the workplace more family friendly. I've already touched on some of the specific issues. On a personal level, it is important that we support women and men in caring roles including those who make choices that are different from ours. We can be more assertive in asking for access to specific "family friendly" conditions

“

“I think we have a good range of family friendly policies available. However it is a great pity that cultural pressure does not allow us to take up many of these options. The higher up the salary scale the worse the pressure. “

“The greater problem is the unacceptability of their use” (in reference to current policies).

“Yes this is a very good idea but I wouldn't dare take it up!!” (referring to recreation leave on half pay)

“Current benefits are often not widely appreciated, despite the best efforts of the union and CSIRO human resources. Perhaps we could try to better inform supervisors of these benefits, with the aim (in the hope?) that they be discussed as part of the career development”.

”

and be prepared to be early users of the newer policies available, knowing that it will be easier for others to follow. There is no doubt that positive attitudes, role modelling and messages from organisational leaders and senior managers are very beneficial - Malcolm McIntosh, the late CEO of CSIRO was a shining example. We can also lobby governments to apply pressure on government funded organisations and granting bodies to be more equitable, to reduce child care costs and to implement the 1995 recommendations of the WISET report.

Role models – mothers with scientific careers

I grew up believing that it was important for women to have careers, so that they could financially support themselves and their children if need be, but that I would postpone having children until I was ready to give up my job and therefore prepared to look after them full-time. As the years progressed and my career remained vital to me, perhaps I would never have got around to having children, if I had not become aware of women making a success of both. It is not a choice for every woman, but if one is prepared to be both highly organised and exhausted from time to time, one can do it! It is certainly made easier by supportive partners, families, friends and colleagues and employer organisations that care. To conclude, I'd like to name a few of the scientists who have combined career and motherhood in Australia and are sources of inspiration. Adrienne Clarke, Suzanne Cory, Elizabeth Dennis, Sue Serjeantson, Catherine Foley, Clare Rae, Elizabeth Deane, Elizabeth Heij, Annabelle Duncan, Anita Andrew, Marilyn Sleigh, Rosemary Irrgang, Miriam Baltuck, Julie Evans and Diana Temple.

Rosemary Sutton is a Senior Research Scientist who has worked for CSIRO for 20 years. She was educated at PLC in Melbourne, the ANU in Canberra and the University of Sydney. Her research has progressed from biochemistry to molecular biology and genetics with projects ranging from plant responses to ozone, changes in liver energy metabolism after birth, identifying allergens in wheat flour, proteins involved in sheep reproduction, transgenic mouse models, gene expression in developing wool follicles, pigmentation genes and DNA testing in sheep.

Rosemary has 3 children aged 15, 12 and 9, a supportive spouse, and now works part-time (70%) for CSIRO, to free up time for her to be involved in after-school kids activities, walk her dog and swim regularly, and to be National Convenor for WISENET.



CHALLENGING THE CONVENTION OF THE TRADITIONAL SCIENCE CAREER PATH

*Dr Sandra Eady,
CSIRO Animal
Production,
Armidale*

Time has flown since we met in Melbourne for the Women Achieving in Science Conference in November 1999. However, a number of issues that were raised in the career development workshop have stayed in my mind.

The request from WISENET was to give a little of my background and then to discuss the outcomes of the workshop I facilitated. I thought this would be easiest to do if I wove the two together. I really need to start back at the high school level. It was at Murwillumbah State High School that I was first exposed to attitudes that could have influenced my career in science. Although I had very good science teachers, there was no strong encouragement from them for me to pursue a science career. Looking back, I do not know if the same lack of encouragement was given to male students. However, I recall vividly the reaction of an English teacher who was quite derogatory about me going to study agricultural science – references to gum boots and slopping round in cow yards!

Many of our best women scientists mention how important the encouragement and enthusiasm of a teacher or parent was in starting them along the science path. These are the “stars” – what happens to the girls who don’t receive that support, or unlike me, are not stubborn enough to go off an enroll in a science degree despite the lack of encouragement? Some women in our workshop audience had teenage daughters and were able to highlight for us the type of peer pressure and stereotypic thinking that is still very strong, and limits our daughters from thinking about science as an attractive career.

