SUMMARY REPORT: **WOMEN IN STEMM INDIA WORKSHOP**

27-30 NOVEMBER 2016 NEW DELHI, INDIA

A joint venture between the Australian Academy of Science and the Indian National Science Academy with support from the Australian Department of Industry, Innovation & Science, the Indian Ministry of Science & Technology and the United Kingdom Science & Innovation Network



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INTRODUCTION

Following discussions, workshop attendees identified key recommendations for each country either individually or collectively to action going forward. These actions are outlined in the next section.

For two days in November 2016, over 70 dignitaries and delegates from India, Australia, and the United Kingdom gathered at the LaLiT Hotel in New Delhi, India. This range of stakeholders and subject matter experts were there for one purpose: a shared commitment to promoting and increasing the participation and progression of women in Science, Technology, Engineering, Mathematics and Medicine (STEMM) careers. Specifically, delegates gathered to develop *practical action plans* designed to progress work done individually and collectively by the partner nations to advance career paths for women in STEMM.

Day One focused on issues, recent developments, and scene-setting by dignitaries and experts. Delegates then broke into two groups to workshop a set of bestpractice models for creating academic and research opportunities for women in STEMM and fostering entrepreneurial culture and capability to support their access to, and activities in, STEMM business and industries. Rapporteurs summarised the outcomes of these discussions to workshop participants.

Day Two emphasized "intelligent pathways" for women in STEMM with a view to defining the factors and enablers that shape and stimulate various careers in STEMM. After scene-setting presentations, delegates worked in parallel sessions on three pathways to gender equality in STEMM: leadership, entrepreneurship, and mobility. Rapporteurs again summarised the outcomes of these discussions to the workshop participants.

Following discussions, workshop attendees identified recommendations for each country to action either individually or collectively. These actions are outlined in the next section.



1. Develop a proposal to the Indian Science Academies' inter-academy panel to introduce an Athena SWAN framework to India

Consult:

- » Head Equality Charters, Equality Challenge Unit, United Kingdom (owner and manager of the Athena SWAN Charter)
- » The CEOs of the Australian Academy of Science (AAS) and Australian Academy of Technological Sciences and Engineering (ATSE), governing bodies of the Science in Australia Gender Equity (SAGE) initiative piloting the Athena SWAN framework in Australia

Lead: Professor Rohini Godbole and Dr Chandrima Shaha Assisted by: Dr Ruth Gilligan and Dr Saraid Billiards

2. Develop a strategy to leverage corporate social responsibility to support female internships across all three countries

Include:

- A review of existing programs in India (e.g. Lockheed, others) and Australia (e.g. ATSE's <u>Industry</u> <u>Mentoring Network in STEM</u> (IMNIS) and the new PhD internships program being developed by the Australian Department of Education)
- » Examination of opportunities for research organisations and governments to require incorporation of gender-sensitive management

approaches within projects funded from Australian and Indian collaborative research schemes

Lead: Professor Suresh Bharghava Assisted by: Dr Anita Gupta, Ms Sowmya Parthasarathy, Dr Arabinda Mitra, and Science Counsellor, Australian High Commission, New Delhi

3. Develop a common set of messages for a digital campaign to promote women in STEMM across Australia, India, and the United Kingdom

Include:

- » Advice from ATSE, Science and Technology Australia, and the Department of Industry, Innovation and Science's <u>Women in STEM and</u> <u>Entrepreneurship</u> funding program
- » Advice from other relevant peak bodies (academies, professional associations, marketing and media) in each country—build on any existing efforts

Focus:

- » Improving the visibility of women in STEMM
- » Inspiring teenage girls to engage in STEMM studies
- » Information about career pathways
- » Retention of early to mid-career researchers in STEMM professions
- » Addressing unconscious bias

Lead: Ms Stephanie Crawley Assisted by: Dr June McCombie, Dr Lakshmi Kantam,working with existing institutions, organisations and government bodies to develop pathways and evidence-based programs that support professional development...'

Dr Saraid Billiards, and Science Counsellor, Australian High Commission, New Delhi.

4. Consider developing a proposal to expand trilateral cooperation on promotion of Women in STEMM to the Commonwealth

Potential for a proposal to be explored ahead of the Commonwealth Science Conference in Singapore in June 2017

Lead: Dr Arabinda Mitra Assisted by: Science Counsellor, Australian High Commission, New Delhi.

5. Strengthen coordination and development of and support for bespoke professional leadership programs for Women in STEMM.

Focus on developing and promoting women in leadership roles in the Higher Education System by:

- » working with existing institutions, organisations and government bodies to develop pathways and evidence-based programs that support professional development, career pathways and opportunities and leadership capabilities for early to mid-career researchers (EMCR), including promoting and strengthening collaboration across existing EMCR fora;
- committing to a national coordinated program for achieving gender and diversity equality (egSAGE Program in Australia)

Lead: Professor Caroline McMillen Assisted by: Dr Chandrima Shaha and Dr Julie Maxton

6. Build an entrepreneurial support network under the STEMM professional and academic associations in India, Australia, and the United Kingdom

This could be achieved through the following organisations:

- » The Industry Entrepreneurs organisation (TIE) branches in India, Australia, and the United Kingdom.
- Industry Growth Centres in Australia, egMTPConnect, which encourages collaboration in the biotechnology and pharmaceutical sectors.

