

WOMEN IN SCIENCE, ENGINEERING AND TECHNOLOGY

**A DISCUSSION PAPER PREPARED BY
THE WOMEN IN SCIENCE, ENGINEERING AND TECHNOLOGY
ADVISORY GROUP**

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PROLOGUE

GENDER HARASSMENT - AN EXPLANATORY NOTE

"It was though I was on the outside looking in. They could see me but I was not really there".

Quote from a young woman trying to join a male work team (Cockburn 1991, p203)

In researching the current position and experience of women and girls in science, engineering and technology (SET) in Australia, the Advisory Group became conscious of a repeated pattern. This pattern was evident in a range of behaviour by the men and boys who predominate in both the educational and employment settings of SET which had a consistently negative impact upon the girls and women wishing to enter, contribute to and progress through higher levels of SET education, training and employment. This behaviour was more evident by its impact and effect than any description or analysis. Indeed, part of the difficulty in drawing attention to this behaviour as a significant issue impacting on the current position of girls and women in SET is that it is apparently accepted as normal and unremarkable by the dominant culture and as such has not been named or identified.

Common elements in this behaviour by men and boys is that it expresses a strong sense of masculine ownership of the whole area of SET, as an area of knowledge, as an area of study, as an area of research and as an area of employment. A second common characteristic of the behaviour is that it consistently emphasises solidarity and shared identity, values and interests between men and boys in such a way that it excludes, alienates, marginalises and isolates the girls and women who are, by definition, the outsiders. Indeed, the words which constantly occur throughout the literature describing female experiences are exclusion, alien, outsider, different, out of place, resistance, impenetrable, boundaries, barriers, rejection and isolation. On the other hand, words which describe the male experience include group solidarity, inner circle, network, club, camaraderie, bonding and in-group understandings. While it is obvious that it is women who make up the group which is outside and that it is men who are keeping them there, it is rare to find references which directly attribute the exclusionary behaviour which women and girls experience to their male colleagues and from boys. Thus women are referred to as being excluded, isolated and alienated but men are rarely acknowledged or described as actually doing anything which achieves this outcome. What we are left with is a mysterious and disembodied negative force.

The behaviour which is used against women in SET education, training and employment ranges from that which is quite overt and aggressive, both verbally and physically, to other behaviour which is more subtle and diffuse, yet equally negative in its impact. In not being adequately identified, described and analysed and indeed named, the behaviour in question shares a similar status with other significant areas of inequality between men and women in which the critical dynamics were initially only observable by their negative impact on women as a group. Sexism and sexual harassment are examples of behaviours which, before being named, were invisible and inaudible phenomena. Naming of these behaviours has allowed them to be seen and heard and subjected to scrutiny, analysis, challenge and finally policy intervention. While the term gender harassment may not encapsulate the full range and nature of the behaviour discussed in this report, it is the only term available. The Advisory Group expects however, that by drawing public attention and policy interest to this matter, other more adequate and evocative terms may be generated, and that the behaviours will eventually be subjected to fuller scrutiny and response.

EXECUTIVE SUMMARY

Women remain seriously under-represented in some specific disciplines of science, engineering and technology (SET), and furthermore, are not well-represented at the most senior levels in all disciplines. This problem is poorly understood since statistics actually show a significant improvement in women's participation overall in SET-based education, training and employment over the last decade..

In May 1993, the then Minister Assisting the Prime Minister for Science and the Minister for Science and Small Business, Senator Chris Schacht, established the Women in Science, Engineering and Technology Advisory Group to advise on strategies to improve women's participation in SET careers and education.

The Advisory Group has adopted two principles to underpin its discussion of issues and consideration of recommended actions. These are:

- the need for a paradigm shift away from asking what is wrong with and women to questioning what it is about the environment of SET (and society's perception of it) that it does not attract and retain the interest of girls and women. Central to this paradigm shift is:
 - * the need to better recognise and value the ways that women contribute to the wide range of disciplines, skills and applications of SET; and
 - * the need also to pay greater attention to the range of behaviours towards women and girls by those who dominate both the educational and employment contexts of SET (that is men and boys) and more specifically to
 - identify, name and therefore make available to public scrutiny the forms and nature of that behaviour;
 - describe and analyse its impact both on women and girls wishing to enter and contribute to SET and to the wider working and learning environment; and
- the need to adopt an holistic policy approach to the various clusters of issues associated with girls' and women's participation in SET.

The Advisory Group recognises that there are a range of important education and employment issues which affect all women, not just those engaged in SET education and careers. These include the need for appropriate child care, more flexible working hours and a recognition of the impact of caring responsibilities. These issues and actions to remedy them are discussed in the report. Some of these generic issues are particularly relevant for women engaged in practical laboratory-based employment.

The consistent themes of access to and progression in SET-based education, training and employment have been used to aggregate the Advisory Group's recommendations in the body of the report. In addition, the recommendations maintain a balance between employment, TAFE and higher education issues.

The Advisory Group has set its recommendations within the policy contexts of *Developing Australian Ideas, A Blueprint for the 1990s* (Science and Technology White Paper 1992), *Working Nation* (1994) and *Women - Shaping and Sharing the Future* (1993). In developing its recommendations, it has focused only on those key areas most likely to generate change. All of the issues and recommended actions in this report are therefore, in the Advisory Group's opinion, important and warrant the attention of Government.

The Advisory Group presents these recommendations to Government in a three step implementation strategy. The short term strategy is aimed at putting in place the conceptual and structural foundations to assist in implementing the medium and long term strategies. The medium term strategy is aimed at providing leverage to existing programs and/or activities with the explicit aim of preventing the loss of existing investments in SET education and training. The long term strategy addresses those areas which either represent a process of ongoing change, or require significant research and examination before they can be implemented.

The Advisory Group has undertaken a public consultation process as part of finalising this report. That process has involved invitations being sent to over three hundred interested individuals, associations and organisations. Eighty-eight submissions commenting on the underlying principles, the key issues and their effectiveness and the three step implementation strategy were received and are listed in Appendix 4.5. Where appropriate, the Advisory Group has included in this report comments made in the submissions. The Advisory Group would like to thank all those who have participated in the consultation process. Diverse commentary on the report has helped the Advisory Group to better focus some of the recommendations and has also revealed the wide range of activities targeted towards women in SET employment, education and training which are already happening.

Women are 51% of the nation's population. Using their talents to the full at all levels of scientific and technological education, training and employment is an economic necessity, and an investment in Australia's future national development. The Advisory Group believes that continued under-representation and under-participation of women in SET-based education, training and employment is not only a cause for social concern on equity grounds, it is also likely to inhibit Australia's capacity to develop internationally competitive research and industries. There needs to be a greater recognition of the value of the different perspectives, priorities and operating styles that women can bring to SET. Women in SET-based education, training and employment contribute additional creativity, imagination and intelligence to the strong SET base of which Australia is justly proud. Their past and present contributions and achievements must be recognised, and the socially constructed impediments which limit their present and future contributions and achievements must be removed if Australia is to fulfil the vision of *Developing Australian Ideas, A Blueprint for the 1990s* (1992) and *Working Nation* (1994).

RECOMMENDATIONS

RECOMMENDATION 1

The Advisory Group recommends that the Government, through the Minister Assisting the Prime Minister on the Status of Women and other relevant Ministers, continue to accord a high priority to public sector-specific reforms and Government actions which influence and encourage change in employer, peer and union attitudes to employment-related social issues which affect women (including work-based child care and flexible hours), and those which particularly affect women in SET-based employment. Continued emphasis on reform in this area is likely to impact positively on participation by women in SET-based employment.

RECOMMENDATION 2

The Working Party recommends that the Minister for Employment, Education and Training, via the Equity Programs component of the educational profiles process, encourage all higher education institutions to:

- (a) formally set aside dedicated funding for a number (to be set during profiles negotiations) of re-entry scholarships for women wishing to re-enter training in SET, particularly at the postgraduate level; and*
- (b) develop and fund a minimum number (to be set during profiles negotiations) of flexible top-up and bridging courses in SET which will provide opportunities for women entering or returning to SET-based employment to renew and update their knowledge base. These top-up and bridging courses should be given credit within an award and be able to be articulated to other awards.*

The Minister should also raise these issues with the Ministerial Council for the Australian National Training Authority and ask it to explore options for dedicated funding for re-entry scholarships, bridging and top-up courses for women wishing to re-enter vocational SET training.

RECOMMENDATION 3

The Advisory Group recommends that the Ministers for Industry, Science and Technology; Employment, Education and Training and the Minister Assisting the Prime Minister on the Status of Women, in consultation with other relevant Ministers:

- (a) initiate and report on the outcomes of a survey of the higher education and vocational sectors to determine the extent of mentoring schemes for men and women in SET-based education, training and employment;*
- (b) should draw on examples of best practice cited in the survey to develop appropriate guidelines for mentoring for men and women which can then be applied in Government science agencies; and*

- (c) *that the Minister for Industry, Science and Technology, in consultation with other relevant Ministers, ensure that Government science agencies establish suitable mentoring schemes for all employees and report on the impact and effectiveness of the schemes annually.*

RECOMMENDATION 4

The Advisory Group recommends that the Minister for Industrial Relations ensure that the Affirmative Action Agency include the following as future project priorities under the Model Directions Program:

- (a) *the development of guidelines for facilitating the recognition of women's prior learning in selection procedures for SET-based positions in both the private and public sector;*
- (b) *designing opportunities for women in SET-based employment;*
- (c) *eliminating indirect discrimination in job evaluation and job selection criteria; and*
- (d) *ensuring equal representation of men and women on selection panels.*

RECOMMENDATION 5(A)

The Advisory Group recommends that the Ministers for Industry, Science and Technology, Employment, Education and Training and the Minister Assisting the Prime Minister on the Status of Women, in consultation with other relevant Ministers, include a particular emphasis on women in SET-related employment in their annual reports to the Affirmative Action Agency on employment practices by higher education institutions and Government science agencies.

RECOMMENDATION 5(B)

The Advisory Group recommends that these Ministers explore mechanisms for enforcing the use of selection criteria which recognise the different employment profiles and prior learning of women and men in the appointment of women to senior positions in SET-related employment in the private and public sector and that women be represented equally with men on all selection panels.

RECOMMENDATION 6

The Advisory Group recommends that the Minister for Industrial Relations direct the Affirmative Action Agency to explore the viability of developing a selection criterion for Government contracts which acknowledges the contribution employers are making to affirmative action in SET-based industries through including women in SET careers in contract tenders.

RECOMMENDATION 7

The Advisory Group recommends that the Treasurer request that the Women's Statistics Unit within the Australian Bureau of Statistics, in conjunction with the Department of Employment, Education and Training and the Department of Industry, Science and Technology, discuss improved registering of employment statistics on women in SET-based employment which records a discipline and sub-discipline breakdown of science, engineering and technology more generally and which also records the different seniority levels and employment status (casual, part-time, tenured/non-tenured, permanent/non-permanent) of participating women.

RECOMMENDATION 8

The Advisory Group recommends that the Minister for Employment, Education and Training, request that the Curriculum Corporation ensure that the document on gender issues in the curriculum (including mathematics) prepared as part of the Gender Equity in Curriculum Reform Project, be widely circulated in schools and to Deans of Education with a view to helping teachers identify and address curriculum factors which discourage school girls from participating in mathematics and computing.

RECOMMENDATION 9

The Advisory Group recommends that the Minister for Employment, Education and Training provide a reference to the National Board of Employment, Education and Training asking it to advise on the formulation and implementation of a national policy on properly funded maths and computing accredited bridging courses at the schools, post-compulsory school, university and TAFE levels.

RECOMMENDATION 10(A)

The Advisory Group recommends that the Minister for Employment, Education and Training, in conjunction with the Australian Vice Chancellors' Committee and Australian National Training Authority, monitor and report on women's participation in SET education and training courses on the basis of disciplines and sub-disciplines rather than only in science, engineering and technology as a whole, and that the Women's Statistics Unit be tasked by the Treasurer with gathering the necessary data as part of gathering employment data as per Recommendation 7.

RECOMMENDATION 10(B)

The Advisory Group recommends that, as part of this monitoring, the Minister for Employment, Education and Training also examine and report on the policy implications of marked inter-institutional variations in enrolment of women in SET disciplines in the higher education sector and identify whether a similar situation exists in the TAFE sector.

RECOMMENDATION 10(C)

The Advisory Group recommends that the Minister for Employment, Education and Training should also ask the Australian Research Council to include, as a standard component of its discipline reviews, an examination of the levels of participation by women researchers in disciplines and sub-disciplines and at different levels of seniority, an examination of the attitudinal and structural barriers which limit their progression to senior levels and to advise on the reasons for any inter-disciplinary differences.

RECOMMENDATION 11

The Advisory Group recommends that the Minister for Employment, Education and Training:

- (a) identify as a priority area under the Evaluations and Investigations Program (EIP) for the 1995 round, an assessment of the gender inclusive teaching staff development needs, including the use of gender inclusive support materials, of vocational and academic staff in SET, particularly in SET disciplines of low female enrolment and progression and high attrition rates;*
- (b) on the completion of the EIP project described above, request that the Committee for the Advancement of University Teaching seek proposals for projects which develop and trial a pilot training program to address the needs identified in the EIP project; and*
- (c) through the Projects of National Significance Program, fund research into the development and dissemination of gender inclusive curricula support materials for vocational education in schools.*

RECOMMENDATION 12

The Advisory Group recommends that the Minister for Employment, Education and Training encourage higher education institutions to start examining the underlying causes of lower levels of female participation in some disciplines of SET as part of the activities developed for their Equity Plans.

RECOMMENDATION 13(A)

The Advisory Group recommends that the Minister for Industry, Science and Technology establish a Women in Science, Engineering and Technology Unit (WISSETU) (for at least a four year period) within the Science and Technology Awareness Program to initiate, develop and monitor policies for advancing women in science, engineering and technology, in collaboration with relevant government departments and agencies, employer and union interests and the professional associations.

RECOMMENDATION 13(B)

The Advisory Group recommends that the Unit's key tasks should include:

- i) participating in the development and management of a public awareness campaign directed at improving understanding of the nature and effect of barriers to women's full participation in SET-based education, training and employment caused by gender harassment and other types of exclusion behaviour; and*
- ii) provision of limited project funding for initiating and supporting activities undertaken by other organisations in support of the Unit's objectives, (for example, monitoring and promulgating data on women in SET to the media and relevant organisations; advising on programs for improving women's participation in SET education, training and employment; the production of newsletters and publications describing good practice in SET-based education, training and employment; the initiation of special purpose workshops and seminars; encouraging and supporting the development of networks of women in SET education, training and employment).*

RECOMMENDATION 13(C)

The Advisory Group recommends that the Unit should report annually in writing to the Minister for Industry, Science and Technology on the monitoring of, and advice on, the Government's response to this report. The Unit's annual statement should be published and widely circulated and should be tabled in Parliament as part of the Department of Industry, Science and Technology's Annual Report.

RECOMMENDATION 13(D)

The Advisory Group recommends that the Unit should arrange at least one major national conference every two years on special issues affecting women in SET education, training and employment which involves widespread participation of relevant policy makers and practitioners. These conferences should be jointly sponsored with other organisations.

RECOMMENDATION 14(A)

The Advisory Group recommends that the Minister for Industry, Science and Technology, through the proposed WISSET Unit within the Science and Technology Awareness Program, and in consultation with other relevant bodies, initiate an awareness raising program aimed at improving understanding and recognition of gender harassment and other behaviours which inhibit female access to and progression in SET-based education, training and employment.

The public awareness campaign should be targeted at employers, unions, the schools sector, the TAFE sector and the higher education sector and the media.

RECOMMENDATION 14(B)

The Advisory Group recommends that the campaign should draw on examples of best practice in SET education, training and employment from existing equity and affirmative action programs in the public and private sector which help to articulate and operationalise strategies to promote as unacceptable the gender-based barriers to women's participation in SET-based education, training and employment.

INTRODUCTION

"If we are to develop the strength to compete in the world and maintain and increase our standard of living, we must make the most of all our resources. Greatest of all these are the talents and energies of the Australian people. When we waste them, we are weakened. When we employ them, we are made stronger."