Then, once started in science, we discussed the types of paths people had taken. For instance I graduated from what was then the Queensland Agricultural College, and started a job within 5 months with the Qld Department of Primary Industries. As I was madly interested in Merino sheep this meant I started my science career at Toorak Research Station, 30 km south of Julia Creek in far north western Queensland; black soil road, 5mm of rain and you couldn’t move! There were 3 science graduates and 20 odd farm and support staff and we all lived on

the station. It was a harsh and isolated environment and I loved it! Here I was, in my early twenties with a great research project evaluating different strains of Merinos and how they handled heat stress. I learnt how to mules, lamb mark, pregnancy test, and drought feed (it only rained properly once in the three years I lived there). It was my job to look after about 1000 sheep so I would do everything from the experimental work through to checking water, mustering and talking to farmers at field days. During this time I completed an external Masters degree at James Cook University, where trips to Townsville were a welcome break from the dust, open plains and heat! From there I moved to Charleville in far south western Queensland, taking on an extension role with farmers who lived in the most beautiful but isolated places as far out as the Channel country. By that stage I had acquired a dog and a 2-way radio in my vehicle, and we covered lots of miles on outback roads, often staying overnight at the properties I was visiting.

But then came the need to make a career decision – I just couldn’t picture myself at 50 driving round the outback in my King Gee work shorts and steel capped boots, slipping into a routine of droughts, field days, shearing and floods. At that stage I made, what for me was a very difficult decision. I left the security of a tenured position with a government agency to go back to university to do a Ph.D., and then join the uncertainty of the job market again. But I built my confidence to do that by planning it out. I applied for industry scholarships so I would have enough money to live on, and checked out all the universities that might offer me the opportunity I was looking for. And just like many of you, chose the university based on the people I wanted to work with. Then I worked hard, and in addition to the scientific work in my Ph.D., did useful things for the groups I was working with so that at the end of my studies I fitted in with ongoing projects on breeding sheep for resistance to worms.

The workshop discussions covered how other people had progressed through their careers and a predominant theme from many

women was that there was little planning and things just happened. As a group we seem to be more “takers” of opportunities rather than “makers” of opportunities. And I suspect this is for a number of reasons. There is still not the same exception that women will follow the traditional undergrad, Ph.D., post-doctoral path as these are likely to be the very years that children are born. The male partner’s career still dominates, and women tend to move with partners to new towns and countries. Feedback from the workshop was that women in science take job opportunities as they come up, rather than managing their careers in a more planned and structured manner.

From my own personal perspective the ability to plan is very much influenced by family commitments. I have consciously chosen not to have children because I just could not see how I could pursue the career that I wanted and raise children, whether by myself or with a supportive partner. Although I don’t have any strong maternal urges, I am not convinced that one day I won’t regret this decision! Some women at the workshop who were juggling both family and career expressed a sense of disillusionment; equality in the work place promised us a satisfying and productive career but where we find ourselves today is exhausted, guilty we are not doing the best for our children, and in no way achieving what our male counterparts can in their careers. Many men (and women) will say – “Well that is your own choice, to have the satisfaction and pleasure of your children but a career commensurate to the reduced effort you put in at work.”- I find this infuriating – nobody ever says it to men! Why is it they can have the satisfaction and pleasure of children and suffer no career penalty?

Through the workshop we spent some time on the importance of mentoring for women. This largely focused on the lack of informal networking for women that plagues workplaces where they are a minority group. Suggestions were canvassed for different ways that mentoring could be structured to give women the encouragement and personal resources to move along in their careers. I certainly have found the willingness amongst senior CSIRO colleagues to assist me both scientifically and with my career progression to be invaluable. For instance, in 1998 I was given the opportunity to spend 18 months working with our CEO, Dr Malcolm McIntosh, as his Executive Officer. Although

in taking this job I had to step away from my day to day research, it gave me invaluable insights into science policy and administration. And the job was still very stimulating from a scientific point of view as I got to see what lots of other scientists were doing with in CSIRO. When I came back to the “bench” last year I brought all sorts of new ideas, including one of my current projects on breeding meat rabbits!