» The UK Department of Business Energy & Industry Strategy.

Lead: Dr Sowmya Parthasarathy Assisted by: Dr Anita Gupta and Professor Veena Sahajwalla

7. Explore opportunities for University/Industry collaboration between India, Australia, and the United Kingdom

Lead: Science Counsellor, Australian High Commission, New Delhi.

Assisted by: Professor Ashutosh Sharma, Dr Sowmya Parthasarathy and Dr Saraid Billiards

8. Identify common gender STEMM regional and international data sources that provide consistent, systematic reporting of gender data and are available for the three countries

Consider:

- » Identifying a small expert group with representatives from each country/region to work together virtually
- » Reviewing available international data sets such as UNESCO and APEC and their applicability for impact assessment of STEMM gender equality initiatives adopted by the three countries
- » Reviewing the Pearson report on <u>Global Access to</u> <u>Higher Education</u>
- » Reviewing the applicability of available national data sets, indicators and metrics such as those held by Australia's Department of Education and Training and Workplace Gender Equality Agency
- » Ways to visualise and publish data to assist active monitoring of progress

Focus:

- » Identification of gaps in data
- » Identification of areas of under-representation or disadvantage of women in STEMM
- » Development of targeted strategies
- » Lead: Dr Pavel Ovesiko and Dr Barbara Crossouard Assisted by: Professor Jane Latimer, Professor Rohini Godbole, Dr Ujjawala Tirkey and Science Counsellor, Australian High Commission, New Delhi.

DAY ONE OVERVIEW

'Some STEMM fields have high rates for female participation but these are often perceived to be 'softer' or more suitable for women. So-called 'hard' sciences e.g. physics still have low participation by women, leading to few role models which exacerbates the problem.'

First session—Welcome

Speakers:

Dr Renu Swarup, Senior Advisor, Department of Biotechnology

Professor Ashutosh Sharma, Secretary, Department of Science & Technology

Professor Krishnaswamy VijayRaghvan, Secretary, department of Biotechnology

Her Excellency Ms. Harinder Sidhu, Australian High Commissioner to India

His Excellency Sir Dominic Asquith, British High Commissioner to India

Dr Arabinda Mitra, Advisor & Head—International (Bilateral), department of Science and Technology

Highlights:

Dr Swarup opened the workshop and welcomed delegates. She made the following points:

- » It is vital to identify the best models from each country to take forward nationally and internationally.
- » Appropriate policy interventions and projects can work to attract to and keep women in STEMM careers.
- » Leadership, entrepreneurship, and career mobility are prime areas for policy intervention.

Professor Sharma highlighted the opportunities and barriers to participation in STEMM careers faced by women in India:

- » While data are limited, actionable solutions are needed and can be initiated.
- » In 2015, India established the <u>Knowledge</u> <u>Involvement through Research Advancement and</u> <u>Nurturing</u> (KIRAN) program.
 - KIRAN is addressing various issues related with women scientists (e.g. unemployment, relocation etc.) and aimed to provide opportunities in research, technology development/ demonstration, and self-employment.
 - All women-specific government programs fall under this umbrella.
- » Some STEMM fields have high rates for female participation but these are often perceived to be 'softer' or more suitable for women. So-called 'hard' sciences e.g. physics still have low participation by women, leading to few role models which exacerbates the problem.
- » University entrance system(s) also a factor impact of intensive coaching programs for entry to engineering schools especially institutes of technology—this type of program (and other pathways incl. boarding schools) not attractive to women (and in some cases not available for women?)



- » Not all sectors need interventions. Where needed, interventions will differ across academia, research, science administration, industry, business, innovation and intellectual property (IP).
- » Mobility between sectors is important to advancing women's career options while recognising lifecycle realities such as family and child-rearing responsibilities.
- » Culture plays an important role in determining whether and which girls are encouraged to enter STEMM careers. Role models can broaden social values regarding women in STEMM and encourage girls to be assertive and enter STEMM fields.
- » India's <u>Women in Science Scheme</u> (WISS) was launched in 2002–2003 to help retain women in STEMM careers by enabling them to "take a break" for family responsibilities. It offers three categories of fellowships and research grants:
 - support for women working in research and applied sciences.
 - salaries for women who choose to use their science skills for societal benefit.
 - Internships in IP rights for self-employed STEMM-trained women.
- » The <u>Consolidation of University Research for</u> <u>Innovation and Excellence Program</u> (CURIE) funds infrastructure for women at universities and at technology and business incubators. The budget is only \$US15 million, but may double in 2017.

Professor VijayRaghvan discussed the position of women in STEMM in India. He noted:

- » STEMM is not the only sector of society which has a poor gender equity and diversity. Most jobs in India are "manned" by men supported by stay-at-home women.
 - Notes that there is a significant gender imbalance in the government workforce in Delhi
- Science academies must develop and promote award systems which boost workplace flexibility.
- » Broad goals of gender equity and flexibility must be translated into specific actions to counter the "alpha-male syndrome" and promote women into leadership roles in STEMM.