Working Nation (1994)

The Twentieth Century is witnessing a world revolution which will be more profound in its consequences than any political revolution. This is the emergence of women from millennia of experience as second class citizens with clearly defined and limited roles. These roles were mainly confined to the private sphere and to the support of men and their families. Whilst the overt restrictions on women arising from these circumscribed roles have largely disappeared in Western cultures, the residue of this history and the unspoken feelings of superiority and inferiority and appropriateness of roles continue to cast a shadow over contemporary experience. It is hardly surprising then that women are not yet frequently found as leaders in public and professional life.

The obstacles to women's achievement in science, engineering and technology (SET) are even greater than they are in many other areas of professional endeavour. Yet it is important to identify and overcome these obstacles for two important reasons. Firstly, humanity and justice require that women be given access to the full range of human challenge and endeavour which is open to men. Secondly, SET are likely to be enriched by incorporation of the different life experiences of women. To confine their agendas and method to only those which emerge from the male perspective is to settle for a limited intellectual spread. Other areas of scholarship and practice, such as medicine, history and law, show us the power and value of including women at the core of their activities.

Women remain seriously under-represented in some disciplines and levels of seniority in science, engineering and technology (SET)-based education, training and employment. For example, in the higher education sector, female enrolments in science, engineering and agriculture are significantly lower than male enrolments. Women represent approximately 40% of all science students and only approximately 12.5% of all engineering students (1993). Participation by women in academic employment in the higher education sector is also low, with women representing only 22.3% and 6.5% of science and engineering academics respectively in 1993. Only 10.7% of academics above the senior lecturer level in all disciplines were women in 1993.

Participation by women in SET-based employment outside the higher education sector is equally patchy. 1993 Australian Bureau of Statistics Labour Force figures show that women represent 29% of natural scientists and only 2.9% of building professionals or engineers. In the para-professional fields, on the other hand, women represent 43% of medical and science technical officers and technicians.

Overall, the figures represent a significant improvement in SET participation over the last decade. For example, women's participation in higher education in veterinary science, science and engineering/surveying increased by 3.6%, 2.9% and 3.0% respectively from 1988 to 1991. However, analysis of the figures discipline by discipline still reveal a situation where women are seriously under-represented in some specific disciplines. For example, the majority of female academics are found in the social sciences, humanities and health sciences, with only small percentages in science, mathematics/computing and engineering.

In *Developing Australian Ideas, A Blueprint for the 1990s* (Science and Technology White Paper, 1992), the Commonwealth Government stressed the importance of capturing the benefits of our creativity, imagination and intelligence. It outlined a policy for Australia to become "a nation of highly skilled people, productively employed in challenging and rewarding jobs in internationally competitive industries and enterprises." The White Paper advocated making "maximum use of our strong science and engineering base" as the best way to achieve these objectives. In the context of this policy background, continued under representation and under participation of women in SET-based education, training and employment is not only a cause for social concern on equity grounds, but is also likely to inhibit Australia's capacity to develop internationally competitive research and industries.

There is also the wider issue of improving general scientific literacy in the community, so that adults and children can understand and benefit from a world which is increasingly shaped by science, engineering and technology. This is particularly important for women, since they run the risk of becoming an "information poor" minority in a technologically powerful society where male technocrats in control of new forms of digital technology are also able to control wealth and form culture and politics (*The Australian*, 2 August, 1994).

Large parts of the general community view science, engineering and technology very negatively. These negative images are increasingly switching off not only girls, but also lateral creative boys, from pursuing careers in SET. The image of physics and engineering is that they are not socially responsible, not people-oriented, inflexible and arbitrary and unrelated to context or to "the web of humanity" (*Critical Filters: Hidden Helix*, 1994). This negative image can be improved through enhancing the purposes and quality of SET by incorporating female values and through allowing women to participate in SET as women, and not through becoming like men.

In May 1993, the then Minister Assisting the Prime Minister for Science and Minister for Science and Small Business, Senator Chris Schacht, announced the establishment of an Advisory Group of Women in Science, Engineering and Technology (WISSET) to advise on strategies to improve participation by women in SET careers and education.

The Minister asked the Advisory Group to address issues relating to:

1. improving the participation of women in senior science, engineering and technology positions in both the public and private sectors;
2. improving the level of participation and retention by women in science, engineering and technology education and training at both the vocational and academic level; and

3. improving awareness of the contribution women can make to science, engineering and technology in Australia.

The Advisory Group was also asked to take account of current government and other organisations' policies and programs, and draw heavily on its own experience and expertise in reporting to the Minister. Its views on short term and long term strategies to address these issues. Relevant reports produced in Australia and overseas were to be taken into account in the formulation of the Advisory Group's advice.

The issues faced by the Advisory Group are complex. Women are not absent from SET based education and careers. Despite the various impediments, some women have attained eminence and distinction in particular disciplines of SET. Their numbers, however, remain small and their proportion, although increasing in some disciplines, remains lower than that of men. Overall, in employment in the fields of SET, they are clustered towards the lower end of the seniority spectrum, as is the case with women's employment generally.

To assist the Advisory Group in its task, WISET asked Professor Eileen Byrne, Professor of Education (Policy Studies) of the University of Queensland and an international expert in the area, to prepare a diagnostic discussion paper which would synthesise the main Australian and overseas research relevant to the terms of reference, and focus on the principal issues defined by WISET at its first meeting. Professor Byrne made a considerable contribution to the work of the working party established to assist WISET in its task. Her discussion paper, *Critical Filters, Hidden Helix: Policies for Advancing Women in Science, Engineering and Technology*, is available from the Office of the Chief Scientist and will be of wider interest in the field. The research and evidence which supports many of the recommendations in this report are described more fully in *Critical Filters: Hidden Helix*.

In addressing the terms of reference set out by the Minister, the Advisory Group has adopted two principles which underpin its discussion of issues affecting women's participation in SET-based education, training and employment and the recommendations it proposes to address these issues. These principles evolved from Professor Eileen Byrne's discussion paper in *Critical Filters: Hidden Helix*.

As its major underpinning principle, the Advisory Group supports the need for a paradigm shift in the way in which gender SET issues are considered by policy makers. The usual line of inquiry is to ask the question "What is wrong with girls and women that they do not participate in mathematics, physics and engineering?". The Advisory Group, instead, supports the alternative approach of questioning what it is about the environments of science, engineering and technology, and society's perception of them, that they do not attract and keep girls and women. This represents a move away from the looking at ways to change the behaviour of women and girls to improve their access to the progression in SET education and careers, to examining the structures and cultures of the employment and education systems for ways to improve access and progression for girls and women. There was strong support for this underpinning principle in the majority of submissions. However, several submissions felt that the Advisory Group should also have considered the more fundamental issue of the social

construction of science, engineering and its gendered nature (Submissions 20, 33, 25, 63, 64, 88).

As part of this paradigm shift, the Advisory Group believes that greater attention needs to be paid to celebrating the varied contributions that women can bring to SET education, training and employment. Women often have different priorities, perspectives and operating styles than men which, if fully recognised, will enhance the diversity and richness of the Australian SET effort. Because women are currently participating at such low levels in SET, they are unable to make this fuller contribution. This results in SET not reflecting female values and continues to support the male image held by SET. The dominance of this male image means that women will continue to feel excluded from SET education, training and employment.

The Advisory Group stresses that a persistence in continuing to expect women to do most or all of the work in the process of advancing women in non-traditional areas of SET will ultimately only be partially successful. Attention also needs to be given to correcting institutional and structural impediments to women's participation, as well as to changing the attitudes and behaviours of men, boys, women and girls.

The Advisory Group believes that the need for attitudinal and behavioural change has as its basis the need for a better understanding of discrimination which occurs on the basis of gender. There is still a very serious misunderstanding in the general public, and particularly in employer and union groups, about sex and gender differences, sexism and sex role stereotyping. Psychologists widely agree that there is only one sex difference between men and women in which all men differ from all women - reproduction. Sexism, on the other hand, argues that women cannot do what men do because of alleged universal sex differences. Sex role stereotyping is based more closely on accepted social norms and argues that women should not do what men do. Closely related to sex role stereotyping is the concept of gender harassment.

Gender harassment is a term which the Advisory Group has used to describe a range of exclusion, marginalising, and resistance behaviours (usually exhibited by men) which result in women being discouraged or inhibited from access to and progression in SET education, training and employment. These behaviours are often subtle and sometimes unintentional. Never-the-less, they continue to have a significant impact on the way women perceive SET and careers and education in these fields.

The use of the term 'gender harassment' requires an explanatory note because, in the absence of other relevant and appropriate terms, it is being used to cover a range of behaviour wider than that usually intended or expected by the use of this term. The term 'gender harassment' is used in this report to refer to a range of behaviour used generally by the men and boys who predominate in both the structures and culture of SET against women and girls wishing to enter and progress in SET education, training and employment. The form and nature of this behaviour varies from that which is quite overt and aggressive, both verbally and physically, to that which is more subtle and diffuse. The elements common to all these forms of behaviour are firstly that it has a negative, exclusionary and undermining impact on the women and girls who experience it, and secondly, that it expresses ownership of the terrain and solidarity between the men and boys who enact it. While the term 'gender harassment' may not encapsulate the full range and nature of the behaviour in question, it is currently the

only term available. The Advisory Group expects, however, that by drawing public attention and policy interest to this matter, other more adequate and evocative terms may be generated. A fuller discussion of the nature of gender harassment is provided in the Prologue to this report.

Responses from submissions to the notion of gender harassment were varied. Many submissions endorsed the decision of the Advisory Group to try and name a previously undescribed phenomenon (for example, submissions 1, 8, 9, 46, 48). Other submissions felt that the terminology was too aggressive and too strongly implied that the described behaviours were intentional (Submission 15). The Advisory Group stresses that the term 'gender harassment' encompasses both intentional and unintentional behaviours. Submission 70 suggested the alternative name of 'gender obstructions/obstacles'.

The second underpinning principle is the need to adopt an holistic policy approach to the various clusters of issues associated with girls' and women's participation in SET. In the past, policies to address girls' and women's participation in SET have tended to be linear or uni-dimensional. They have focused on individual initiatives, each of which made apparent sense on its own, but which have not necessarily been planned as part of a coherent, inter-related whole. Byrne notes in *Critical Filters: Hidden Helix* that there is usually a group of related factors which influence or cause a particular outcome. In her paper she describes eleven clusters of issues relating to girls' and women's participation in SET from primary school through to employment in both academic and vocational careers. The majority of submissions supported the concept of an holistic approach to policy matters in this area.

Bringing about the paradigm shift and addressing the associated issues of valuing women's contribution of SET and developing an understanding of exclusion and resistance behaviours will be a slow process. In advocating an holistic policy approach, the Advisory Group has recognised that societal change needs to occur in parallel with structural change. For this reason, the Advisory Group supports a policy approach which tackles a number of key contributing factors simultaneously.

The Advisory Group has structured its discussion of the issues and its proposed recommendations to closely follow the terms of reference. Under Terms of Reference 1 and 2, the consistent themes of access to and progression in SET-based education, training and employment have been used to aggregate the recommendations. In addition, the recommendations maintain a balance between employment, TAFE and higher education issues. Terms of Reference 1 and 2 also include discussion of education and employment issues which are generic to all women, not just those engaged in SET education and careers.

ISSUES AND RECOMMENDATIONS

Term of Reference 1:

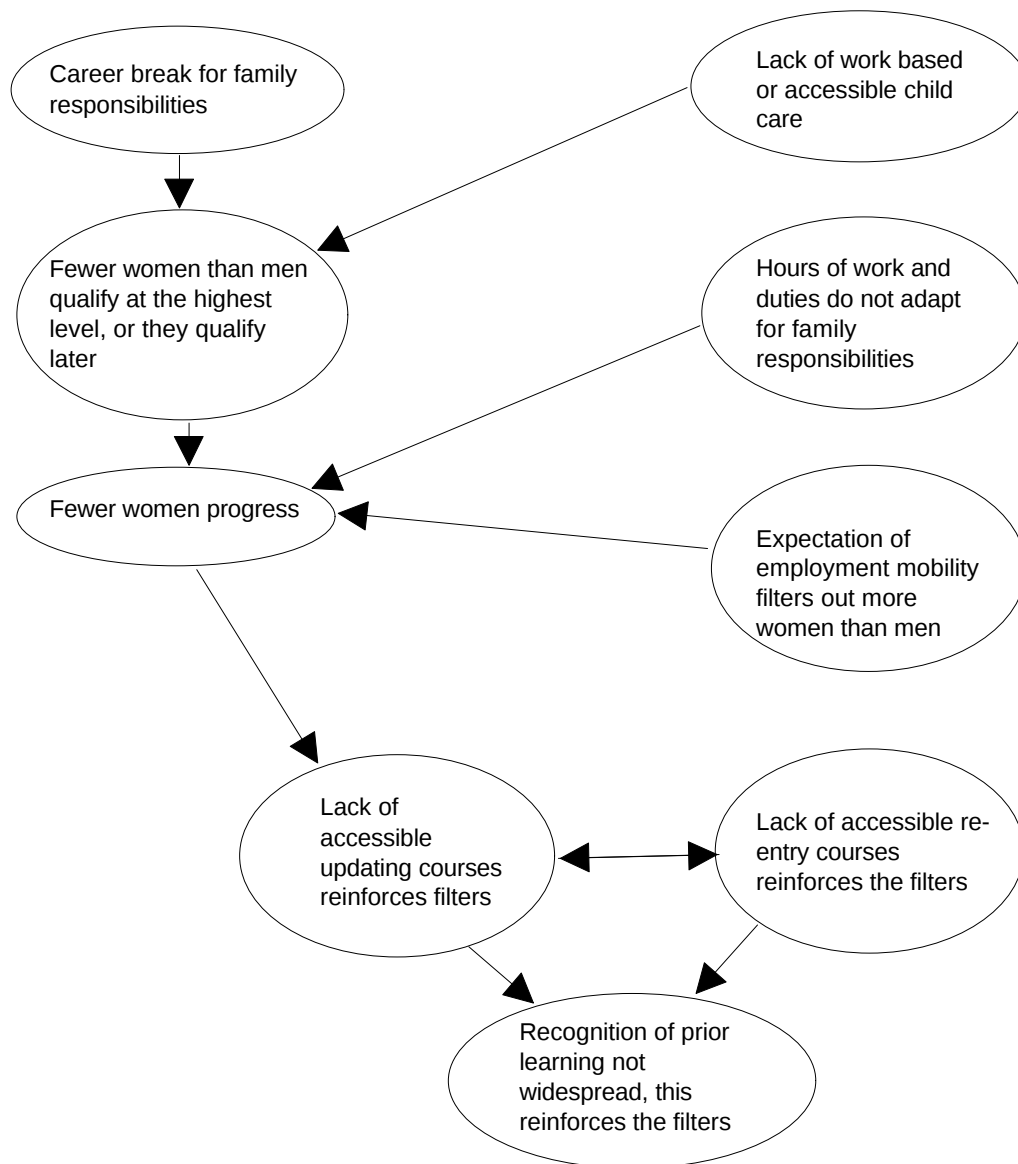
Advise on improving the participation of women in senior science and engineering positions in both the public and private sectors

Employment of Women: Issues Facing the Community

Some issues which act as critical filters to participation by women in science, engineering and technology (SET)-based employment are generic to most working women. Issues relating to parental responsibilities, flexible working hours and child care are particularly important to women as workers and as primary care givers. Diagram 1 shows the cluster of generic issues identified in *Critical Filters: Hidden Helix* (Byrne, 1994) which impact upon women in SET-based careers.

To some extent women in SET-based careers are better able to address some of these generic issues than women working outside these fields. This is because they on average earn more than other women workers and hence are more able to afford support such as child care and home help. However, many of the issues raised in the cluster have a double impact on women in SET-based employment. This is because SET-based occupations have been slower to re-structure in a way which offers flexible work hours and permanent, pensionable part time work (*Critical Filters: Hidden Helix*, 1994). Options for working at home are always constrained in jobs with a laboratory emphasis and there is an expectation that workers in these fields are sufficiently flexible in their domestic arrangements that they can undertake long hours of work on demand and travel widely for field work. Child care issues are particularly important in this context, since child care hours of service usually only coincide with the conventional nine to five working day. The issue of re-entry after a career break is particularly acute for women in SET-based employment because of the accelerating pace of change and development in science and technology. Career breaks need to be short to avoid losing touch. Consequently, provision of work-based child care becomes an even more important issue. Many submissions expressed the view that the report had paid insufficient attention to the issue of child care in the employment context (for example, submissions 3, 4, 10, 18, 23, 28, 73, 87, 88, 92, 95). The Advisory Group agrees that the provision of flexible and affordable child care is an important issue, but felt that it was an issue which was not unique to workers in the SET fields. It also felt that, since the Office of the Status of Women was already undertaking significant work in this area, it did not warrant any more detailed coverage in this report than it has already been given.