The workshop discussion then moved to different paradigms of career progression, designed to give advancement, acknowledgment and reward in a framework that accommodates the competing demands on women. A number of women talked about different models that suited them far better than the traditional work place. The common theme from this discussion was the need for confidence and a willingness to move outside the established system of doing science and delivering results to industry and the community, things like consultancy rather than being employed in a traditional workplace structure. Many participants felt this was a big ask but not impossible for women to do.

Were there any quantum breakthroughs at the end of the day? I doubt it, but I think a number of important aspects were reinforced for me – the need to have a plan, connect with those people in your work place who can help you, and be flexible and lateral in your approach to your career. Many thanks to all those women who contributed.



Sandra Eady

SCIENCE POLITICS – DARING TO DREAM

Jan Thomas

Introduction

Most of us choose to enter the scientific professions because we look for satisfying careers in exciting fields which may create a better world. We know it is unlikely to lead to fame or fortune but we hope for a decent salary, stable employment, opportunities for intellectual challenge and a collegiate working environment where the contribution of all is valued.

The title *Science Politics—Daring to Dream* was chosen because successive governments have made this kind of outcome for beginning scientists very difficult and undermined what many scientists thought they had already achieved. Corporatisation of the universities and bodies like CSIRO, combined with a reduction in government funding and less support for business research and development, have seriously eroded the fabric of Australian science. It has created an environment where options for scientists to pursue worthwhile careers has been lessened and, in addition, a climate that many women—and men—find unappealing. The competitive nature of many contemporary scientific workplaces can be damaging to the collegiate working environment and to personal and family life.

There is little doubt that Australian science is in crisis. We need to dare to dream that this can change but we also need to pursue actions that may make the dreams become reality.

Science Politics

At a time when the rest of the developed world is investing in science and technology, it is difficult to understand why Australian governments have treated this sector so badly. The current government has pursued an agenda which has taken no account of the efficiencies which had been achieved by the tertiary and other sectors involved in basic research. Thus the universities had already taken 20% more students without increasing teaching staff. This may have been sustainable but the reduction in funding since has seriously eroded the capacity for research and the quality of teaching. Expectations on other bodies such as the CSIRO to find much of their funding from sources other than government have led to a

concentration of their research agenda on what is profitable. As a result unprofitable, public good science becomes difficult to sustain.

There is no vision for Australian science although some state governments have shown that this is both possible and helpful. As a result it would appear, for example, that any chance for Australia to be a player in Information Technology is remote. For this to have occurred it would have required maintenance of the core disciplines underpinning this sector such as mathematics. However, mathematics in the university sector is barely meeting the needs of business and industry, let alone other sectors including education where there is an urgent need for more mathematics teachers.

A vision for Australian science would identify the kinds of graduates that would be needed to fulfil that vision. It would target research and industry support to that vision. Instead there have been haphazard cut-backs which occurred within a funding crisis that meant that crucial disciplines have been cut in the universities and profitable industry research and development has become the domain of multinationals or wealthy nations who are prepared to invest in potential wealth generating ventures.

Australian scientists have seen globalisation present both opportunities and dangers. The opportunities have come with being part of the bigger scientific world and a sharing of ideas. The dangers have come with the opportunities for outsiders, especially big multinationals and wealthy nations, to take advantage of developments in smaller or poorer nations. There is little doubt that globalisation has increased opportunities for Australian scientists to seek careers overseas. However, the lack of vision and support for indigenous science in this climate has dramatically reduced opportunities for worthwhile careers in Australia in universities, bodies such as the CSIRO and business and industry. Until this is addressed there is little chance that women or men will find it encouraging to pursue careers in science.