Her Excellency Ms Harinder Sidhu acknowledged the strength and value of the 10-year Australia-India fellowship collaboration. She also discussed Australian STEMM programs and realities:

- » The <u>National Innovation & Science Agenda</u>, announced in 2015, has budgeted \$AUS13million over five years for programs designed to encourage girls to study and stay in STEMM.
- » 75% of tomorrow's jobs will require STEMM skills (Lifting our Science, Technology, Engineering and <u>Mathematics (STEM) Skills</u>—The Australian Industry Group (2013)).
- » In 2015 the <u>Science in Australia Gender Equity</u> Program (SAGE) launched the nation's pilot of the Equality Challenge Unit's Athena SWAN Program.

» The <u>Male Champions of Change</u> initiative has been extended to the STEMM sector. It encourages men in leadership positions to join with women to tailor strategies for promoting women in science, technology and entrepreneurship, and for elevating gender and equity as an issue of national and international social and economic importance.

His Excellency Sir Dominic Asquith acknowledged the strength and value of collaboration in the promotion of women in STEMM careers. He emphasised science, innovation and education strands as fundamental to the 'Living Bridge' between the UK and India. He highlighted that the India UK Tech Summit, opened in November 2016 by the India and UK's Prime Ministers, demonstrated how synergising innovation, entrepreneurship, design and education can support India's ambitions to skill its workforce; grow its economy; and boost trade, investment, and cooperation in science and education.

He also highlighted UK-backed STEMM programs operating in India:

- » STEMM education is the "route to many ambitions", they offer 600 <u>higher education scholarships for</u> <u>Indian students to study in the United Kingdom</u>.
- » <u>Newton Bhabha programme</u> and <u>UKIERI</u> support research exchanges for staff and students, and joint UK-India collaborations.
- » Newton Bhabha programme also supports <u>Workshops on Opportunities for Widening</u> <u>Participation of Women in Science</u>
- » UK Supports India's <u>Skill India</u> Programme through a <u>Centre for Excellence</u> for the automobile sector in Pune.
- » British companies in India spend an average 7% of their total revenue on training and skilling their employees in India.
- » Under the <u>Tech Rocketship awards</u>, young Indian entrepreneurs are provided a trip to the United Kingdom for mentoring by British experts and a chance to pitch to potential investors for finance.

In addition, Sir Dominic also noted that:

» The percentage of girls taking A' level physics has stubbornly remained at only 20% for the last 20 years. And less than 10% of professional engineers are women. The all-male engineering team that designed airbags "overlooked women and children entirely", testing prototypes on men only.

- » The United Kingdom's STEMNET program encourages STEM education for boys and girls, and offers young people hands-on and mentoring opportunities. <u>STEMNET</u> is a UK-wide network of 31,000 people from science, engineering and academia volunteers with a vision to increase young people's choice and chances through science, technology, engineering and mathematics. 40% of <u>STEM Ambassadors</u> are women.
- » Tackling deficiencies in STEMM capital is not a job for government alone; it requires educators, communities and industry too. In the UK we have come a long way in the last decade in mainstreaming science including for women, thanks in no small part to stars such as Brian Cox and the important work of organizations like <u>ScienceGrrl</u>
- » And, of course, the <u>Athena SWAN Charter</u> established to encourage commitment to advancing the careers of women in science, technology, engineering, maths and medicine employment in higher education and research.

Dr Arabinda Mitra closed the session by stating that other countries wanted to be a part of the workshop, and recommended that the workshop become an annual event. He added:

- » Supply chain management and leadership are central to building a "roadmap" of concrete actions to bring nations together on women and STEMM issues.
 - Noted the <u>Biotechnology Career Advancement</u> <u>and Re-orientation Programme</u> (Bio-CARe) for Women Scientists developed by the Department of Biotechnology
- » India has STEMM collaborations with 44 countries.
- » Women hold 60% of positions in Bangladeshi laboratories. Statistics are similar for Myanmar.
- » The tri-national collaboration for the workshop should expand to not only include all Commonwealth countries, but beyond, including Africa.

'Tackling deficiencies in STEMM capital is not a job for government alone; it requires educators, communities and industry too.'



'Maintain a culture within the Society that encourages and promotes diversity and inclusion.'

Second session—Scene Setting: Defining Value in Equity & Diversity

Speakers:

Dr Chandrima Shaha, Indian National Science Academy, India

Professor Veena Sahajwalla, University of New South Wales, Australia

Dr Julie Maxton, Executive Director, The Royal Society, United Kingdom

Highlights:

- » Reasons for the lack of Indian women in STEMM include inadequate encouragement from parents, poor interactions with mathematics and science teachers, limited exposure to appropriate courses, lack of confidence, limited exposure to hands-on laboratory experiences, and, later in life, career breaks for family duties.
- » Australia has attempted to improve the position of women in STEMM, but while many now do a STEMM doctorate only 17% of senior academic position in STEMM are held by women.
- » It is necessary to drill down into the reasons girls don't get into the career pipeline of hard sciences such as mathematics and engineering.
- » "Messaging" is critical. Girls need to see themselves in the hard sciences. "If you see it, you can be in it".
- » The <u>Science 50-50</u> program at Australia's University of New South Wales offers young women career advice, networking and mentoring. The program also involves school kids visiting <u>STEM employers</u> (Cochlea).
- » Programs that bring girls to labs/research units to 'plant the idea' have been effective.
 - Professor Sahajwalla noted that bringing girls together reduces isolation and builds inspiration at school they may be nerdy minority but they work and network well when given opportunities to meet girls from other schools.