Diagram 1. Generic Issues Cluster



Source: Byrne, *Critical Filters : Hidden Helix* 1994

Recent moves towards developing flexible approaches to working at home may reduce the impact of some of the issues identified in Diagram 1 for women in SET-based careers. Electronic communication networks have the potential to reduce some of the physical restrictions faced by women. For example, advances in software and access to networks which allow communications with the workplace could enable women in certain disciplines to perform some of their work at home on a personal computer. This type of flexibility would greatly assist women and men with caring responsibilities. Submission 42 noted that working at home may make it difficult for women to engage in important information sharing and networking at the social level.

Policies which aim to increase women's participation in SET-based careers need to be implemented simultaneously with policies which address generic women's employment-

related issues such as child-care, re-entry and updating courses, flexibility of work hours to accommodate family commitments, equal pay and sexual harassment. Many of these issues and the legislative instruments used to address them (*The Sex Discrimination Act 1984* and *The Affirmative Action (Equal Opportunity for Women) Act 1986*) are discussed more fully in *Half Way to Equal: Report of the Inquiry into Equal Opportunity and Equal Status for Women in Australia* (April 1992) and the Government response to this report (December 1992). These issues should be considered as part of overall government, union and employer employment policies so that long-term, and systematic change in women's employment patterns in SET can occur. *Women - Shaping and Sharing the Future*, the National Agenda for Women 1993-2000 provides a good general framework in which such action should occur.

RECOMMENDATION 1

The Advisory Group recommends that the Government, through the Minister Assisting the Prime Minister on the Status of Women and other relevant Ministers, continue to accord a high priority to public sector-specific reforms and Government actions which influence and encourage change in employer, peer and union attitudes to employment-related social issues which affect women (including work-based child care and flexible hours), and those which particularly affect women in SET-based employment. Continued emphasis on reform in this area is likely to impact positively on participation by women in SET-based employment.

Employment Issues Specific to Women in SET-based Careers

Access and Progression - the Need for Attitudinal Change

Employment in SET is generally either professional (based on higher education or equivalent qualifications) or technical (based on TAFE or similar qualifications). Australian Bureau of Statistics Labour Force figures for November 1993 show that women are under-represented in professional SET careers in science and engineering (29% and 2.9% respectively). However, they do have a better level of participation in some para-professional areas (43.5% in medical and science technical officers and technicians). Unfortunately, women are still poorly represented in engineering and building associates and technicians jobs (6.5%). Whilst many more women now undertake training in the sciences and engineering at the tertiary level, few have equivalent career paths to their male counterparts. These figures support the view that many women end up in low-paid, auxiliary positions and many simply leave the discipline and take on more rewarding careers in other fields.

Essentially the barriers that exist for women in SET employment inhibit access to employment and career progression once employed. An underlying theme to many of the barriers experienced by women is the urgent need for attitudinal change by employers (including governments as employers) and unions. The Advisory Group believes that the attitudinal change needs to encompass a recognition of the impediments faced by women in SET-based employment created by resistance and exclusion behaviours by (mostly) male colleagues. Some submissions stressed that attitudinal change was the key issue in the report (for example, submissions 8, 58).

These attitudinal changes need to be reflected in measurable actions. For example, whilst the Government has a reasonable record overall for supporting affirmative action (15% of the senior executive service are women), the record for women in SET careers in public funded institutions is less exemplary. For example, women academics above the senior lecturer level comprised only 4.9% in science, 4.2% in maths/computing and 0.77% in engineering/processing in 1991. Unions and employers have such poor records of women's participation overall, that it is unlikely that issues relating to the access and progression of women in SET-based careers will be adequately addressed. For example, many unions support the principles of affirmative action, but research in South Australia by Pocock, University of Adelaide, shows that only 7% of state secretaries are women (*The Bulletin*, 9 August, 1994). However, it should be noted that some unions for specialist technical and professional workers are beginning to address these issues. For example, the Association of Professional Engineers, Scientists and Managers Australia held a conference in October 1994 to identify employment issues of concern to women members. In the private sector, women remain under represented in senior management positions at less than 5% (*The Bulletin*, 9 August, 1994) and remain concentrated in industries with minimal SET content.

The private sector also has a long way to go in ensuring that women in SET-related employment are paid equally to their male colleagues. The November 1993 Australian Bureau of Statistics Labour Force Survey shows that overall, women's wages tended to be lower than men's in most occupations. For example, the average weekly ordinary time earnings for male natural scientists was \$744.70, whilst it was only \$630.00 for women. This is common across most occupational groups and is particularly marked amongst the Health Diagnosis and Treatment Practitioners. The average weekly ordinary time earnings for men in this occupation was \$905.10, whereas it was \$719.20 for women. These differences were even more marked in the average total wage rates (these include overtime), \$1053.00 for men and \$783.70 for women. Appendix 4.3 provides comparisons in other fields of SET.

Attitudinal change needs to encompass a recognition and understanding of the impact of the range of omitting and marginalising behaviours (which the Advisory Group calls gender harassment) on employment patterns for women in SET careers. This matter is addressed through recommendations under Term of Reference 3.

Barriers to Access - TAFE as a Doorway into Employment

There are a number of issues relating specifically to access to SET-based employment which need to be addressed.

Australia's development depends as much on its technicians and senior technicians as on its professional staff. Science is not an area of low enrolment for women compared with men. In 1992 the numbers enrolled in science nationally in TAFE were 28,000 males and 24,000 females. However, female under-representation in engineering and technical training in the middle and senior levels of the technical workforce of industry remains a much more intransigent problem than in the academic and professional workforce. TAFE, as the training provider for women entering technical SET careers, still has a number of entrenched structural and attitudinal problems. These are demonstrated by the alienating and other behaviours exhibited by male teachers and students which are limiting access for women in TAFE training for certain types of SET employment. Most Australian TAFE institutions reflect their history of apprenticeship and trade training. These are areas which have traditionally excluded

women, so the resulting TAFE environment is one which is not yet inclusive of women. This is reflected in the fact that, whilst women make up over half of TAFE enrolments, most of them are concentrated in recreation, leisure and educational preparation courses.

Evidence cited in *Critical Filters: the Hidden Helix* (Byrne, 1994) confirms that in TAFE (and in industrial training and employment) too many employers, trainers, supervisors and male workers persist in refusing to accept or support women in certain courses, trades, technician and professional areas of SET or for promotion to senior levels. A report prepared in 1992 by Robinson and Mageean entitled *Gender Inclusive Teaching in TAFE*, documented a range of deliberate and unintended behaviours by male teachers and students which made female students feel isolated and unwanted.

There has been substantial diagnosis of the difficulties faced by women trying to access SET technical careers through the TAFE system and these reports are discussed more fully in *Critical Filters: Hidden Helix* (Byrne, 1994). *Women and TAFE: A National Plan of Action* was released in 1991 to set in place national objectives and strategies to improve women's access to and participation in TAFE courses in non-traditional female areas. A range of projects have been undertaken to implement the strategies set out in the Action Plan. Many of these have resulted in the production of published reports which examine and propose actions to address specific issues faced by women in TAFE.

The Advisory Group commends these initiatives, but notes that, whilst some TAFEs are moving in the right direction, most have yet to make the paradigm shift from focusing on encouraging women to change to focusing on what it is about the system which discourages their access. Indirect discrimination based on gender, and male behaviour which asserts that women do not belong, continues to be a matter of concern in the TAFE sector as women progressively move into training for careers which are seen to be traditionally male. The issue of these attitudes and types of behaviour will be addressed by the recommendations under Term of Reference 3, as will the need to improve awareness of the importance of the paradigm shift.

Barriers to Access - Valuing the Advantages of a Career Break

Most women in the workforce have a large number of unpaid responsibilities outside the workplace. Given that 70-80% of Australian women will have children in their lifetimes, their careers will therefore always be interrupted in some way by the birth of children (*Half Way to Equal* 1992). Career breaks for women in SET careers can represent a significant barrier to access to SET-based employment because of the pace of scientific, engineering and technological change. In addition, women who choose to have a family often face barriers caused by the false perception that they have automatically become less committed to their careers. Improved availability of re-entry scholarships to update knowledge for women trying to return to both technical and professional careers will significantly enhance opportunities for women's access to SET-based employment. Re-entry scholarships are also important for women who have experienced a break in their education and training for a SET-based career. *Women - Shaping and Sharing our Future* (1993) identified the need to encourage higher education institutions to maintain special entry, bridging and support programs as a way of improving women's participation in education and training. These types of programs also have a positive impact on women trying to return to employment. The report *The Rising Tide* (1994) prepared by the British Committee on Women in Science, Engineering and Technology

also recognised the importance of re-entry schemes and recommended national funding and support for successful re-entry programs.

Many higher education institutions have established re-entry scholarships for women returning to study. However, these types of scholarships are often tenuously funded from temporary or discretionary sources. These types of scholarships need to be permanently funded in all institutions so that women can refresh their skills and return to the workforce. *The Rising Tide* (1994) also noted that in the United Kingdom, funding for re-entry schemes was fragmentary and insecure. Interestingly, submission 93 noted that, in its case, access courses through TAFE had proved more effective than re-entry scholarships.

Also important in this context is the need for institutions to provide appropriate top-up and bridging courses, particularly in maths, so that women entering or returning to the SET workforce can update their existing knowledge base rather than having to repeat earlier training. It is important that these courses be awarded credit for recognised study programs and that they are able to be articulated into other awards. Submission 63 stressed the importance of improving credit transfer and articulation between vocational and higher education institutions in this context. The issue of maths bridging courses is discussed under recommendations for Term of Reference 2. However, the need for top-up and bridging courses in other disciplines, such as computing, also needs to be addressed. Issues relating to computing are also discussed under Term of Reference 2.

Submissions 78, 82, and 87 suggested that support for more-re-entry and bridging scholarships would be greater if they were available to everyone, not just women. This more equitable approach was felt to not only encourage women re-entering employment after a break, but also to encourage men who had had to break their careers for family reasons.

RECOMMENDATION 2

The Working Party recommends that the Minister for Employment, Education and Training, via the Equity Programs component of the educational profiles process, encourage all higher education institutions to:

- (a) formally set aside dedicated funding for a number (to be set during profiles negotiations) of re-entry scholarships for women wishing to re-enter training in SET, particularly at the postgraduate level; and***
- (b) develop and fund a minimum number (to be set during profiles negotiations) of flexible top-up and bridging courses in SET which will provide opportunities for women entering or returning to SET-based employment to renew and update their knowledge base. These top-up and bridging courses should be given credit within an award and be able to be articulated to other awards.***

The Minister should also raise these issues with the Ministerial Council for the Australian National Training Authority and ask it to explore options for dedicated funding for re-entry scholarships, bridging and top-up courses for women wishing to re-enter vocational SET training.

The disadvantages of a career break can be minimised by reducing the loss of scientific and technical skills over the period of the break. Mechanisms to assist women in maintaining their skills include provision of better child care facilities so that women in SET-related employment on maternity leave can return to work to attend short seminars and other important technical information exchange activities, and more flexible use under union awards of part-time work to allow for refreshing or maintaining skills before returning to full-time work. The Advisory Group believes that, whilst these mechanisms do already exist, employers are not taking a long term view of the value of maintaining the skills base of their female employees and are therefore not using the available mechanisms in a creative fashion. This is an issue, which although particularly important to women in SET-related employment, is also valid for women in other skilled areas of employment. Consequently, the Advisory Group feels that the points covered by Recommendation 1 will address this matter.

Barriers to Progression -The Benefits of Diverse Experiences

Failure to address the generic issues discussed earlier will also act as a major barrier to progression in both professional and technical SET-based employment. Similarly, there is also a need to address concurrently issues associated with increased understanding/recognition of the marginalising and resistance behaviours, which the Advisory Group describes as gender harassment, by employers and unions. Consequently, the recommendations already outlined above will also address many of the problems of progression in SET-based employment.

The main barrier to women progressing in SET-based careers (other than inherent gender bias through lower participation and negative male attitudes) is the experience deficit that women may suffer because of the other barriers which they encounter. For example, many women experience reduced mobility for field work because of family commitments and therefore are less likely to be offered this type of work experience. Women must also contend with prejudice against employing women for field work. A major review of *Women and Minorities in Science and Engineering* in the USA conducted by the National Science Foundation (1982) confirmed that women graduates in all fields of science and engineering were more likely to be influenced by geographical considerations in their access to employment and promotion than their male peers. The difficulty in working unusual hours on demand and at short notice (a regular feature of work in some fields of SET employment) also limits the work experience opportunities available to many women. Submissions 37, 40 and 49 highlighted the importance of improving recognition of different types of experience in the employment context. In particular, submission 40 noted that women scientists who change their job several times often develop a broad experience base, but because this is usually not accompanied by the extensive publication list which can be developed through staying in one job, this experience base is under valued. Submission 73, on the other hand, felt that the experience deficit was a fallacy and that women should have expectations for themselves.

Indirect discrimination of women by men is an acute problem in those workplaces where women are seen as a non-traditional minority. The lack of a critical mass of women in SET-based employment means that entrenched assumptions about women's capacities and roles reduces opportunities for equal and the same tasks, training and work. Other than addressing the gender basis of this discrimination (see awareness raising recommendations under Term of Reference 3), two very practical ways by which progression opportunities can be improved are mentoring by both female and male superiors and better construction of selection committees and the criteria against which they assess applicants.

Barriers to Progression - Mentoring Provides Support

Mentorship in employment has been most simply defined as an active process of positive sponsorship by patrons (teachers, managers, trainers, counsellors, senior women staff) towards less experienced staff, students or trainees (Byrne, 1993). Mentor schemes for women address two paradigms which inform two different strategies for dealing with discrimination. The first is that women should be equipped to compete on an equal footing with men and therefore mentoring should focus on helping women to help themselves. The mentor scheme should be aimed at bestowing on women the opportunities which men already have. The second paradigm sees women's experience and knowledge as different from men's, but equally valid. Women's differences should not only be recognised but also used as a basis to challenge and change dominant practices. Mentoring can ensure that women's differences are accommodated and, ideally, by accommodating these differences, organisations will learn from the different ways in which women do things. (University of Melbourne Mentor Scheme for Women)

Mentoring is largely a voluntary activity undertaken by committed individuals who have reached senior levels in their profession. Given the small number of senior women employed in SET, it is likely that women pursuing SET careers will have a male mentor, if they have one at all. *Women and Science: The Snark Syndrome* (Byrne, 1992), found that, whilst mentoring was reasonably well understood and practised in executive management, it was quite informal and rarely visible in academic institutions. The Advisory Group believes that, given the confused understanding and application of mentoring for women in SET-based careers, there is a need to develop structured mentoring schemes for women to help them progress along their career paths. The Advisory Group recognises the difficulty in targeting employers directly, but believes that the Government, as an employer of women in SET-based careers, can play an important exemplar role through establishing formal mentoring schemes for both men and women. However, the attitude and commitment of senior men will be critical in determining the success or failure of mentoring schemes. Most submissions strongly supported the notion of fostering mentor schemes as a mechanism for improving opportunities for women in SET careers. Only two submissions felt that mentoring was not a key issue.

An example of a successful formal mentor scheme is the one which currently operates at the University of Melbourne. Participation in the scheme is voluntary. However, selection of mentees sometimes focuses on particular groups of staff. Mentors and mentees are matched on the basis of the skills required and the skills offered by the respective participants. In addition, research discipline and administration skills are also considered. Participants attend a training session which introduces them to the mentoring model and gives them an opportunity to practice mentoring skills. The relationship is evaluated at the end of the agreed period. The majority of participants in the scheme have found it to be of great benefit in boosting self-confidence and in developing greater insights into the organisation as a whole. The success of the scheme has generated interest from other higher education institutions and it seems likely that it will be trialed in other institutions in the future.