Daring to Dream

The decline in science in Australia has its origins in political actions. Few scientists feel comfortable in the political arena and the paucity of scientists in parliament is no doubt a reflection on this. Further, at a time when it is important for scientists to be part of the debate, political action on the part of individuals has become dangerous and can result in damage to one's career.

The role of professional societies in maintaining a forum for open debate about the politics of science has become crucial. Australia is fortunate to have the integrated lobbying capacity it does through FASTS and other bodies such as the academies. However, all of this depends increasingly on the core professional societies remaining strong as they get less and less support from bodies such as the universities. At the same time the cost of some of their core business such as producing journals has risen.

The current debate about genetically modified foods is a good example of the difficulties facing Australian science. There is need for community support for science. The best way to get this support is to provide the community with the kind of information they need to make informed decisions. In the case of genetically modified foods this is going to need sensitive comment about the benefits and the possible dangers. Now are ambitious young researchers going to put their potential industry funding on the line by being involved in the latter and should they be placed in this situation anyway? More importantly, what will be the view of their vice-chancellors even if they are prepared to do it? Yet it the public is not properly informed and problems develop later, won't science be further diminished and even less trusted?

There has been little discussion about the silencing of many people through control of funding and positions, tendering arrangements, confidentiality agreements and other mechanisms. However, providing a forum for discussion of controversial ideas and preserving the core values of science become part of the politics and they put a heavy burden on the profession societies which increasingly need to provide this.

Actions

There are some actions that some of us can take because we have reached a certain stage in our careers so that risks can be taken. Some of us are taking risks because we are near the end

of our careers and we want young people to have the same opportunities we had. My message to people beginning their careers is leave the risks to those of us who can do this without coming to too much harm and do the things that you can do to support us. There is much that you can do.

- Join your professional society and get involved with its decision making. Make sure it sets its subscriptions at a realistic rate so it can be a member of FASTS and play an active role in public forums etc.
- Be involved in activities such as Science Week where your science can be promoted in a way that is not going to harm your career.
- Be boring as you repeat the mantra to anyone who is prepared to listen: "Science is an investment, not a cost". Dare to dream and to fight for that dream.

Jan Thomas teaches in the Graduate Diploma in Secondary Education. Jan is interested in linguistic and cultural factors on mathematics learning especially as they affect students learning in a second language; policy in the mathematical sciences and politics of mathematics education; teaching and learning of tertiary mathematics and the education of mathematics teachers.

Currently she is Vice-President of the Federation of Australian Scientific and Technological Societies and part-time Executive Officer for the Australian Mathematical Society. Previously Jan was President of the Australian Mathematical Sciences Council and member of the National Committee for Mathematics. She is involved in an International Committee on Mathematical Instruction study on the teaching and learning of mathematics at the tertiary level.



Jan Thomas



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BREAKFAST IN THE SUBURBS.

WISENET members in Sydney are invited to welcome Spring 2000 at a breakfast at the home of Doreen Clark, a member of the Central Link Team. Women chemists from RACI are also invited. Women and dauntless men are invited; no charge.

Date: **Saturday 2 September 2000** Place: **19 Parkwood Grove, West Pymble** Time: **From 9am until 11am**
 Acceptances and apologies: dvclark@ozemail.com.au before Monday 28th August.

Australian & New Zealand Association for the Advancement of Science (ANZAAS), Women in Science Enquiry Network (WISENET) and North Sydney Boys' High School invite you to a meeting to discuss:

MEMORY ENHANCING DRUGS, SOME ISSUES

Thursday 17 August 2000 7.30pm to 9.30 pm

Library, North Sydney Boys High School, Falcon Street, CROWS NEST Parking available in school grounds

AGENDA

- 1) Ms Julianne Crowley, Head Science Teacher NSBHS: Introduction
- 2) Prof Graham Johnston, University of Sydney: Scientific Background
- 3) Panel: Teacher, Parent, Student and Journalist

How effective are drugs in enhancing mental activity? Are they harmful? Are they wide-spread? What are the ethical implications of using them?

These questions will be discussed at a meeting designed for parents and interested members of the community.