- » We should not limit our efforts to gender but include diversity of thinking, ability, ethnicity, experience, culture and education.
- » UN Secretary-General Ban Ki-moon says there is a "business case" for diversity.
- » In the UK there is nearly a 50-50 gender split in the scientific workforce¹, but only 18% of women are in senior roles. This drop off at seniority is reflected in ethnicity which drops from 14% to 8% and in disability from 17% to 2%.
- » The Royal Society has introduced a <u>Diversity</u> <u>Strategy</u> aimed at increasing diversity in STEM and building a more inclusive scientific community—the strategic objectives are:
 - Maintain a culture within the Society that encourages and promotes diversity and inclusion.
 - Identify and address barriers to participation and success in STEM.
 - Work in partnership to maximise the effectiveness of diversity initiatives across the scientific community.
 - Recognise and champion the achievements of a wide range of scientists from underrepresented groups.
- » These objectives also apply to the Society itself which started electing women in 1945 after almost 300 years of electing men. This means changing the culture by publishing data, increased flexibility in grant programs, public engagement & dialogue, speaker mix and unconscious bias. The Royal Society has a briefing on unconscious bias circulated to committee members and included in the papers for all meetings.

https://royalsociety.org/topics-policy/diversity-in-science/uk-scientificworkforce-report/

'Proactive hiring policies for helping couples manage dual careers. Currently, it is illegal for a single institution to hire both partners.'

Third session—A World of Converging Technologies: Positioning Women in STEMM for the Future

Facilitated workshop 1—Part 1: Presentations

Speakers:

Professor Veena Sahajwalla, University of New South Wales

Dr Rohini Godbole, Indian Institute of Science

Dr Barbara Crossouard, University of Sussex and Dr June McCombie, University of Nottingham

Highlights:

- » Mainstreaming consideration of gender in STEMM isn't a matter of charity—it's for the good of science.
- » Measures of gender equity are poorly defined globally.
- In India, specific projects seek to change the "societal" mindset about women in STEMM. Examples include:
 - Publication of <u>Lilavati's Daughters: The Women</u> <u>Scientists of India</u>, edited by Godbole and Ram Ramaswamy, and published by the Indian Academy of Sciences.
 - <u>The Girl's Guide to a Life in Science</u>, edited by Godbole, Ram Ramaswamy and Mandikini Dubey, and published by Young Zubaan.
 - The State of Karnataka launched, with industry partners, the <u>Chetana</u> program to mentor girls in rural areas.
 - Innovation in Science Pursuit for Inspired Research (INSPIRE)—innovative programme sponsored and managed by the Department of Science & Technology for attraction of talent to Science.
- » The Indian National Science Academy conducted a survey of 2000 women to determine why they left

science. 66% dropped out because they could not find jobs commensurate with their expertise.

- » Numbers vary with the perceived level of excellence of the institution—highly-esteemed institutions seem to have fewer women in STEMM.
- » Specific actions needed to improve participation by Indian women in STEMM careers:
 - A crèche on every campus.
 - High priority for young couples for campus housing.
 - Proactive hiring policies for helping couples manage dual careers. Currently, it is illegal for a single institution to hire both partners.
 - Encourage and reward excellence by women.
 - Improve the working climate for women. This includes managing harassment.
 - Conduct independently assessed gender audits in all institutes and publicise results.
 - Mentoring.
 - Removing or at least reducing chance as a factor—can't count on luck but we can build better systems, processes, policies.
 - Tailor programs to suit local conditions—urban vs rural areas, for example.
- » Negativity is part of the challenge—need to show/ emphasise that it is not impossible to have career in STEMM and a family (this goes for both men and women).
- » In the UK, there have been many initiatives focusing on Women in Science/STEMM
- » The outcomes have been limited. In part this can be attributed to a misplaced focus—many have focused on 'fixing the woman', rather than addressing the institutional cultures of STEMM and their hostility to women, as well as to other minority groups.
- » Contemporary neoliberal value systems compound the propensity for institutional cultures to be masculinist, aggressive and competitive.



- The <u>Athena SWAN</u> program focusses on institutions and departments, not the individual. It provides a way of benchmarking progress towards gender equality for UK HEIs. It is now being extended to other disciplines, and now includes attention to minority ethnic groups.
- » Alongside the work of Athena SWAN, bottom up action enquiry initiatives, such as the <u>CHUCL</u> project recently concluded at Imperial College London, are still important to engender deep change within institutional cultures.
- » Public scrutiny of data on women in STEMM is important. <u>ECU</u> in the UK provide valuable reports. The European Union is also building gender equity into benchmarking activities and produces biennial data on women in science (<u>SHE Figures</u>).
- » The <u>UN Sustainable Development Goals</u> (which unlike the Millennium Development Goals apply to both 'developed' and 'developing' countries), is another international arena where benchmarking gender equity could play an important role in enhancing the role of women in STEMM.