RECOMMENDATION 3

The Advisory Group recommends that the Ministers for Industry, Science and Technology; Employment, Education and Training and the Minister Assisting the Prime Minister on the Status of Women, in consultation with other relevant Ministers

- (a) *initiate and report on the outcomes of a survey of the higher education and vocational sectors to determine the extent of mentoring schemes for men and women in SET-based education, training and employment;*
- (b) *should draw on examples of best practice cited in the survey to develop appropriate guidelines for mentoring for men and women which can then be applied in Government science agencies; and*
- (c) *that the Minister for Industry, Science and Technology, in consultation with other relevant Ministers, ensure that Government science agencies establish suitable mentoring schemes for all employees and report on the impact and effectiveness of the schemes annually.*

Barriers to Progression - Better Selection Processes

Selection committees, although bound by equal employment opportunity (EEO) requirements, can still discriminate against women applicants for SET-based positions. They can do this through failure to include women on selection committees and through the adoption of inappropriate selection criteria. *Half Way to Equal* (1992) raised the issue of gender inclusiveness of selection criteria in its consideration of issues associated with indirect discrimination. Many submissions to this report supported better selection processes as a key issue (for example, submissions 9, 32, 60). However, several also stressed that a requirement for equal female representation on selection committees could increase the already large burden on the small number of women who are sufficiently senior to be on those panels (eg Submissions 43, 57, 63) and many submissions noted that it would be difficult to achieve equal representation in the short term.

Half Way to Equal report also identified the lack of awareness and recognition of skills to be of concern. Non-recognition of relevant prior learning is a particular handicap for women in SET employment because they often have different training and employment profiles to their male colleagues. Their prior learning is often very relevant but is not accepted by selection panels as a substitute for the conventional learning and experience required for particular types of jobs. For example, the design and construction techniques for sewing require a good understanding of spatial relationships, a skill that is also highly relevant to mechanics, but is unlikely to be appreciated by non-sewers, including most males

The TAFE sector has already recognised the importance of prior learning by producing *Recognition of Prior Learning - A Practical Guide for Women* as part of the *National Plan of Action for Women in TAFE*. The Guide assists women in identifying skills acquired through their experiences at work, in the home, in the community and in the education system for which credit can be given as a substitute for formal training in those skills.

In its response to *Half Way to Equal*, the Government noted the role of the Affirmative Action Agency in implementing programs aimed to eliminate discrimination against women employed in the higher education sector and the private sector and to promote equal opportunity for women. However, the effectiveness of affirmative action and equal opportunity legislation was questioned in a recent article *He's (Still) The Boss* (*The Bulletin*, 9 August, 1994). The article pointed out that after eight years in operation, the legislation had

been of limited effectiveness. In fact, in industries with significant SET content, women's participation in many areas had actually declined (see Appendix 4). Ms Fiona Krautil, Esso's Equal Opportunity Manager, highlighted the institutional environment issues associated with affirmative action, when she was quoted in the article as saying "The problem with affirmative action is that it puts the onus on women to fit in. Even companies with very progressive equal opportunity programs have been accustomed to burying the differences and highlighting similarity. Yet individuals cannot shed differences such as gender, race or family responsibilities like an umbrella and leave them at the door to pick up on the way out".

The recent view of the Affirmative Action Agency identified the need to improve the quality of affirmative action programs. In 1992 the Model Directions Program was initiated within the Agency as a means of addressing this need. The Program provides grants to employers covered by the *Affirmative Action Act* to help them to develop models of best practice in affirmative action which can be demonstrated to and adopted by the organisations. Priority areas for the 1992-93 projects were establishing a program in a smaller organisation, addressing gender segmentation in the workplace and designing opportunities for disadvantaged women in predominantly female industries.

The Advisory Group believes that the Model Directions Program could be a useful mechanism for encouraging employers of women in SET-based careers to develop affirmative action programs which break down the behavioural, attitudinal and structural barriers which prevent them from progressing to senior levels.

RECOMMENDATION 4

The Advisory Group recommends that the Minister for Industrial Relations ensure that the Affirmative Action Agency include the following as future project priorities under the Model Directions Program:

- (a) the development of guidelines for facilitating the recognition of women's prior learning in selection procedures for SET-based positions in both the private and public sector;***
- (b) designing opportunities for women in SET-based employment;***
- (c) eliminating indirect discrimination in job evaluation and job selection criteria; and***
- (d) ensuring equal representation of men and women on selection panels.***

In addition to examining the overall effectiveness of affirmative action and equal employment opportunity programs, the Advisory Group believes that the Government, as an employer, can improve practice in SET-based employment through influencing selection practices in the higher education sector and through implementing better practice in science agencies.

RECOMMENDATION 5(A)

The Advisory Group recommends that the Ministers for Industry, Science and Technology, Employment, Education and Training and the Minister Assisting the Prime Minister on the Status of Women, in consultation with other relevant Ministers, include a particular emphasis on women in SET-related employment in

their annual reports to the Affirmative Action Agency on employment practices by higher education institutions and Government science agencies.

RECOMMENDATION 5(B)

The Advisory Group recommends that these Ministers explore mechanisms for enforcing the use of selection criteria which recognise the different employment profiles and prior learning of women and men in the appointment of women to senior positions in SET-related employment in the private and public sector and that women be represented equally with men on all selection panels.

Submission 68 noted that there is likely to be strong resistance to this recommendation.

In January 1993 the Government introduced a policy for contract compliance which ensures that employers who have failed to comply with the requirements of the *Affirmative Action Act* will not receive Government contracts and specified forms of industry assistance. Non-complying companies are also named in Parliament. The Advisory Group believes that, in addition to disincentives of this type, the Affirmative Action Agency should also explore incentives for employers who, when they apply for Government contracts in SET areas, include SET-qualified women in the project design and implementation teams. The Advisory Group believes that the choice of a tender should still be based on the usual criteria, but that tenders who show that women in SET-based careers are integral to their organisations and therefore integral to their contract tenders should be viewed in a favourable manner.

RECOMMENDATION 6

The Advisory Group recommends that the Minister for Industrial Relations direct the Affirmative Action Agency to explore the viability of developing a selection criterion for Government contracts which acknowledges the contribution employers are making to affirmative action in SET-based industries through including women in SET careers in contract tenders.

Barriers to Progression - Better Data to Improve Understanding

One of the difficulties encountered by the Advisory Group in formulating advice on this Term of Reference has been the inadequacy or inappropriateness of statistical information on women's employment in SET disciplines. Appendix 4.3 outlines a summary of the employment and other data available to the Advisory Group. The lack of detail on disciplines in education and levels in employment makes it difficult to diagnose in detail the areas where improvements in women's participation have been made and those areas which need closer attention. Better information is required on where the acute problems in access and progression in SET-based employment so that awareness raising activities can be targeted to those areas of greatest need (see Term of Reference 3). This type of detailed information can also inform the development of wider policies for promoting women's access and progression in SET-based employment. Many submissions emphasised the need to improve the quality and detail of data on women's employment in SET fields (for example, submissions 26, 32, 51, 72, 73, 82, 87). Submission 70 suggested that there could be reluctance from employers to provide information which could reveal existing or potential discriminatory perceptions or practices in their workplaces.

In June 1994 the Office of the Status of Women and the Australian Bureau of Statistics signed a memorandum of understanding covering the ongoing work performed by the Bureau for the

Office. The memorandum agreed to the establishment of a Women's Statistics Unit within the Australian Bureau of Statistics. The Unit will have a number of functions including the production of an annual Year Book of Australian Women, coordination of gender-specific output from Bureau collections and coordination of requests to the Bureau for the collection of additional data relating to women. The Advisory Group believes that this latter function will provide the best mechanism for ensuring that there is an improvement in collecting employment data on women in SET employment.

RECOMMENDATION 7

The Advisory Group recommends that the Treasurer request that the Women's Statistics Unit within the Australian Bureau of Statistics, in conjunction with the Department of Employment, Education and Training and the Department of Industry, Science and Technology, discuss improved registering of employment statistics on women in SET-based employment which records a discipline and sub-discipline breakdown of science, engineering and technology more generally and which also records the different seniority levels and employment status (casual, part-time, tenured/non-tenured, permanent/non-permanent) of participating women.

The submissions identified several issues of relevance to this Term of Reference which have not been addressed in this report. These were a need for more job sharing and part-time employment options for women (Submissions 11, 14, 28, 34, 55); addressing the special needs of women from non-English speaking backgrounds (Submissions 25, 53); and the need to address superannuation and unemployment issues (Submission 13).

The majority of submissions felt that the recommendations made by the Advisory Group against this term of reference would be effective. However, many stressed that successful outcomes would take time and would be contingent on adequate and ongoing funding. A few submissions also noted the need for indicators of success once the recommendations had been implemented (for example, submission 88). Submission 71 felt that more recommendations should be directed specifically to the private sector. The Advisory Group notes the difficulty in identifying mechanisms to influence cultural change within the private sector.

Term of Reference 2:

Advise on improving the level of participation and retention of women in science, engineering and technology education and training at both the vocational and academic level.

Barriers to Access - Maths and Computing as Critical Filters

The Terms of Reference specifically ask the Advisory Group to focus on vocational and academic education and training. However, during the Advisory Group's analysis of issues associated with this Term of Reference, it became clear that there is a significant access issue associated with education in the schools sector. This issue is the critical filter represented by girls entering the tertiary and vocational education and training systems with inappropriate school maths education, particularly in higher and applied maths. These girls are being excluded from study in physics, engineering, surveying and other key areas of scientific and

industrial activity because they failed to plan the educational pre-requisite at an early enough stage, and so lack advanced maths, or because they have the wrong type of maths. Advanced mathematics is essential as an entry requirement for most, if not all, of the university disciplines still seen as non-traditional for women. Several submissions felt that physics should also be included as a critical filter, particularly for the discipline of engineering (for example, submissions 13, 47, 93). Submissions 71 and 73 also suggested the inclusion of chemistry and biology.

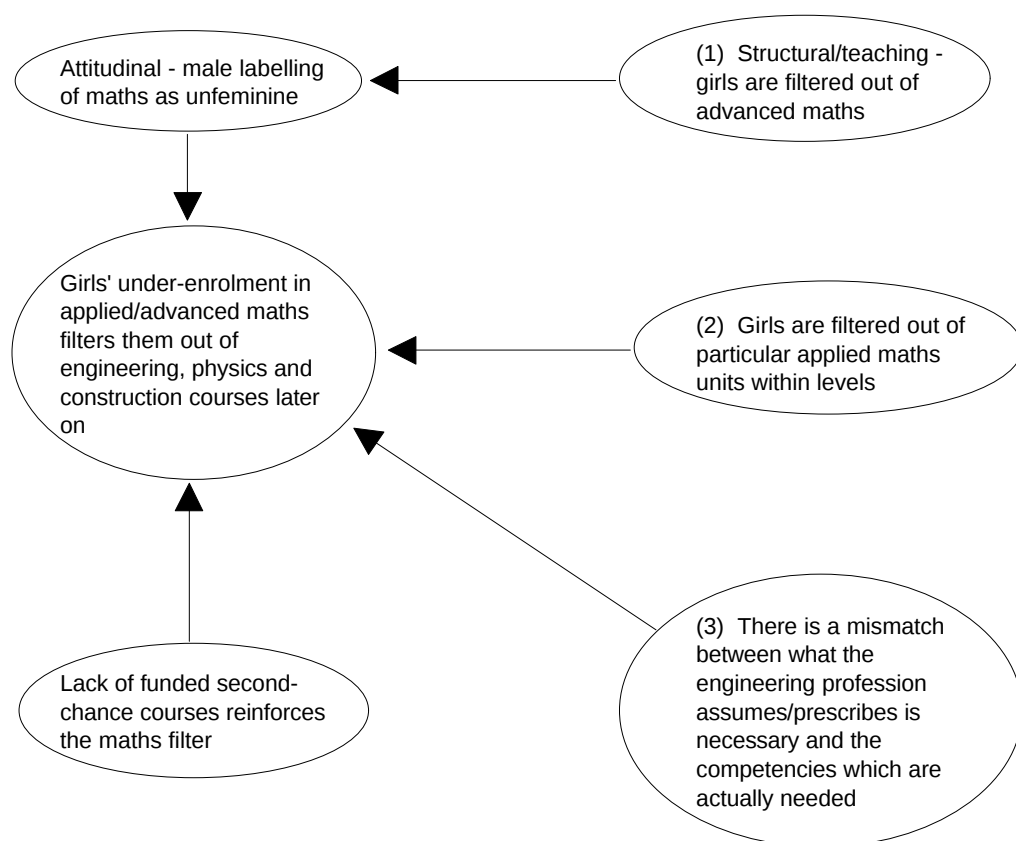
Critical Filters: Hidden Helix (Byrne, 1994) and *Women and Science: The Snark Syndrome* (Byrne, 1993) examine in some detail the basis for this critical filter. Diagram 2 shows the cluster of issues affecting maths as a critical filter. The main issue of concern to the Advisory Group is that girls' lack of education in matrices, vectors, mechanics and calculus is excluding them from particular SET-based courses at TAFE and higher education institutions.

Access to computers and proficiency in computing processes are now essential for almost all forms of learning and employment. One of the consequences of male behaviours which exclude women in both the school room and at university and TAFE is that computing has developed an undeniably male image. Girls and women are increasingly excluded from access to computers through exclusive male behaviours and this inhibits their developing proficiency with computers. *Critical Filters: Hidden Helix* (Byrne, 1994) discusses American research which has shown that "by male self-selection and female default, the computer centre becomes defined as male turf". The same researchers report on several large surveys which confirm that many girls are interested in computing and are aware of its importance and relevance to their future, but that boys still had much greater access to computers than girls and used them more. English research has found similar patterns.

Aside from the educational and employment disadvantages arising from this exclusion, there is also the wider issue of girls and women being progressively excluded from participating in and contributing to the technological innovations in digital information technology, electronic information networks and cybernetics. Dr Dale Spender, speaking at the Sixth International Feminist Bookfair (*The Australian*, 2 August, 1994), cautioned against women being excluded from computer technology when she said "We're going to turn around in the year 2000 and have an information-rich society that's male and an information-poor society that's female". Furthermore, some girls' and women's lack of confidence with computers means that they are unable to capitalise on the use of computer networks to access important career and education information and to network more effectively with the limited number of women in certain professions and fields of study.

Filtering girls and women out of maths and computing has both an attitudinal (gender harassment and other resistance and marginalising behaviours) and structural (gender bias in curriculum materials) basis. In the schools sector, these attitudinal and structural issues are being addressed more generally by the Commonwealth's *National Policy for the Education of Girls in Australian Schools*, and *The National Action Plan for the Education for Girls 1993-97*, endorsed by the Australian Education Council.

Diagram 2: Maths as a Critical Filter



Source: Byrne, *Critical Filters: Hidden Helix*, 1994

The attitudinal and behavioural issues underpinning the maths and computing filters to girls' access to higher education and training will need to be addressed as part of the wider public awareness campaign advocated by the Advisory Group (see Term of Reference 3). However, the Advisory Group believes that there are specific options for addressing the structural problems and in particular, the problem of gender-biased curriculum. The Advisory Group notes that the *Gender Equity in Curriculum Reform Project* funded by the Department of Employment, Education and Training has recently completed work in the area of gender inclusive development in all areas of the curriculum, including mathematics. It is now considered by experts in the area of gender and curriculum that girls' different participation from boys in mathematics is more to do with school culture, teacher awareness and understanding of gender issues, and the different perceptions of boys and girls to their roles in life than it has to do with the actual curriculum. However, notwithstanding this point, the Advisory Group feels that further work in the area of curriculum reform can only be beneficial.

RECOMMENDATION 8

The Advisory Group recommends that the Minister for Employment, Education and Training request that the Curriculum Corporation ensure that the document on gender issues in the curriculum (including mathematics) prepared as part of the Gender Equity in Curriculum Reform Project, be widely circulated in schools and Deans of Education with a view to helping teachers identify and address curriculum

factors which discourage school girls from participating in mathematics and computing.

Barriers to Access - Building Bridges for Maths and Computing

Deficits in the supply of gender-inclusive maths and computing curricula are also strongly influenced by the quality of teaching. As mentioned above, there is a growing body of evidence that the teaching styles of maths teachers influences girls' perceptions of the discipline. The largely traditional attitudes of most teachers become transmitted through the use of gender-biased educational materials and this can negatively affect the aspirations and motivation of girls when they face later subject choices involving disciplines regarded as non-traditional for women.

Addressing curriculum matters will tackle the maths and computing critical filter at its source, namely girls in the schools system. However, there is also a significant need for mechanisms to remedy the problem of young women already entering SET education and training with an existing maths and computing deficit. Top-up and bridging maths and computing courses offered by schools, TAFEs and higher education institutions can accelerate access for young women and disadvantaged young men to first year TAFE and higher education courses from which they would otherwise be excluded. These courses should be for award credit and should be able to be articulated into other awards. Submission 72 noted the importance of credit transfer in allowing women with TAFE qualification to add to them at university.

RECOMMENDATION 9

The Advisory Group recommends that the Minister for Employment, Education and Training provide a reference to the National Board of Employment, Education and Training asking it to advise on the formulation and implementation of a national policy on properly funded maths and computing accredited bridging courses at the schools, post-compulsory school, university and TAFE levels.

Barriers to Access - Overcoming the Educational Disadvantage of a Study Break

The final access issue considered under this Term of Reference is the problems faced by women students undertaking vocational and higher education who have had a break in their studies because of caring responsibilities. The time lag experienced when returning to studies makes it difficult for female candidates to compete effectively for the normal postgraduate awards because the pace of change in many disciplines means that their knowledge base is no longer current. Also, some awards have an upper age limit of 30 years which could exclude some women from re-entering via this route. Many women students recognise that they are unable to compete on equal terms and simply opt out of continuing with their education. Anecdotal evidence available to WISET suggests that part of the female workforce in the para-professional fields (technical officers and technicians) are women who have not resumed higher education studies after a break to raise children. As discussed under Term of Reference 1, re-entry scholarships would provide an important incentive for women to return to their studies at both the higher education and TAFE levels and to subsequently progress in SET-based employment. Recommendation 2 under Term of Reference 1 is equally valid under this Term of Reference.

Barriers to Progression - Science, Engineering and Technology are not Homogeneous Disciplines

Closer examination of the filters which discourage women from remaining in SET education and training is difficult because of the tendency to treat science, engineering and technology as homogeneous disciplines. For example, in the *Higher Education Series* (Report No 18, August, 1993) focusing on female academics, an analysis of the percentage of women staff in subject areas grouped science, maths and veterinary science together. This aggregation gives a misleading impression of the percentage of women staff in these areas compared to other areas - the science/maths/veterinary science percentage was higher than that for education and for business/law, when in fact the percentage of female staff in science and maths individually is very low and is quite high for veterinary science.

"There is a widely-held belief in some universities, that part of the general alteration of the image of veterinary science which has helped to make it gender-neutral for girls, who are now about 50% of enrolments, was the introduction of the female Vet in *A Country Practice*; and the high popularity of the *All Creatures Great and Small* series, which, while both vets were male, presented veterinary practice in a highly positive, socially friendly and supportive, and people-oriented way." (*Critical Filters: Hidden Helix*, 1994)

Although women's enrolment in science, engineering and technology as a whole has increased in recent years, the different disciplines show extremely diverse patterns of female participation, and within the same discipline at different levels, usually showing cascading losses as the level advances. In addition, the patterns of retention in separate disciplines vary between institutions, at least in the higher education sector.

School level data are now available on the *National Database on the Education of Girls* in sufficient detail to inform policy making. The TAFE sector has also recognised the need for better collection of data to assist in monitoring and analysing the performance of the sector. In 1991 the Committee on TAFE and Training Statistics identified as a major priority the need to implement a national information system for TAFE. The National Management Information and Statistics Project (NATMISS) was instituted to examine the requirements, establish the consistency and develop a comprehensive information system to meet the changing needs of the system. The major task of NATMISS has been to produce the Australian Vocational Education and Training Management Information Statistical Standard (AVETMISS). The Standard is being progressively implemented from 1994 to 1996. Current TAFE sector data allows the checking of female enrolments in each state or territory and comparisons between upper craft, technician and senior technician levels. Comparisons relating to different subject and discipline areas will be available when 1994 data are processed.

At the tertiary level no such parallel database is available, nor can it currently be compiled from raw data without special research. *Critical Filters: Hidden Helix* (Byrne, 1994) and *Women and Science: The Snark Syndrome* (Byrne, 1993) include a discussion of the details of some of the trends and changes based on the limited data available. Appendix 4.3 also includes some of the relevant statistics which show that despite a public perception that real progress has been made in female participation and progression, women still suffer from cascading losses in key disciplines in SET areas. Women's numbers and proportions decline

steadily in relation to male participation, at each successive stage or level of tertiary education and training. This occurs even in those disciplines where women are well represented at the school or undergraduate level.

The Advisory Group believes that improved data would assist in understanding the institutional and disciplinary factors underlying these apparent patterns. This in turn would assist in developing strategies to improve those institutions with a poor performance and recognise the successes of those performing well. This recommendation parallels the women's employment information deficit addressed under Recommendation 7. As with the employment data, many submissions strongly supported this recommendation (for example, submissions 13, 23, 51, 70, 72, 73, 82, 87). Submission 70 also suggested that data aggregated on a State and regional basis would also be useful.

RECOMMENDATION 10(A)

The Advisory Group recommends that the Minister for Employment, Education and Training, in conjunction with the Australian Vice-Chancellors' Committee and Australian National Training Authority, monitor and report on women's participation in SET education and training courses on the basis of disciplines and sub-disciplines rather than only in science, engineering and technology as a whole, and that the Women's Statistics Unit be tasked by the Treasurer with gathering the necessary data as part of gathering employment data as per Recommendation 7.

RECOMMENDATION 10(B)

The Advisory Group recommends that, as part of this monitoring, the Minister for Employment, Education and Training also examine and report on the policy implications of marked inter-institutional variations in enrolment of women in SET disciplines in the higher education sector and identify whether a similar situation exists in the TAFE sector.

RECOMMENDATION 10(C)

The Advisory Group recommends that the Minister for Employment, Education and Training should also ask the Australian Research Council to include, as a standard as a component of its discipline reviews, an examination of the levels of participation by women researchers in disciplines and sub-disciplines and at different levels of seniority, an examination of the attitudinal and structural barriers which limit their progression to senior levels and to advise on the reasons for any inter-disciplinary differences.

Barriers to Progression - Teach the Teachers

Teaching of SET curriculum in a way which is free of inherent gender bias is a difficult problem which confronts all levels of the teaching profession, from primary school teachers through to lecturers at universities and TAFE. In addition, the gender bias of most SET teaching materials adds to the lack of balance in the way in which SET is taught. For example, in educational texts in physics and maths the examples for exercises are most frequently based on the kinds of interests that boys have, such as football fields and scores, electric trains, astronomy, car mechanics and construction. In addition, in illustrations in these texts, male figures appear up to fifty times more frequently than female figures, and the female figures

that do appear are often presented in passive and dependent roles. *Critical Filters: Hidden Helix* (Byrne, 1994) discusses the research evidence for this phenomenon more fully.

Same sex role modelling is also important in this context. While there is some anecdotal evidence, especially from schools, that female role models act positively on fostering young women's interest in SET, there is some criticism that there has been too much reliance on this as an intervention, when other factors may be more relevant in restricting the participation of young women in SET. For example, perhaps it is the overwhelming predominance of men in SET which is the real barrier. Cross-national and cross-cultural evidence shows that children and young people internalise and adopt as constructed reality the types of role modelling images which are presented to them in their educational materials (*Critical Filters: Hidden Helix*, 1994) and presumably in their education environment and in the images which they see in the media.

Associated with teaching and curriculum is the more general issue of the male image which SET holds. These issues have already been discussed in the introduction and in the context of the maths and computing critical filters. While poor teaching quality is more likely to discourage access into SET education by girls, it can still influence the progression of women who have already overcome the gender barriers in the school system to entry into post-compulsory SET education and training.

Improved professional development opportunities and gender inclusive curricula (ie curricula that are relevant to boys and girls) are already being addressed in the schools sector and are beyond the scope of the Advisory Group's terms of reference. However, in the vocational and academic sectors there is also a need for improved professional development for teaching staff, wider access to the limited range of gender inclusive teaching materials which are now being developed and development of specific gender-inclusive curricula material for use in tertiary teaching. Many submissions endorsed the need for better training for teachers of SET at all levels of the education system (eg Submissions 15, 20, 36) and many also focussed on the importance of gender inclusive curriculum and resources (eg Submissions 11, 20, 23, 42, 44, 64).

A start has already been made in the TAFE sector through a national project under the *National Plan of Action for Women in TAFE* entitled *Gender Inclusive Teaching in TAFE* (Robinson and Mageean). The project assessed gender inclusive teaching staff development needs, particularly in areas of low female enrolment. The report concluded that what was required is an approach which embeds the understanding of gender issues and gender inclusive teaching in all staff development programs. The project has culminated in the production of a staff development kit which is currently being piloted in many States and is also being marketed to the higher education sector.

Within the higher education sector, staff development initiatives above and beyond institutional staff development plans are funded through the Commonwealth Staff Development Fund. However, Commonwealth funding for the Staff Development Fund ceases after 1995 and the future of the fund is currently under review.

Projects funded for 1994 in the Skills Development in Teaching and Learning component of the Fund focus on issues such as distance and open learning, computer-based learning and up-

grading the research qualifications and skills of academics. Gender inclusive teaching is not a feature of those programs which include coverage of teaching skills.

The Committee for the Advancement of University Teaching (CAUT), established in 1992, allocates some \$5 million per year for National Teaching Development Grants, commissioning of projects and networking. CAUT's programs are funded through the National Priority (Reserve Fund). The Advisory Group believes that CAUT has a role to play in improving the quality of tertiary level teaching of SET subjects.

The Department of Employment, Education and Training assists improving the quality and efficiency of higher education in Australia through the Evaluations and Investigations Program. The Program funds studies and research projects to evaluate performance and investigate issues of national importance in higher education in Australia. One of the priorities identified in the 1994 funding round was academic staffing issues including staff recruitment, development and conditions of service. Gender inclusive teaching skills would certainly fall under the heading of staff development. However, the Advisory Group remains sceptical that the issue of gender inclusive teaching will receive sufficient attention, given that the types of staff development which universities support (as evidenced by projects supported by the Commonwealth Staff Development Fund) have not recognised the importance of gender inclusive teaching within the array of skills required by academic teaching staff.

The Advisory Group believes that an assessment of gender inclusive staff development needs, in conjunction with the development of gender inclusive curricula support materials, should become a funding priority for The Evaluations and Investigations Program.

RECOMMENDATION 11

The Advisory Group recommends that the Minister for Employment, Education and Training

- (a) identify as a priority area under the Evaluations and Investigations Program (EIP) for the 1995 round, an assessment of the gender inclusive teaching staff development needs, including the use of gender inclusive support materials, of vocational and academic staff in SET, particularly in SET disciplines of low female enrolment and progression and high attrition rates;***
- (b) on the completion of the EIP project described above, request that the Committee for the Advancement of University Teaching seek proposals for projects which develop and trial a pilot training program to address the needs identified in the EIP project; and***
- (c) through the Projects of National Significance Program, fund research into the development and dissemination of gender inclusive curricula support materials for vocational education in schools.***

Barriers to Progression - Shared Issues for Women in Employment and Education

Generic employment issues such as child care, flexible working hours and sexual and gender harassment are equally applicable to women who are simultaneously engaged

in SET education and training and raising a family. The issue of child care is particularly important since traditional laboratory work and most technical and field work cannot be done at home. The Office on the Status of Women is currently commissioning consumer research to determine child care needs and also levels of satisfaction with currently available services. The main child care issues affecting women in SET-based education, training and employment are the number of places that are available, their affordability and the need for flexibility in hours of care. In some disciplines such as physics, maths and some fields of engineering, the advent of sophisticated software and information networks means that more work is able to be performed at home. The national and international focus of SET research also puts great pressure on women to travel for field work and conferences. Recommendation 1 is equally valid for women in SET-based education and training as it is for women in SET employment.

Many of the issues already discussed (re-entry scholarships, mentoring and bridging courses) are equally important in assisting women to progress from undergraduate to postgraduate SET education and training. Mentoring is particularly important to women in SET education because a good mentor can provide career guidance, assist in applying for postgraduate awards and part-time tutorships, enhance female student visibility through encouraging participation in seminars and conferences and assist in gaining industry placements where these are required to complete a course of study. Recommendations 2, 3, 5a and 7 are equally important to women in SET-based education and training as they are for women in SET employment. Submission 92 suggested there might be value in inviting SET workers from industry to mentor students.

Barriers to Progression - Changing the Educational Environment

Recommendations 2, 3, 5a and 7 target specific areas which require actions. However, the Advisory Group feels that more can be done by TAFEs and higher education institutions to develop and support educational environments which minimise barriers to women's participation and progression. The Advisory Group feels that institutional equity plans continue to be an effective tool for promoting institutional change and believes that the outcomes-based approach to funding under the Higher Education Equity Program will continue to promote and encourage change. The focus of equity plans on levels of representation of particular target groups has helped develop an understanding of the changing patterns of participation. However, the Advisory Group believes that the focus for women in non-traditional areas such as SET should now be on developing an understanding of the underlying causes of lower female participation in certain disciplines.

RECOMMENDATION 12

The Advisory Group recommends that the Minister for Employment, Education and Training encourage higher education institutions to start examining the underlying causes of lower levels of female participation in some disciplines of SET as part of the activities developed for their Equity Plans.

Submissions identified several issues relevant to this Term of Reference which are not covered in this report. The main two were the need to better educate parents on SET education and careers options for girls (Submissions 16, 19, 54, 70, 83); and the need to target careers advisers in schools to ensure they provide more balanced advice to girls (for example, submissions 14, 34, 29, 54, 70, 80, 83). Many submissions expressed disappointment that the report had not covered issues relating to schooling at the primary and secondary levels in any detail. The Advisory Group notes that its Terms of Reference required it to examine education

only at the vocational and academic levels. Other bodies have examined or are examining schooling issues in this area. Submissions 70 and 72 noted the need to recognise and address the special educational needs of young women in rural or isolated communities and the value of distance education for these women.

As with the employment issues, the majority of submissions felt that the actions proposed by the Advisory Group would be successful if adequately resourced. Several submissions suggested that there be an equal balance of funding support for the employment and education initiatives.

Term of Reference 3: Advise on improving awareness of the contribution women can make to science and engineering in Australia

Structures for Coordination - the Basis for an Holistic Policy Approach

The Advisory Group strongly believes that the complex nature of issues associated with improving women's participation at all levels and within all disciplines of SET-based education, training and employment warrants the establishment of a dedicated unit to coordinate, monitor, evaluate and, where necessary, implement activities to address these issues. The establishment of such a unit would help build links which cross the boundaries of portfolio responsibilities and would help foster the holistic approach to policy advocated by the Advisory Group. The Advisory Group notes that the report *The Rising Tide* (1994) produced by the British Committee on Women in Science, Engineering and Technology also identified the need for a dedicated unit to take forward those actions identified in its report which would benefit from coordination. The establishment of the WISET unit received hearty support in many of the submissions (eg Submissions 2, 11, 12, 26, 32, 51, 60). However, one submission questioned the need for yet another Canberra-based unit to address women's issues, and several submissions suggested that the funding would be better directed to existing programs (for example, submissions 72, 81)

In considering the range of activities which such a unit might undertake, the Advisory Group felt that a priority activity should be arranging a national conference, possibly with the Affirmative Action Agency, on the impact of indirect discrimination through selection criteria and job evaluation on women in SET-based employment. The Advisory Group felt that such an action deserved priority status because it provides a mechanism for targeting attitudes and behaviours within the private sector.

A second priority should be to examine the coverage of the theory and practice of the management of women in SET-based employment in management education in higher education institutions. This was felt to be an important issue since, in most fields of SET employment, the manager making recruitment decisions, developing selection criteria and undertaking job evaluation was likely to be male. Still in a 1993 report *Women in Management: The Forgotten Theory in Practice or How Not to Change a Culture*, discusses the difficulties in including coverage of women's management issues in postgraduate courses in management. If the training for management professionals does not also include skills in managing female scientists, technologists and engineers then this will perpetuate the current

attitudinal and behavioural climate which predominates in management in SET industries generally, and will act as yet another attitudinal and structural barrier to women's participation in these fields. Submission 80 noted the need to target managers in information technology areas. A few submissions suggested that the unit also undertake research on gender harassment (for example, submissions 32, 38). A further submission suggested that the unit could compile a register of existing programs aimed at improving women's participation in SET employment, education and training.