Facilitated workshop 1—Part 2: Break-Out Group Discussions

Facilitators:

Ms Jane Urquhart, Department of Industry, Innovation and Science Professor Suresh Bhargava, RMIT University

Rapporteurs:

Dr Chandrima Shaha, Indian National Science Academy Ms Sowmya Parthasarathy, Ove Arup & Partners, UK

Highlights:

- » Programs to increase the number of women entering the STEMM pipeline are essential, complemented by actions to address the issues that make them leave STEMM careers.
- » Corporate social responsibility has an important role in promoting women in STEMM. One example highlighted was the Australian <u>Male Champions of Change</u> program.
- » Financial incentives (including philanthropy, tax incentives, and tying grant funding to gender outcomes) boost positive responses by institutions to gender equity programs but can't depend on these over the medium to long term. Better coordination of incentive mechanisms (state vs national, public vs private) would be helpful.



- » The <u>Athena SWAN</u> program should be expanded beyond the UK/Ireland and Australia to countries such as India and beyond the academic community to industry and the corporate sector.
- » Institutional training programs are needed to remove unconscious bias against women in STEMM.
- » 'Ground-up' and sector driven action is preferable to government mandates but institutions need to know they can count on government support (in principle at least).
- » Mentorship programs where women mentor women are essential. Sponsorship is also useful.
- » Active involvement by industry is essential.
- » Gender equity audits are vital.
- » Proponents of women in STEMM must work to influence politicians.
- » The Athena SWAN framework should be introduced in India, tailored to the Indian context.
- » Trilateral meetings such as this workshop should become a regular event.
- » It is important to use non-traditional platforms such as social media to communicate to people outside the academic community.

RECOMMENDED ACTION ITEMS FROM DAY ONE DISCUSSIONS

ACTION #1: Develop a proposal to the Indian Science Academies' inter-academy panel to introduce an Athena SWAN framework to India.

ACTION #2: Develop a strategy to leverage corporate social responsibility to support female internships across India, Australia, and the United Kingdom.

ACTION #3: Develop a common set of messages for a digital campaign to promote women in STEMM across India, Australia, and the United Kingdom.

ACTION #4: Consider developing a proposal to expand trilateral cooperation on promotion of Women in STEMM to the Commonwealth

DAY TWO OVERVIEW

'Entrepreneurship is "an endurance test". Being a woman entrepreneur is another endurance test.'

Intelligent Pathways for Women in STEMM: Leadership, Entrepreneurship & Mobility

Keynote Speaker:

Dr Kiran Mazumdar-Shaw, chairperson and managing director of Biocon Limited, and chair of the Indian Institute of Management, Bangalore.

Highlights:

- » All international collaborations need STEMM at their heart.
- » Her goal in establishing Biocon Ltd was to provide opportunities for Indian scientists and stop the brain drain. She also wanted women to pursue careers in industry and receive the same rewards as men.
- » Today Biocon Ltd employs 30% women scientists and has 30% women in senior positions.
- » Entrepreneurship is "an endurance test". Being a woman entrepreneur is another endurance test.
- » Bangalore is India's tech hub. Originally a start-up ecosystem, many companies are now multinational enterprises.

- » Bangalore has 1.4 million software engineers. Silicon Valley has 1.8 million. By 2020 Bangalore is expected to have 2.1 million software engineers, overtaking Silicon Valley.
- » She offered this advice to government: don't shackle investment in unnecessary regulation. Regulation can hinder flexibility of ideas. Deregulation is necessary to break down barriers and silos.ro
- » It is important that those in academia are exposed to other environments.
- » A gender diverse workforce is a good investment. Countries that exclude women risk losing that investment.
- » It is important to focus on creating a "virtuous cycle" in the STEMM ecosystem and the post-school environment.
- » Women also play an important role in policy development.
- » A recent survey revealed that 50% of respondents believe a woman's brain is not wired for STEMM.
- » While overregulation can be negative, affirmative action is positive.

Facilitated Workshop Session 2

Break-out Group 1: Leadership

Speakers:

Dr Athena Vongalis-Macrow, Deakin University, Australia Ms Stephanie Crawley, University of Queensland, Australia Dr Barbara Crossourd, University of Sussex, UK

Rapporteur:

Professor Caroline McMillen, University of Newcastle, Australia

Highlights:

Dr Vongalis-Macrow discussed:

- » The concept of leadership is poorly defined. There are over 250 definitions.
- » A systematic approach to a working definition of leadership should begin with data. A good resource is the <u>Universum research report</u> which reviewed STEM data on 55 countries.
- » The concept of leadership is important because men and women take on leadership positions for different reasons.
 - Men seek high levels of responsibility and want to perform at the highest levels early in their career.
 - Women find secure employment and "doing good" more important than a leadership role.
- » Promoting leadership skills for women is important because:
 - Good programs and interventions can improve competency 20-30%.
 - The quality of leadership affects the climate for creativity by 20-67%.
 - Appointing women is seen as a high-risk strategy as there is a "surplus" of incompetent male leaders.
- » There are many leadership programs. The most effective are:
 - <u>The Leadership Institute</u>, funded by the National Science Foundation
 - The Hedwig van Amerigen <u>Executive Leadership</u> <u>in Academic Medicine</u>
- » Successful leadership programs are based on successful models including:
 - The Kouzes and Posner Leadership Challenge (1987)
 - <u>The Research Productive Department: Strategies</u> <u>from Departments that Excel</u> (2004)
 - Feminist Leadership (2004)