In conducting all its activities, the Advisory Group believes that it is very important that the Unit maintain close links with representative organisations in the scientific community and also with appropriate sections of the media.

RECOMMENDATION 13(A)

The Advisory Group recommends that the Minister for Industry, Science and Technology establish a Women in Science, Engineering and Technology Unit (WISETU) (for at least a four year period) within the Science and Technology Awareness Program to initiate, develop and monitor policies for advancing women in science, engineering and technology, in collaboration with relevant government departments and agencies, employer and union interests and the professional associations.

RECOMMENDATION 13(B)

The Advisory Group recommends that the Unit's key tasks should include:

- i) participating in the development and management of a public awareness campaign directed at improving understanding of the nature and affect of barriers to women's full participation in SET-based education, training and employment caused by gender harassment and other types of exclusive behaviour; and*
- ii) provision of limited project funding for initiating and supporting activities undertaken by other organisations in support of the Unit's objectives, (for example, monitoring and promulgating data on women in SET to the media and relevant organisations; advising on programs for improving women's participation in SET education, training and employment; the production of newsletters and publications describing good practice in SET-based education, training and employment; the initiation of special purpose, workshops and seminars; encouraging and supporting the development of networks of women in SET education, training and employment).*

RECOMMENDATION 13(C)

The Advisory Group recommends that the Unit should report annually in writing to the Minister for Industry, Science and Technology on the monitoring of, and advice on, the Government's response to this report. The Unit's annual statement should be published and widely circulated and should be tabled in Parliament as part of the Department of Industry, Science and Technology's Annual Report.

RECOMMENDATION 13(d)

The Advisory Group recommends that the Unit should arrange at least one major national conference every two years on special issues affecting women in SET education, training and employment which involves widespread participation of relevant policy makers and practitioners. These conferences should be jointly sponsored with other organisations.

The Advisory Group recognises that the establishment of the Unit will have significant resource implications, both in staffing and in program support. Therefore, the Advisory Group sees merit in building on existing programs and suggests that there may be scope for savings by establishing the Unit within the Science and Technology Awareness Program. The Advisory Group believes that an appropriate level of resources for the Unit would involve three dedicated staff and a minimum of \$500,000 per annum for program funds. Several submissions suggested that this level of staffing and funding should be the minimum (eg Submission 25).

One Submission (41) suggested that the WISET unit should be located in the Department of Employment, Education and Training rather than within the Science and Technology Awareness Program. However, the Advisory Group considers that the Science and Technology Awareness Program would give the issue greater focus and stronger links with the science, engineering and technology community. The Program has a close association with the media, and an excellent track record in awareness raising activities. In addition, the Advisory Group felt that, since the Program already has women and girls as one of its target groups, the location of the WISET Unit within the Program would provide a natural extension of its activities in that area.

Awareness Raising - The Basis for a Conceptual Framework

Australia's economic future depends in part on better using SET as a source of innovation and competitiveness. In a world increasingly shaped by SET, greater awareness within all sectors of the community of the importance of SET is necessary to ensure that Australia develops an appropriate skills and knowledge base. *Working Nation* (1994) explicitly states the Government's position in this regard. "If we are to develop the strength to compete in the world and maintain and increase our standard of living, we must make the most of all our resources. Greatest of all these are the talents and energies of the Australia people. When we waste them, we are weakened. When we employ them, we are made stronger."

The Advisory Group believes that simply improving the awareness of the contribution women can make to SET in Australia will not achieve the goals of improved women's access to and increased retention and progression in SET-based education, training and employment. The best way of improving awareness of the contribution women can make is by demonstrating it through their increased participation and visibility in the media in all disciplines, at all levels and in all the different work and learning environments. The community, and young women in particular, also need to be shown the satisfaction and fulfilment that can be found in an SET career.

The specific actions recommended in this report are targeted at particular areas of weaknesses. However, these areas of weakness are symptoms of a wider malaise which can only be addressed by tackling the fundamental issues. These are the issues of:

- the need for a paradigm shift away from asking what is wrong with girls and women to questioning what it is about the environment of SET that it does not attract and retain the interest of girls and women. Central to this paradigm shift is the need to better recognise and value the ways that women contribute to SET and also to pay greater attention to the range of behaviour towards women and girls by those who dominate both the educational and employment contexts of SET; and
- the need to adopt an holistic policy approach to the various clusters of issues associated with girls' and women's participation in SET.

These issues also describe the fundamental principles which have underpinned the Advisory Group's consideration of issues in this report.

The Advisory Group believes that a comprehensive, concerted and targeted public education campaign is required to address these issues. The campaign needs to make clear the paradigm shift from trying to change women to examining and addressing impediments to women in the education and work environments. It should address the attitudinal barriers which currently prevent women from participating more fully in SET-based education, training and employment. In addressing these barriers, there is also a fundamental need to improve understanding and recognition of gender harassment and other exclusion and resistance behaviours in SET-based education, training and employment. The goal should be to make the SET education and working environment "woman friendly".

The awareness raising campaign needs to target both the public and the private sectors and should build on existing programs aimed at promoting affirmative action and equal employment opportunities for women generally. The campaign should also identify examples of good practice in industries with a strong SET emphasis and encourage the Affirmative Action Agency to disseminate them. An analysis of any SET components of existing affirmative action and equity programs, and how they can contribute to a public awareness campaign, should be undertaken before the awareness campaign commences.

As an example of an existing program, the Advisory Group notes with particular interest the biennial Engineering 2000 Awards scheme established by the Institution of Engineers (Australia) which promotes sponsorships and gives national recognition to those individuals and organisations who have introduced successful measures to promote the advancement of women in all levels of engineering. However, the Advisory Group also notes that, whilst public sector employers, school and TAFE colleges are well represented in the awards, private sector firms are less well represented. No private sector award was made in 1991 because of the lack of adequately relevant projects or initiatives applying from the sector.

The combination of the public awareness campaign and the specific actions identified in this report, if undertaken by Government, will represent the first step in taking an holistic approach to the complicated and clustered issues which affect women in SET education, training and employment.

RECOMMENDATION 14(A)

The Advisory Group recommends that the Minister for Industry, Science and Technology, through the proposed WISET Unit within the Science and Technology

Awareness Program, and in consultation with other relevant bodies, initiate an awareness raising program aimed at improving understanding and recognition of gender harassment and other behaviours which inhibit female access to and progression in SET-based education, training and employment.

The public awareness campaign should be targeted at employers, unions, the schools sector, the TAFE sector and the higher education sector and the media.

RECOMMENDATION 14(B)

The Advisory Group recommends that the campaign should draw on examples of best practice in SET education, training and employment from existing equity and affirmative action programs in the public and private sector which help to articulate and operationalise strategies to promote as unacceptable the gender-based barriers to women's participation in SET-based education, training and employment.

The Advisory Group acknowledges that this type of program would require resources in addition to those currently available for the Science and Technology Awareness Program. However, the cost of the awareness campaign has been factored into the proposed funding for the WISET Unit and is estimated to be \$250,000.

There was widespread support for an awareness raising campaign in the submissions. However, a few submissions cautioned against a possible defensive reaction against a campaign which focused too much on problems at the expense of solutions. Many submissions commented on the importance of the media as a medium for portraying more positive images of SET to the community (eg Submissions 2, 6, 23, 33, 46, 47, 48, 49, 56, 91). The important role of the media has been recognised by the Advisory Group through identifying it as one of the key liaison groups for the Women in Science, Engineering and Technology Unit. The influence of positive television images of veterinary science on young women's entrance into training for this profession has already been mentioned. The under representation of women in SET more generally could be influenced positively by more frequent portrayal of women scientists in the print, radio and television media. As with the other recommendations, most submissions felt that adequate funding would ensure the effectiveness of the recommendations against this Term of Reference..

CONCLUSION

The Advisory Group has closely adhered to the task given to it by the then Minister Assisting the Prime Minister for Science and Minister for Science and Small Business, Senator Chris Schacht. The discussion of issues and recommendations for action in this report are specifically directed at the three terms of reference. The Advisory Group has also taken account of current government and other organisations' policies and programs, as well as relevant reports produced in Australia and overseas. These are either specifically referred to in the text or are summarised in Appendix 4.2.

The Advisory Group has also considered the direction from the Minister to report on long and short term strategies to address issues confronting women in SET-based education, training and employment. In developing its recommendations, the Advisory Group has focused only on those key areas most likely to generate change. All of the issues and recommended actions in this report are therefore, in the Advisory Group's opinion, important and warrant the attention of Government. However, the Advisory Group has also developed its recommendations in such a way that they can be implemented over the short, medium and long term and still achieve the holistic approach to policy change advocated in this report. The allocation of a particular recommendation to a particular implementation time-frame is a reflection of how long it will actually take to implement rather than a reflection of any priority the Advisory Group might give a particular recommendation.

Short Term Strategies

In the short term (over the next 12 months), the Advisory Group believes that the key actions should be the initiation of the public awareness campaign and the establishment of the Women in Science, Engineering and Technology Unit. The awareness raising campaign is important because it will set in place the philosophical framework for other recommendations by helping to improve understanding of the effects of gender harassment and other resistance and omitting behaviour, as well as helping to put in place strategies to remove the impediments to women in SET education, training and employment which these behaviours represent. This in turn will affect institutional environments and help to promote the paradigm shift advocated by the Advisory Group away from focusing on what is wrong with girls and women to changing SET-based education, training and employment environments to make them more attractive to women.

Early establishment of the Women in Science, Engineering and Technology Unit is equally important because it will put in place the structural mechanism to facilitate implementation of many of the other recommendations. The Unit operationalises the remaining principle underlying this report - that of promoting an holistic approach to the complex clusters of issues which confront women in SET-based education, training and employment. The Unit will be able to do this through building links which cross the boundaries of portfolio responsibilities and through drawing and building on existing policies and programs.

Associated with the need to establish underpinning philosophies and structural mechanisms for coordination is the need to improve the collection and reporting of statistics on women in

SET-based education, training and employment. The Advisory Group feels that most of the recommendations addressing this need can be implemented almost immediately through the Women's Statistics Unit. Better information will assist in developing and targeting the awareness raising campaign, as well as assisting the Women in Science, Engineering and Technology Unit in targeting and prioritising its activities.

Recommendations for Implementation in the Short Term

Initiate an awareness raising program targeted at employers, unions, the schools sector, the TAFE sector and the higher education sector aimed at improving understanding and recognition of gender harassment and other behaviours which inhibit women's access to and progression in SET-based education, training and employment. (Summary of Recommendation 14)

Establish a Women, Science, Engineering and Technology Unit (WISSETU) (for at least a four year period) to initiate, develop and monitor policies for advancing women in science, engineering or technology, in collaboration with relevant government departments and agencies, employer and union interests and the professional associations. (Summary of Recommendation 13)

The Women's Statistics Unit within the Australian Bureau of Statistics, in conjunction with DEET and DIST, discuss improved registering of employment statistics on women in SET-based employment which records a discipline and sub-discipline breakdown of science, engineering and technology more generally and which also records the different levels at which women participate and the nature of their employment (part-time, casual etc). (Summary of Recommendation 7)

Monitor and report on women's participation in SET education and training courses on the basis of disciplines and sub-disciplines rather than only in science, engineering and technology as a whole. The Women's Statistics Unit be tasked with gathering the necessary data as part of gathering employment data as per Recommendation 7. Examine and report on the policy implications of marked inter-institutional variations in enrolment of women in SET disciplines in the higher education sector and to identify whether a similar situation exists in the TAFE sector. Ask the Australian Research Council to include examination of the factors which affect women's participation in disciplines and sub-disciplines when it undertakes discipline reviews and advise on any inter-disciplinary differences. (Summary of Recommendation 10)

Medium Term Strategies

The Advisory Group believes that recommendations which are likely to be most effective if implemented in the medium term (1-3 years) are those which provide leverage to existing programs or activities. The need for re-entry scholarships and bridging courses fall specifically into this category because they provide "second chance" opportunities for women to re-enter their chosen profession, to recommence study which they otherwise would not have continued or to correct any deficits in education which they may have experienced.

An important leverage tool in assisting women to progress in SET-based education, training and employment is the increased use of mentoring and improved articulation of selection criteria which do not indirectly discriminate against women. The recommendations targeted at addressing these problems build on the existing education and training held by women in these situations and prevent the loss of a significant existing investment in education and training in SET.

Recommendations for Implementation in the Medium Term

Encourage all higher education institutions to formally set aside dedicated funding for a number of re-entry scholarships for women wishing to re-enter training in SET, particularly at the postgraduate level. Raise the issues with Australian National Training Authority and ask it to explore options for dedicated funding for re-entry scholarships for women wishing to re-enter vocational SET training. (Summary of Recommendation 2a)

Encourage all higher education institutions to develop and fund a minimum number of flexible top-up and bridging courses in SET which will provide opportunities for women entering or returning to SET-based employment to renew and update their knowledge base. Explore options with Australian National Training Authority for provision of such courses for women wishing to enter or return to vocational SET training. (Summary of Recommendation 2b)

Initiate and report on the outcomes of a survey of the higher education and vocational sectors to determine the extent of mentoring schemes for women in SET-based education, training and employment. Draw on examples of best practice cited in the survey to develop appropriate guidelines for mentoring. Ensure that Government science agencies establish a suitable mentoring scheme for female and male employees and report on the impact and effectiveness of the scheme annually. (Summary of Recommendation 3)

Monitor and report annually to the Affirmative Action Agency on the female SET employment practices by higher education institutions and Government science agencies, encourage the use of selection criteria which recognise the different employment profiles and prior learning of women and men in the appointment of women to senior positions and the inclusion of women on all selection panels. (Recommendation 5)

Use the educational profiles process as a mechanism for encouraging higher education institutions to examine the underlying causes of lower levels of female participation. (Summary of Recommendation 12)

Long Term Strategies

The Advisory Group has categorised as long term strategies (3-5 years), those recommendations which target a process of ongoing change or those which require significant research and examination before they can be implemented. In the former case, the Advisory Group believes that the Government's commitment to improving the working environment for women generally represents a long term process which will facilitate changes in the attitudes and expectations of employers and male and female employees. In the latter case, the Advisory Group believes that recommendations on staff development, curriculum change and the development of gender inclusive teaching materials will also take longer to bring about change, but need to be pursued since they impact so strongly on the quality of current and future learning and teaching.

Recommendations for Implementation in the Long Term

Continue to accord a high priority to public sector-specific reforms and Government actions which influence and encourage change in union and employer attitudes to employment-related social issues which particularly effect women. (Summary of Recommendation 1)

Include a number of female SET-employment specific priority areas within the Model Directions Program of the Affirmative Action Agency (Summary of Recommendation 4)

Explore mechanisms for including a criterion in Government contract procedures which recognises good performance by companies of increasing participation of women in SET-employment (Summary of Recommendation 6)

Ensure that the gender issues in the curriculum documentation arising from the Gender Equity in Curriculum Reform Project is widely circulated in schools and to Deans of Education. (Summary of Recommendation 8)

Advise on the formulation and implementation of a national policy on properly funded maths and computing bridging courses at the schools, post-compulsory school, university and TAFE levels. (Summary of Recommendation 9)

Include an assessment of gender inclusive teaching staff development needs in as a priority for the Evaluations and Investigations Program and encourage the Commonwealth Staff Development Fund to seek project proposals for gender inclusive teaching. (Summary of Recommendation 11a,b)

Fund research into the development and dissemination of gender inclusive curricula support materials. (Summary of Recommendation 11c)

The majority of submissions felt that the implementation strategy presented a logical mechanism for progressing the recommendations in the report. However, several submissions suggested that the long term strategy should be implemented earlier or at least in conjunction with the medium term strategy, that is to say within a three year time frame (for example, submissions 46, 60, 64). A few submissions suggested that setting of specific targets would assist in monitoring implementation (for example, submissions 79 and 88).