- The Athena Leadership Model (2010)
- <u>The Centred Leadership Model from the</u> <u>McKinsey Leadership Project</u> (2011)
- » The women in STEMM movements need to:
 - Develop a unique framework for women in STEMM.
 - Start at the undergraduate level, emphasising that STEMM careers also involve leadership.
 - Emphasise that leadership is not an extra task. It is part of work.
 - Build diversity of experiences.
 - Be innovative and experiment.
 - Develop measures of leadership success. The measures should be staged through the career path.
 - Produce a publication for women in STEMM.
 - Support "wild and crazy" ideas.
 - Develop some discipline-specific measures/ actions—recognising that while there are common challenges there are different 'pinch points' in each discipline.

Ms Crawley discussed:

- » The difficulty of attracting women to engineering applies broadly to other STEMM disciplines.
- » The University of Queensland (UQ) is the first Australian university to offer a university-industry high school outreach program aimed at boosting the number of women in engineering.
- » The program has increased female engineering enrolments at UQ have increased from 19% in 2012 to 23.8% in 2015, above the state average (13%) and the national average (15%).
- » Key barriers to entering engineering include:
 - Lack of role models
 - Perceived male dominance
 - Lack of self-confidence
 - Uncertainly about the stability of an engineering degree
 - Lack of understanding what engineering is and what engineers do
 - The culture of engineering schools and firms
- » Actions needed to encourage girls to pursue an engineering career:
 - Don't preach to the converted. Work smarter and teach teachers.
 - Determine what engineering courses are, and are not, taught in high school. Often girls' schools offer no engineering courses because not enough students are interested.



- Identify appropriate metrics for women. Those used across the engineering pathway are geared to men. Entrance requirements are inflexible.

Dr Crossouard presented <u>findings</u> from a British Council funded study of barriers to women's leadership of higher education in six South Asian nations. Publically available data were limited—there is an important need for national and institutional data that is disaggregated by gender, discipline, employment category, and cultural differences emerged. Barriers identified include:

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- » The power of cultural roles. Women have family obligations men don't have.
- » Social class intersects with gender and structures of inequality to determine which women can enter leadership roles.
- » Organisation and discipline "cultures" are deeply patriarchal and "chilly to women".
- » Recruitment and election processes are biased against women.
- » Women are not expected to be leaders.
- » Family values can be a barrier, as well as an enabler of women's participation in leadership.

Enablers identified include:

- » Supportive institutional and national policies.
- » Mechanisms to ensure monitoring and reporting of their implementation.

- » Professional development opportunities at all levels of the career path.
- » Women only leadership courses.
- » Mentoring programs and opportunities.
- » Gender sensitization and awareness programs involving all staff, male and female.

Summary points:

- » The language we use is important when approaching gender equality issues—it works to construct the 'problem' in different ways.
- » It is important to challenge biological determinism and shift to more contemporary theorisations of gender as something that we 'do', rather than something that an individual 'has'.
- » Women must be supported to become leaders in higher education and helped to feel they have professional integrity.
- » Do not expect women to assimilate into "hostile cultures".
- » Programs such as <u>Changing University Cultures</u> (CHUCL)—an action enquiry approach to tacking equality and diversity in higher education, focused on institutional cultures, implemented at Imperial College London, can assist in bringing change.

Professor McMillen summarised the break-out group discussion:

- » There are different enablers and disablers for women along the pipeline to leadership.
- » Cultures, belief systems, role models and availability affect whether women see themselves as leaders.
- » Different disciplines and different countries need different interventions to enhance women's participation in leadership roles.
- » Metrics can be a barrier. There are no alternate pathways to admit talented young people.
- » It is important to remove barriers in the education system. Interventions should begin at the high school level.
- » Funding agencies must be included in the process of change.
- » Relationships are core to promoting women in leadership roles.
- » Distributed leadership provides more opportunities for women to learn leadership skills than hierarchical systems.
- » Potential leaders need financial literacy and governance risk management skills.
- » We can create a leadership system which adapts to women.
- » A leadership framework is necessary to permit professional development at all stages of a career.
- » It is important to stress that diversity of a leadership team produces good decision-making.
- » Science is not seen as a profession, discouraging parents from supporting daughters who wish to enter the field.

ACTION #5: Strengthen coordination and development of and support for bespoke professional leadership programs for Women in STEMM.

Focus on developing and promoting women in leadership roles in the Higher Education System by:

- » working with existing institutions, organisations and government bodies to develop pathways and evidence-based programs that support professional development, career pathways and opportunities and leadership capabilities for early to mid-career researchers (EMCR), including promoting and strengthening collaboration across existing EMCR fora;
- » committing to a national coordinated program for achieving gender and diversity equality (eg SAGE Program in Australia)



Break-out Group 2: Entrepreneurship

Speakers:

Dr Sowmya Parthasarathy, Ove Arup & Partners, UK Dr Anita Gupta, Department of Science & Technology, India

Rapporteur:

Dr Saraid Billiards, Science in Australia Gender Equity

Highlights:

Both speakers highlighted the importance of training and internships in entrepreneurship to supplement women's technical skills. Recommendations include:

- » Develop a multidisciplinary entrepreneurial network.
- » Encourage the development and use of hubs, shared office spaces in central areas.
- » Retraining or professional development for women re-entering the workforce from a break.

Dr Parthasarathy discussed initiatives that may help drive change:

- Build networks. These can take the form of an entrepreneur sub-committee within national professional associations. The sub-committees could oversee:
 - Training
 - Mentoring
 - Visibility
 - Skills
 - Ways to access capital
 - Preparation of inspirational stories, books
 - Development of a support ecosystem for entrepreneurs that recognises the importance of role models, TV shows, books and the like.
- » Establish a University/industry collaboration forum. This could be a government initiated forum that runs regular events, including a tri-national component which recognises that leadership programs are at different stages of development in India, Australia, and the UK.
- » Access to capital is critical. Develop a programme of support (loan guarantees?) to make credit more easily available to women entrepreneurs.
- » Evaluate programs in the three nations and raise awareness of their existence, especially in India. Opportunities exists for women in:
 - The commercialisation of aspects of health care
 - Engineering solutions to technical problems
 - Rural areas. There is a "huge" opportunity for STEM-related small and micro-enterprises

Dr Gupta built on Dr Parthasarathy's recommendation to build networks and establish a University/industry collaboration forum. He also stressed the need to focus on access to capital by making it a key issue to be addressed by the entrepreneurial networks and the University/Industry Collaboration Forum.

Dr Billiards summarised the break-out group discussion:

- » Building networks is integral and needs to be embedded within industry
- » Networks will help to build visibility and role models
- » There needs to be greater academic/industry collaborations

ACTION ITEM #6: Build an entrepreneurial support network under the STEMM professional and academic associations in India, Australia, and the United Kingdom

ACTION ITEM #7: Explore opportunities for University/Industry collaboration between India, Australia, and the United Kingdom

Break Out Group 3: Mobility

Speakers:

Dr June McCombie, University of Nottingham, UK

Professor Suresh Bhargava, RMIT University, Australia Dr Namita Gupta, Department of Science & Technology (DST), India

Rapporteur:

Dr Ruth Gilligan, Equality Challenge Unit

Highlights:

All three speakers argued that women in STEMM need access to mobility throughout their career path to accommodate family responsibilities which fall more heavily on them than they do on their male colleagues. Comments:

- » Assessment procedures are problematic, particularly for women, because they fail to factor in mobility. For example, a recent study of the Research Excellence Framework, conducted by the United Kingdom Higher Education Funding Council did not take sufficient account of people exiting and re-entering the workforce.
- » Solutions to mobility issues must be integrated, effective and coordinated.
- » The <u>KIRAN</u> program established by the DST offers a "mobility scheme" which provides a 5-year contractual research fellowship to allow geographic mobility. Relocation is an important issue for women in STEMM careers.

Dr Gilligan summarised the group discussion and spoke to three topics:

- » Moving in and out of a career:
 - Of the three topics discussed by the group, schemes supporting mobility of researchers in and out of their scientific career are the most advanced and well-established in each country. Funding for these schemes varies, with some supported by government funding, and others funded through charities.
 - Mobility should be embedded in the culture of research/industry so that specific external programmes are not required. Research funders should make sure that the terms and conditions of grants and fellowships allow for researcher mobility and career re-entry.
 - The duration of fellowships could be made more flexible to allow for part-time and flexible working arrangements; for example, extending the maximum duration from 5 years to 10 years.
 - Mobility schemes should cover all caring responsibilities, not just childcare. They should allow for part-time and flexible contracts which enable career progression.
- » Academic/Industry partnerships:
 - Formal academic/industry partnerships are not common, and/or are in the early stages in all countries.
 - Funded partnerships would enable academics to spend time in industry.
 - Various fellowships are available in the UK (e.g. <u>Royal Society, RAEng</u>) which support exchanges between industry and academia for up to 2 years, which can be taken flexibly.
 - India supports academics to work in industry for up to 2-years (e.g. <u>Newton Bhabha Fund</u>).
 - Such schemes are generally not gender specific, and there have been issues with poor uptake.
 - To ensure the success of these schemes, and to make sure that researchers/industry representatives are not penalised for their time away from their primary location, career progression processes such as appraisal and promotion should recognise both academic and industrial measures of esteem.
- » Mentoring STEMM graduates and post-graduates:
 - Noted that mentoring and role-modelling was discussed at length during day 1 of the workshop.
 - One approach is joint industry/academic degrees, which was discussed by Prof Bhargava and Dr Mazumdar-Shaw in their earlier presentations.

 Dialogue with industry leaders would help determine what is available now and how best to proceed.

The group noted that given the strongly academic focus of the workshop, further dialogue with industry colleagues will be necessary to determine the best ways to ensure mobility is supported across academia and industry.