In conclusion, the Advisory Group reiterates the comment it made at the beginning of this report. Women are 51% of the nation's population. Using their talents to the full at all levels of scientific and technological education, training and employment is an economic necessity, and an investment in Australia's future national development. Continued under-representation and under-participation of women in SET-based education, training and employment is not only a cause for social concern on equity grounds, it is also likely to inhibit Australia's capacity to develop internationally competitive research and industries. Women in SET-based education, training and employment contribute creativity, imagination and intelligence to the strong SET base of which Australia is justly proud. Their past and present contributions and achievements must be recognised, and the impediments which limit their present and future contributions and achievements must be removed if Australia is to fulfil the vision of *Developing Australian Ideas, A Blueprint for the 1990s* (1992) and *Working Nation* (1994).

APPENDICES

APPENDIX 4.1

MEMBERSHIP OF THE WOMEN IN SCIENCE, ENGINEERING AND TECHNOLOGY ADVISORY GROUP

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PREPARATION OF THE REPORT

Ms Fiona Oliver	National Board of Employment, Education and Training (seconded to the Department of the Prime Minister and Cabinet and also in a private capacity)
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SECRETARIAT SUPPORT

(The secretariat staff served consecutively)

Ms Sandra Dahl Department of the Prime Minister and Cabinet

Ms Margaret Pender Department of the Prime Minister and Cabinet

APPENDIX 4.2

Current Actions By Government Departments and Agencies

Employment, Education and Training

Higher Education

The national plan for equity in higher education, a *Fair Chance for All*, aims to ensure that Australians from all groups in society have the opportunity to succeed in higher education. The Commonwealth provides funds for higher education institutions to address the needs of women through equity plans as a part of their educational profiles. A key objective of the national plan is to increase the proportion of women in non-traditional courses and post graduate study, particularly research. Specific targets set for women in *A Fair Chance for All* are:

- to increase the proportion of women in non-traditional courses other than engineering from the current level to at least 40% by 1995;
- to increase the proportion of women in engineering courses from 7% to 15% by 1995; and
- to increase the numbers of women in postgraduate study, particularly in research, relative to the proportion of female undergraduates in each field by 1995.

Current statistics show that women represent more than half (53%) of the higher education student population and continue to increase their proportion in non-traditional areas and research postgraduate studies where they are currently under-represented.

Under the Evaluation and Investigation Program (EIP), the Higher Education Division of DEET is funding a study, by Dr Deirdre Cobbin of the University of Technology Sydney, on a comparison of the performance of Australian universities attracting and retaining women in non-traditional study areas. This study will be completed shortly. In addition, Ms Lin Martin is undertaking a study on Equity and General Performance indicators which will be used in the higher education sector from 1995 to improve the collection of data relating to successful equity outcomes.

Women's Bureau

The Women's Bureau was established in 1963 as a specialist research and policy advising unit. Today, the Bureau promotes women's participation in employment, education and training, advises on labour market developments and employment, education and training policies and programs, co-ordinates portfolio-wide activities on gender equity and promotes gender equity through information programs and cooperation with other agencies. Since 1990, labour market and education and training issues affecting women have been integrated into general operations of the Department. Gender equity is the responsibility of all program managers, and resources are provided to major areas to facilitate this role.

The Women's Bureau administers the Women's Research and Employment Initiatives Program which plays an important role in facilitating innovative research on women's employment.

The Women's Bureau also provides the secretariat for the Women's Employment, Education and Training Advisory Group (WEETAG) who advise the Minister on women's policy issues and the Department of Employment, Education and Training Women's Consultative Committee who advise the Secretary on women's employment, education and training.

The Women's Bureau, through its outposted officers in the Action for Women Unit, support Women's Employment Advisers in Area Offices and Women's Employment Contact Officers in CES outlets to promote gender equity principles. This is achieved by monitoring women's participation in DEET programs and services and liaising with employers and management to promote women's opportunities in a range of employment and training placements.

The Women's Employment, Education and Training Advisory Group (WEETAG)

The Women's Employment, Education and Training Advisory Group (WEETAG) was established in 1988 to advise the Minister on women's issues as they relate to the portfolio. Originally, members comprised all the women appointed to the National Board of Employment, Education and Training (NBEET) and its Councils. In 1992, WEETAG were restructured to include representatives from the industry sector.

One of WEETAG's priorities is education for girls and women amongst a variety of other policies and programs. The group:

- identifies priorities for research, policy development and actions;
- commissions and undertakes research;
- consults with relevant groups and individuals in the community;
- works with government and non-government agencies; and
- collects information,

Vocational Education and Training

Over the last few years, the Commonwealth Government has undertaken a range of measures to address gender imbalance in our Vocational Education and Training System. The following summary outlines major recent developments in the area of gender equity.

The National Plan of Action for Women in TAFE

The National Plan of Action for Women in TAFE was the first national approach to improving access, participation and outcomes for women in technical and further education (TAFE). The National Plan, a joint Commonwealth-State initiative, was developed in 1991 and implemented between 1991 and 1994. The National Plan recognises that systematic affirmative action is needed for women to have equal access to, and participation in, TAFE.

The National Plan was agreed to nationally but implemented by means of state and territory action plans. Funds were provided to develop a national research and project base through commissioning a number of national projects which have subsequently resulted in a range of resource materials covering research, training and information.

Useful outcomes from the National Plan projects include a series of guidebooks on designing gender inclusive curriculum, the development of a training package for TAFE staff on

promoting an environment free of sexual harassment for women, and the development of marketing plan to encourage young women into non-traditional areas.

An evaluation of the National Plan has recently been completed which recommends a new strategic framework for women in VET to form the basis of the next phase of the achievement of equity for women in VET. The second phase focuses on extending the benefits of the National Plan to the wider VET sector.

Gender Equity in the Australian Vocational Training System

The Australian Vocational Training System (AVTS) is a new national entry level training system which is designed to provide flexible access to training and allow a greater convergence of vocational and general education. The AVTS will include a broad range of pathways combining education, training and work experience. Gender equity measures for the AVTS include:

- the AVTS Equity Strategy which identifies women as a target group;
- access and equity guidelines for AVTS pilot development and selection;
- an equity matrix to identify any gaps in the examination of equity issues across the suite of pilots; and
- an evaluation and monitoring plan which includes attention to access and equity issues for example by examining participation by women in both traditional and non traditional industries.

Part time and Casual Workers

A part time and casual worker study now in progress is another current project funded by the Commonwealth which is highly relevant to gender equity issues. The report of the study will inform further advice for Ministers on gender equity strategies for the AVTS.

Vocational Education, Employment and Training (VEET) Women's Taskforce

The Ministerial Council for Employment, Education, Training and Youth Affairs (MCEETYA) has established the VEET Women's Taskforce to provide advice on women's access and equity issues. Issues currently being considered include ensuring gender equity in the implementation of the White Paper *Working Nation*, and assessing the impact of enterprise bargaining on women in the vocational education and training industry.

Australian National Training Authority (ANTA) Initiatives

ANTA has developed a National Strategy for Vocational Education and Training which provides a national direction and also comprehensively addresses access and equity issues. The National Strategy outlines specific initiatives to improve women's access to opportunities in vocational education and training. These include:

- the provision of additional training places for new female entrants in areas where women have traditionally had limited training opportunities; and
- the implementation of recognition of prior learning policies and practices to recognise the skills that women gain outside formal training.

In 1995, ANTA will conduct an extensive literature review and industry survey on the barriers to training for women working at operative levels in industry. The Authority will disseminate the information on "best practice" strategies arising from this study.

ANTA has included gender equity requirements in its guidelines for Industry Training Plans and State/Territory Training Profiles. The guidelines will ensure that women's training needs are addressed by Industry and the States and Territories.

White Paper Initiatives

The Government's White Paper on Employment and Growth, *Working Nation (May 1994)* includes a number of strategies and directions which should improve gender equity within the training system, including:

- the extension of the additional payment for disadvantaged apprentices and trainees to all first year apprentices in non-traditional trades (ie excluding hairdressing and beauty culture). Female apprentices are included in the disadvantaged category;
- the extension of the disadvantaged incentive payment in pre-vocational courses;
- the expansion of traineeships to include adults (which will provide an avenue for older women seeking to enter or re-enter the workforce)
- initiatives to promote training within small enterprises, a significant area of employment for women, through the Small Business Employment and Training Strategy. This strategy also includes initiatives targeted towards women specifically:
 - the development of pilots in open learning to provide a delivery framework for women in small business; and
 - improving women's access to the New Enterprise Incentive Scheme, a program helping jobseekers become self employed through training and income support.

A number of the directions set out in the White Paper also offer benefits for women over the longer term:

- the identification of lifelong learning as a concept requiring further development should assist women returning to the workforce after child rearing;
- the move to case management of unemployed people should ensure that women have access to the information about the full range of training and employment options, including those in non-traditional areas;
- the articulation of Labour Market Programs with a significant training element to the entry level training system;
- the encouragement of multiple pathways from school to work, including institutional pathways with improved links with industry (through work experience). Given that women often study in the institutional stream, the improvement of this stream should improve outcomes for women.

Women in Entry Level Training

The Women in Entry Level Training (WELT) Project was initiated by the VEET Women's Taskforce in recognition of the need to research and document successful strategies developed and implemented in both private and public sector organisations to increase the number of women in entry level training. The WELT report, released in 1991, makes a range of recommendations to Commonwealth and State Governments designed to increase women's access to VET. These recommendations have been progressively implemented since the release of the report.

One of the recommendations was the development of a resource kit for distribution through schools, TAFE and the CES. The kit entitled, "Your Brilliant Career - Career Options for Women" was produced in 1993 and includes posters and a magazine featuring a range of traditional and non-traditional occupations including trades, which do not require tertiary education at entry level. This kit has been very successful and is still in demand.

The WELT report also initiated the development of a resource kit for employers and trainers which includes, an information booklet for Group Training Companies to assist them in attracting and recruiting greater numbers of women into their companies and two reports which outline a range of successful and practical strategies to promote, recruit and retain women in jobs and industries where women are still under represented.

The two reports are:

- *What Gets Measured Gets Managed* which documents best practice case studies of women's recruitment and retention in non-traditional entry level training; and
- *Women's Participation in Non-Traditional Vocational Training* which identifies strategies to increase women's participation in Australian Vocational Training System projects in industries and occupations where they have been under represented in the past.

The WELT program also developed strategies to assist Industry Training Advisory Bodies (ITABs) to develop appropriate policies on gender equity issues particularly in relation to entry-level training. *The Representation of Women on Industry Training Advisory Bodies and Related Policy and Planning Issues* is a report of a survey on the representation of women on ITABs. It sets out issues for further consideration in developing strategies to improve women's access in the work of ITABs.

Different Futures: Critical Factors in Encouraging Women's Participation in Non-Traditional Entry Level Training

Different Futures was a Commonwealth funded project which included a report which sets out the critical factors affecting the career decisions of young women and a kit entitled *Value Added Recruitment* for employers on gender free recruitment practices. The kit provides practical advice for employers and focuses on positive strategies for encouraging women into traditionally male-dominated areas. The project report and recruitment kit were launched in August 1993 and have been very well received by industry.

Schools Education

The Australian Education Council (now called the Ministerial Council on Employment, Education, Training and Youth Affairs) endorsed a National Policy for the Education of Girls and has produced a National Action Plan for the Education of Girls 1993-97, aiming to bring about real improvements in equality of educational outcomes for girls and boys. *The National Policy for the Education of Girls in Australian Schools*, a Commonwealth initiative, was endorsed by the Australian Education Council in 1987.

The Council undertook a review of the policy in 1991-92 which resulted in the production of the National Action Plan for the Education of Girls 1993-97. The review investigated girls' experiences at primary and secondary schools and analysed their subject choice at years 11 and 12. The findings showed that considerable progress has been made, but that curricula in Australian schools still serves boys better than girls. The plan aims to do more than raise awareness; it encourages direct action in such areas as curriculum, girls' classroom experience, the behaviour and attitudes of males towards females, and changes to the social, physical and cultural environments in which girls learn.

The review Committee had representatives from all States and territories Education Authorities, National Catholic Education Committee, National Council of Independent Schools Association and the Schools Council of the National Board of Employment, Education and Training (NBEET). The review gathered evidence through:

- State/Territory education of girls personnel;
- current research being undertaken around the country and internationally;
- the *Listening to Girls* report (from the consultancy undertaken by Milligan and Associates for the Review); and
- the *Girls in Schools* reports which were part of the reporting cycle of the National Policy.

The review found that the Policy should continue for the next five years with the following priority areas for action:

- examining the construction of gender
- broadening work education
- improving teaching practice
- addressing the needs of girls at risk
- eliminating sex-based harassment
- changing school organisation and management practices
- improving the educational outcomes of girls who benefit least from schooling
- reforming the curriculum

The Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) has established a Gender Equity Taskforce to monitor the implementation of the National Action Plan for the Education of Girls and to provide advice on gender issues in relation to both girls and boys education. DEET has initiated projects to advance the National Policy for the Education of Girls and co-ordinated the Gender Equity in Curriculum Reform Project. The Project aimed to promote the development of school curriculum which is equally relevant to girls and boys.

The Gender Equity in Curriculum Reform Project funded the appointment of specialist education of girls personnel to work with each of the curriculum writing teams to ensure that the curriculum statements and profiles were written using gender inclusive language and that their content was inclusive of girls' and women's experiences. DEET is funding a project, through the Curriculum Development Projects Program, to develop a publication on Gender Inclusive Curriculum Development Guidelines. This publication will be an important guide to inform curriculum developers about gender inclusive curriculum principles and practices.

DEET also publishes a monthly newsletter called *The Gen* with a circulation of 35,000 which presents ideas and information relevant to the National Policy on the Education of Girls to the relevant players. A recent evaluation found that *The Gen* is received by about 80,000 people including teachers, parents, academics, women's groups, parliamentarians and journalists.

The National Board of Employment, Education and Training (NBEET)

NBEET has commissioned two reports to investigate:

- the understanding of science and technology by children in their last year of primary school in Australia; and
- under achievement in science and technology education.

The Schools Council, through the National Board, is commissioning a consultant to undertake a project which will further promote the Board's ongoing concern to increase participation in science and technology in schools. In this project the Schools Council is seeking to develop joint action with industry to advance the involvement of industry in broadening participation in science and technology courses.

The former report provides some analysis regarding gender differences in various areas, including in performing science skills and regarding attitudes to science.

Industry, Science and Technology

The Science and Technology Awareness Program in DIST supports a diverse range of activities that assist in meeting the Program's objectives and which are directed to the Program's target groups, one of which is women. Gender issues are an important consideration in all projects selected for funding. For example, the Program has shown strong support for projects aimed at primary school children and their teachers. This recognises that the primary years are a critical time for formation of attitudes towards women's roles in science and technology, and that primary teachers, who are predominantly female, are often uncomfortable teaching science, as they often have little or no science and technology background themselves.

The Program has also supported several projects specifically directed to women, with the aim of increasing participation of women and girls in science, technology and engineering activities. For example the Program has sponsored components to two relevant conferences - the sixth International Gender and Science and Technology Conference in July 1991 and a 1991 Industry-Education forum in WA entitled 'Women in Science & Technology - a Vital Asset'. Two exhibitions on women in Australian science have also been supported - one by the Waite Historic Precinct Management Committee, and a travelling exhibition from the Women

in Science Enquiry Network (WISENET). Support was also given for an innovative theatre production from the Salamanca Theatre Company, "The Marie Curie Chat Show", which explored issues surrounding women in science.

CSIRO

CSIRO is attracting girls into science with a number of projects. CSIRO's *Double Helix Science Club* has 23,000 members nationally of which almost 40% are girls. The Club runs girls-only activities from time to time and has a gender-inclusive approach to *The Helix* magazine received by members. The Club is also supported by BHP.

The *CSIRO Student Research Scheme* allows 600 senior secondary students each year to undertake research work over a six month period under the guidance of a scientist. Over half the participants are female.

CREST stands for Creativity in Science and Technology. This project fosters student research in lower secondary schools as part of the curriculum. CREST is currently being introduced in Australia but overseas experience indicates strongly that girls will make up more than half the participants and will involve them in scientific research and technology that they would not normally undertake.

Public Service Commission

The Public Service Commission has undertaken research into *Women In Non-Administrative, Technical, Professional General Service And Information Classifications of the Australian Public Service (APS)*. This project emanated from the Joint Council - Women in the Service Sub-Committee which was concerned about the impact that the significant reforms in the workplace may be having on women. The report:

- provides a statistical overview of women in non-administrative areas of employment;
- identifies some of the factors which hinder and those which assist women's employment and progress in the non-administrative areas of the APS;
- compares the situation for women in the APS in non-administrative areas with those in the labour market in general;
- examines the impact of corporate/organisational culture in the APS on occupational segregation and the consequent status, representation and visibility of women; and
- provides a range of strategies to assist women's employment, retention and progress.

The report findings show that despite the fact that more women are moving into the non-traditional areas of education, this trend in education is not being reflected in areas of employment. The statistics examined for the Australian Public Service (APS) between 1989 and 1993 show that women's participation rate has risen; in 1989 women constituted 20% of the APS non-administrative work force and by 1993 the participation was 26%. However, women still dominate the employment areas prescribed as traditional, such as social work and

librarianship. Furthermore, women are still almost non-existent in the more non-traditional areas of employment such as trades, engineering and technical.

The report shows that although women are represented in all classifications, they are limited to the lower levels. Very few reach the upper echelons of the APS even in the more female traditional areas.

The report identifies the hindrances to women's progress and those factors which have assisted that progress. It also provides a range of strategies that could be implemented to improve the employment, retention and progress of women.

Non-Government Organisations

Institution of Engineers (Australia)

The Institution of Engineers (Australia) has formed a National Women in Engineering Committee to consider issues relating to the education and employment of women in engineering. The Committee includes elected representatives of women engineers, both employed and unemployed, across Australia, and also includes representatives with expertise in equal opportunity, affirmative action and engineering education.

The Institution, through the National Women in Engineering Committee has taken or initiated the following actions to increase participation of women in engineering:

- Since 1990 the Annual Engineering 2000 Awards. These awards acknowledge projects, policies and initiatives in schools, tertiary education centres and industry which lead to the advancement of women in engineering.
- Since 1991 the Institution has continuously interacted with the media to ensure that the public is aware of the issues relating to career paths for women in engineers.
- Based on advice from the Committee, the Institution has approved payment of child care to primary care givers attending Institution functions. The Committee is presently developing guidelines for the implementation of this policy.
- The Committee is proposing to hold an interactive workshop hosted by a large private company. The workshop would promote best practice in the area of managing diversity in the workplace and aligning work and family policies.

Australian Science Teachers Association (ASTA)

In 1987 the Association developed a policy on girls and women in science and education. ASTA is currently reviewing this policy and how the implementation is proceeding. Actions were proposed aiming to promote equality of opportunity and outcome in science education for girls and women, to highlight relevant issues regarding their low participation, and to raise awareness of their contribution and potential.

Women in Science Enquiry Network (WISENET)

WISENET was established in 1984 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 is a national linking organisation formed through the establishment of a series of State branches. Regional groups and subject or interest groups, such as the one responsible for the exhibition "A History for the Future", have also been active.

APPENDIX 4.3

SELECTED RELEVANT STATISTICS

EMPLOYMENT

Table 1: Employed Persons Aged 15 Years and Over: Occupation

Occupation	Women (%)		Men (%)	
	1988	1992	1988	1992
Managers and administrators	6.3	6.7	14.0	14.7
Professionals	11.9	13.9	12.1	13.8
Para-professionals	6.4	6.7	5.5	5.6
Tradespersons	4.3	3.7	24.8	23.3
Clerks	32.6	30.6	7.4	6.5
Salespersons and personal service workers	22	23.7	8.4	9.1
Plant and machinery operators and drivers	3.3	2.4	10.8	10.6
Labourers and related workers	13.1	12.4	16.9	16.4

Source: *Women in Australia*, Australian Bureau of Statistics, 1993

Table 2: Employed Persons Aged 15 Years and Over: Industry

Industry	Women (%)		Men (%)	
	1982	1992	1982	1992
Agriculture, forestry, fishing & hunting	4.4	3.6	7.6	6.3
Mining	0.4	0.3	2.0	1.9
Manufacturing	12.6	9.2	22.4	18.2
Electricity, gas & water	0.4	0.4	3.0	2.1
Construction	1.9	2.1	10.5	10.3
Wholesale & retail trade	23.0	22.4	17.6	19.6
Transport and storage	2.6	2.3	7.8	6.8
Communication	1.4	1.1	2.4	1.8
Finance, property & business services	11.8	13.5	7.8	10.4
Public administration & defence	3.8	4.0	4.9	4.9
Community services	28.3	30.2	9.7	11.5
Recreation, personal & other services	9.8	10.8	4.3	6.
TOTAL	100	100	100	100

Source: *Women in Australia*, Australian Bureau of Statistics, 1993

Table 3: Women who had Taken a Break from Employment (between 1975 and 1991): Difficulties in Returning to Employment After Most Recent Break (by Length of Break)

	Length of Break (%)		
Difficulties in Returning to Employment (a)	Less than one year	One year or more	Total
Balancing family responsibilities and the job	11.6	22.2	17.3
Child care arrangements/cost	6.6	13	10.1
New technology to learn/lack of skills	5.7	12.8	9.5
Work related (b)	6.9	13.2	10.2
Lack of confidence/feeling the need to prove oneself	3.9	10.8	7.6
Age	0.9	2.5	1.7
Daily travel	2.4	3.4	2.9
Other	6.7	7.8	7.3
No reported difficulty	75.2	63.1	68.8

Figures shown in bold are subject to high variability.

(a) Columns do not add to 100% because many women may have experienced more than one difficulty.

(b) Comprises returned to the same job but work was different, lack of support or recognition from employer or workmates, and had to adjust to working with new people.

Source: *Women in Australia*, Australian Bureau of Statistics, 1993

Table 4: Average Weekly Total Earnings and Hours Paid for Full-Time Adult Non-Managerial Employees: Selected Occupational Groups, Australia, May 1992*

Average Weekly Total				
Occupation	Male Earnings (\$)	Hours	Female Earnings (\$)	Hours
Professionals	761.8	38.0	673.9	37.0
Natural Scientists	778.3	38.9	646.0	37.9
Chemists	745.0	39.2	644.5	36.8
Geologists & Geophysicists	895.4	39.6	744.9	38.8
Life Scientists	716.5	37.3	617.5	36.7
Medical Testing Professionals	837.9	39.7	652.8	38.7
Other Natural Scientists	765.0	37.4	545.0	35.6
Building Professionals & Engineers	786.7	38.9	645.8	36.5
Architects & Landscape Architects	709.4	37.7	566.6	36.9
Quantity Surveyors	555.7	37.2		
Cartographers & Surveyors	701.2	40.1		
Chemical Engineers	927.8	39.4		
Civil Engineers	721.9	37.5	595.6	36.2
Electrical & Electronic Engineers	816.4	39.3	568.3	36.3
Mechanical Engineers	847.1	39.8	685.9	37.8
Mining Engineers	1127.9	38.5		
Metallurgists & Materials Scientists	881.5	38.5		
Other Engineers	811.9	40.0		
Health Diagnosis & Treatment Practitioners	1053.0	42.8	783.7	39.8
General Medical Practitioners	1184.1	47.7	1231.2	46.1
Specialist Medical Practitioners	1442.9	39.8	1134.3	36.5
Dental Practitioners	934.3	37.2	785.6	37.5
Pharmacists	671.6	38.8	678.4	40.2
Occupational Therapists	701.4	38.1	627.3	37.7
Physiotherapists	680.6	38.9	650.6	38.5
Radiographers	981.8	42.2	754.4	38.1
Speech Pathologists			681.5	37.8
Other	655.9	39.5	616.0	37.6
Para-Professionals	698.0	39.4	652.0	38.6
Medical & Science Technical Officers & Technicians	625.5	38.1	551.7	38.5
Medical Technical Officers & Technicians	567.7	38.9	574.4	39.0
Science Technical Officers and Technicians	636.4	38.0	531.6	38.0
Engineering Associates and Technicians	703.2	39.6	565.4	37.9
Electrical and Electronic Engineering Associates & Technicians	686.0	39.3	597.8	38.8
Civil Engineering Associates & Technicians	628.1	38.1	555.4	37.0
Mechanical Engineering Associates & Technicians	712.1	38.8		
Building, Architectural & Surveying Associates & Technicians	687.3	40.1	565.0	37.7
Other	927.4	42.0	518.5	37.3

* Average Weekly Total earnings of employees is equal to ordinary time earnings plus weekly overtime earnings. Source: *Women in Australia*, Australian Bureau of Statistics, 1993

Table 5: Academic Staff by Tenure, Level, % Female and Academic Organisational Group (AOU) (1991)

Tenured Staff (% Female)				
AOU Group	Above Senior Lecturer	Senior Lecturer	Lecturer	Below Lecturer
Humanities	14.52	21.16	40.03	60.00
Social Studies	15.44	24.89	38.45	60.71
Education	13.81	25.11	44.53	60.00
Sciences	4.09	9.88	21.95	42.37
Maths, Computing	3.67	8.08	15.51	36.00
Visual/Performing Arts	15.91	20.83	34.73	25.00
Engineering/Processing	0.86	2.13	2.59	12.50
Health Sciences	17.67	43.08	73.08	85.00
Administration, Business, Economics, Law	7.65	14.98	29.98	66.67
Built Environment	4.08	8.48	13.10	0.00
Agriculture/Renewable Resources	5.16	6.95	14.06	8.33
Not Allocated	8.33	19.26	41.50	48.15
TOTAL	9.11	17.83	36.11	49.85

Non-Tenurable Staff (% Female)				
AOU Group	Above Senior Lecturer	Senior Lecturer	Lecturer	Below Lecturer
Humanities	19.23	21.43	48.31	65.45
Social Studies	33.33	33.33	49.47	60.33
Education	25.00	27.50	61.04	78.61
Sciences	11.22	12.63	27.22	43.47
Maths, Computing	9.52	10.34	24.11	33.70
Visual/Performing Arts	20.00	12.73	40.46	55.17
Engineering/Processing	0.00	4.76	6.64	15.61
Health Sciences	25.51	21.30	56.19	69.98
Administration, Business, Economics, Law	12.35	15.32	40.25	46.23
Built Environment	11.11	11.11	28.95	35.56
Agriculture/Renewable Resources	0.00	17.65	24.75	36.09
Not Allocated	11.56	20.31	51.38	58.79
TOTAL	14.58	17.69	41.64	51.27

Source: Derived from Table 7.10, *National Report on Australia's Higher Education Sector (1993)*

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Table 6: Year 12 Enrolments in Tertiary Accredited Subjects: Proportion Who Were Female

Subject Choice*	1986	1990	% Point Change
Home Science	93.0	90.7	-2.3
Creative & performing arts	72.3	70.3	-2.0
Languages	71.4	68.1	-3.3
Biological & other sciences	61.1	60.5	-0.6
Humanities & social sciences	56.5	57.0	0.5
Economics & business	49.1	52.4	3.3
Mathematics	46.3	48.1	1.8
Physical education	46.4	43.8	-2.6
Computer studies	30.2	40.4	10.2
Physical sciences	33.3	36.7	3.4
Agriculture	34.3	35.5	1.2
Technical studies	5.0	7.3	2.3
TOTAL**	52.0	52.7	0.7

* includes all subjects which are publicly examined and/or tertiary accredited.

** includes other subjects not elsewhere specified.

Source: *Women in Australia*, Australian Bureau of Statistics, 1993

Table 7: TAFE Students by Stream

	Recreation and Leisure		Vocational	
Year	Women (,000)	Men (,000)	Women (,000)	Men (,000)
1983	257.3	101.9	340.7	445.5
1984	307.1	121.4	377.0	455.1
1985	332.0	125.4	397.6	461.6
1986	365.9	126.2	415.6	471.1
1987	379.9	130.5	441.7	495.5
1988	395.0	137.7	448.0	503.5
1989	425.6	158.1	439.6	492.7
1990	237.6	92.5	429.8	530.9
1991	261.9	96.1	444.8	541.1
1992	523.2	178.2	464.2	564.8
1993	492.0	161.7	506.3	597.3

Despite increasing female enrolments in TAFE vocational courses, there remains a difference in the types of courses undertaken. In 1991, women outnumbered men in education preparation and basic employment skills courses, while men outnumbered women in trades and professional courses.

Source: *Women in Australia*, Australian Bureau of Statistics, 1993. *Selected Vocational Education and Training Statistics*, National Centre for Vocational Education Research, 1993.

Table 8: TAFE Vocational Stream Enrolments: Proportion Who Were Female by Field of Study, 1993

Field of Study	% Female Enrolments
Veterinary science, animal care	89
Arts, humanities & social services	70
Health, community services	73
Education	63
Business administration, economics	59
Services, hospitality, transportation	58
TAFE multifield education	51
Science	49
Law, legal studies	40
Land & marine resources, animal husbandry	21
Architecture & building	8
Engineering & surveying	7

Source: *Selected Vocational Education and Training Statistics, National Centre for Vocational Education Research, 1993*

Table 9: Traineeship Commencements: Industry Sector, July 1985-Sept 1992 (Number)

	Women	Men
Private Sector		
Industry Based Groups		
Agriculture, forestry, fishing & hunting	285	1761
Manufacturing	852	1315
Wholesale & retail trade	4499	4356
Finance, property & business services	1949	1080
Recreation, personal & other services	2059	1125
Other*	80	1074
Occupation Based Groups		
Office clerical	21935	2801
Information technology	138	227
Total Private Sector	31797	13739
Public Sector		
Commonwealth	4292	2404
State	4732	1914
Local Government	852	585
Total Public Sector	9876	4903
Total Commencements	41673	18642

* Comprises mining, gas, electricity and water, building and construction, transport and storage, community services and health.

Source: *Women in Australia*, Australian Bureau of Statistics, 1993

Table 10: Full Time Equivalent Staff in Higher Education Institutions: Academic Field by Function, 1991

	Women		Men		% Female
Field	Teaching Only	Teaching & Research	Teaching Only	Teaching & Research	
Humanities	272.0	955.1	267.9	1607.6	39.6
Social Sciences	313.6	793.5	271.3	1425.3	39.5
Education	393.0	858.0	366.4	1233.9	43.9
Sciences	302.3	773.9	514.9	2814.2	24.4
Mathematics/Computing	135.9	333.3	383.0	1483.9	20.1
Visual Performing Arts	269.5	336.3	397.1	608.0	37.6
Engineering, Processing	33.7	99.0	455.0	1362.5	6.9
Health Sciences	764.4	1226.2	293.6	1298.3	55.6
Administration, Business, Economics, Law	303.2	1013.1	573.5	2422.3	30.5
Built Environment	47.4	95.0	127.2	488.7	18.8
Agriculture, Renewable Resources	35.8	156.9	157.3	567.6	21.0
TOTAL*	2871.4	6640.3	3807.3	15312.2	33.2

* Includes fields not allocated

Source: *Women in Australia*, Australian Bureau of Statistics, 1993

Table 11: Higher Education Students: Proportion Who Were Women by Field of Study and Level of Course, 1991

Field	PhD & above	Masters	Post-graduate	Bachelor *	Diploma **	Total***
Health	46.3	61.0	78.2	67.6	84.9	73.9
Education	49.5	59.2	70.2	75.6	75.2	72.7
Arts, humanities & social sciences	49.2	60.9	69.6	69.0	66.1	67.9
Veterinary science	34.8	42.2	21.4	55.9		52.9
Law, legal studies	31.8	33.8	47.8	49.0	25.6	46.3
Business administration, economics	27.6	28.5	37.1	43.6	40.1	41.8
Science	29.4	33.1	32.1	41.5	33.3	39.4
Architecture, building	21.9	28.5	30.3	35.0	24.7	33.7
Agriculture, animal husbandry	26.3	25.5	27.4	33.5	34.4	32.7
Engineering, surveying	10.3	6.2	10.9	11.3	6.2	10.8
All fields of study****	35.8	43.0	56.2	52.3	66.0	53.3

Source: *National Report on the Higher Education Sector, 1993*

APPENDIX 4.4

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APPENDIX 4.5

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- 2 Dr Caroline Perkins, Research School of Earth Sciences, Australian National University
- 3 Cris Jones, student at Griffith University.
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- 80 Margaret Price, Women in Technology (WIT) Convenor
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Belated Submissions

Three submissions were received by the WISSET Secretariat after the closing date of 22 March, 1995. These submissions arrived too late to be considered by the WISSET Advisory Group.

Professor P J Drake, Vice-Chancellor, Australian Catholic University

Professor Jannice Reid, Pro-Vice-Chancellor (Academic), Queensland University of Technology

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