Session 3—Setting up for Success: Defining Metrics and Measuring Success

Opening address and facilitators:

Ms Jane Urquhart, Department of Industry, Innovation & Science (DIIS), Australia

Professor Jane Latimer, George Institute for Global Health, Australia

Dr Pavel Ovseiko, University of Oxford, UK

Rapporteur:

Professor Caroline McMillen, University of Newcastle, Australia

Highlights:

Ms Urquhart spoke about:

- » Assessment and Metrics. In 2015, the DIIS decided to implement a new evaluation strategy for all departmental programs.
- » Evaluation is built in to the Australian Government's <u>National Innovation & Science Agenda</u> (NISA). While there is no single evaluation framework for the NISA, each initiative is expected to have an evaluation plan and follow the department's overall strategy for consistency in assessment.
- » Challenges for evaluation include assessing the impact on Small to Medium Enterprises and in entrepreneurial sector(s).
- » Interim evaluations of the new strategy will be critical. For the <u>Women in STEM and Entrepreneurship</u> program, for example, a 'post-implementation evaluation' after the first round is an important part of the process and will have an impact on the timing, scope etc of subsequent rounds.

- » DIIS is also using the various <u>Women in STEM</u> and <u>Entrepreneurship</u> projects to help establish a benchmark for measuring future progress.
- » Australia is fortunate in being able to draw on the data collected and publicly reported by the <u>Workplace Gender Equality Agency</u> (WGEA). WGEA collects data from a wide range of employers and sectors. Reporting includes e.g. a breakdown on salary differences, seniority, type of employment.

Professor Latimer discussed Australia's <u>Male</u> <u>Champions of Change (MCC)</u> strategy, a group she advises:

- » The founding group of 10 has expanded and there are now several MCC groups including some industry/sector specific ones.
- » The new <u>MCC-STEM</u> group is supported through NISA and includes 15 CEOs and leaders of STEM organisations including universities, publicly-funded research agencies, and STEM-based industries.
- » The founders commissioned <u>In the Eye of the</u> <u>Beholder</u>, a "thought piece" on how to define "true merit". The concept can be expanded to STEMM.
- » MCC is not about men saving or speaking for women but about stepping up beside women. It provides a safe space to discuss issues. "It can be lonely at the top."
- » The key question is if the initiative is driving equality, but there are few reliable data sources.
 - UNESCO Institute of Statistics does not provide enough data for Asia-Pacific Economic Cooperation nations.
 - A European Union initiative led to a review of gender equity measurement programs and initiatives.
 - National and international data sources on gender equity are necessary.

Dr Ovseiko discussed:

- » There is a business case for gender equity in universities. Educated, productive people provide knowledge to benefit society.
- » Nobel Prizes are a marker of success. Oxford biochemist Dorothy Hodgkin was the first and only British STEMM woman to win Nobel Prize. She did so in 1964 when sexism and discrimination was widespread. The *Daily Mail* headline read: "Oxford housewife wins Nobel".
- » Globally, the number of female STEMM Nobel winners is increasing.
- » The UK now requires translational research organisations to demonstrate they support gender equity.

- » Ovseiko and colleagues have developed a "logical framework" for gender equity assessment and monitoring. It combines measures of:
 - Leadership
 - Talent
 - Funding
 - Outputs
- » SMART Criteria: Specific, Measurable, Attainable, Relevant, Time-related

After a general discussion among panellists and delegates, **Professor McMillen** made the following remarks:

- » The group recognises the need to align data sets of India, Australia and the UK, and work on differences where they are important. Culture and culture change can be measured and provided to institutions.
- » Work on impact must be conducted at the higher national and international levels.
- » Large corporations care little beyond international ranking. This needs to be addressed.
- » Social media can be used to collect data on early and mid-career researchers.
- » Monitoring progress for women in STEMM would be assisted by an online dataset.

ACTION #8: Identify common gender STEMM regional and international data sources that provide consistent, systematic reporting of gender data and are available for India, Australia, and the United Kingdom.

RECOMMENDED ACTION ITEMS FROM DAY TWO DISCUSSIONS

ACTION #5: Establish Leadership models in STEM

ACTION ITEM #6: Build an entrepreneurial support network under the STEMM professional and academic associations in India, Australia, and the United Kingdom

ACTION ITEM #7: Explore opportunities for University/Industry collaboration between India, Australia, and the United Kingdom

ACTION #8: Identify common gender STEMM regional and international data sources that provide consistent, systematic reporting of gender data and are available for India, Australia, and the United Kingdom.



Speaker:

Mr Sanjeev Kumar Varshney, Department of Science & Technology (DST), India

Highlights:

- » Mr Varshney thanked the assembled delegates, speakers and organisers of the Women in STEMM India Workshop.
- » He said DST wants to extend the dialogue further by inviting all Commonwealth countries to participate in the promotion of women in STEMM.
- » He noted the upcoming events which might provide a suitable opportunity to pursue the dialogue:
 - The Commonwealth Heads of Government Meeting in the United Kingdom—2018
 - The Commonwealth Science Conference in Singapore—June 2017
 - Other science conferences could focus on young women achievers
- » Mr Varshney reminded delegates that volunteers are needed to progress the work
- » The Governments from the three countries are supportive and looking for affirmative and collaborative action.

Australia is fortunate in being able to draw on the data collected and publicly reported by the Workplace Gender Equality Agency (WGEA). WGEA collects data from a wide range of employers and sectors. NB: Bold indicates speakers

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