

2013

Diversity Fueling Excellence in Research and Innovation Conference Report



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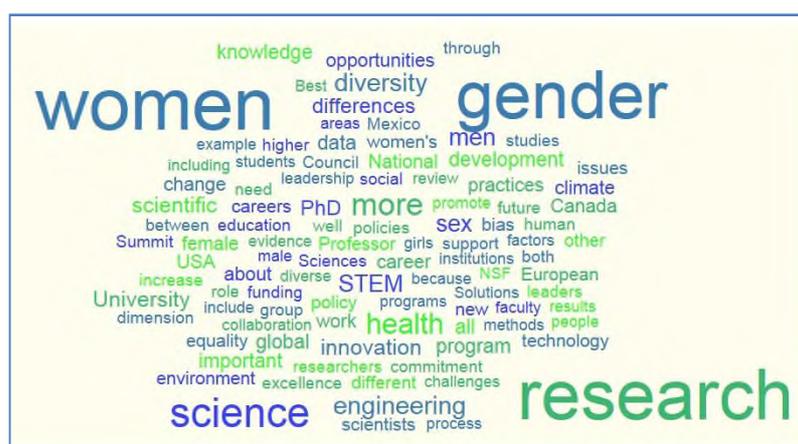
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Diversity Fueling Excellence in Research and Innovation: Conference Report

Gender Summit 3 — North America
Washington, DC

November 13 -15, 2013



CONTENTS

Executive Summary	1
Introduction and Context	3
Collective Commitment for Global Impact: Multi-National Collaborations	5
Evidence: Research Results/Syntheses	10
Solutions/Best Practices	25
Next Steps	42
Acknowledgments	45
Appendices	45
A US National Science Foundation	
B The Natural Sciences and Engineering Research Council of Canada	
C The National Council on Science and Technology of Mexico	
D US National Institutes of Health	
E The Canadian Institutes of Health Research	
F Portia Ltd UK, in Association with the European Commission	
Inner Cover Art	47
Conference Program	48



Executive Summary

The aim of the 3rd Gender Summit, which focused on North America, was to connect stakeholders for a global call to action to achieve positive change towards greater diversity in the science and engineering workforce and greater inclusion of biological sex and gender considerations in research content, process, and policy. The three-day meeting was guided by theme *Diversity Fueling Excellence in Research and Innovation*.

The meeting began on Wednesday, November 13, 2013, with welcoming statements from USA and European leaders and a keynote address by Valerie Jarrett, Senior Advisor to President Barack Obama and Chair of the White House Council on Women and Girls. She emphasized the power of women to unlock the full potential of our economy. The plenary session that followed featured leaders from major science institutions in the United States, Europe, Canada, and Mexico, as well as the Vice President of the European Parliament and Commissioner of Research for Research, Innovation and Science of the European Commission. They addressed current efforts being taken by their respective organizations to address gender issues and their collective commitment for a gender-focused multi-continental collaboration. In other plenary sessions, STEM leaders from the participating countries (including Chancellors, Deans, Chairs, and Distinguished Professors) discussed the need for joint policies as a way of broadening access to knowledge, boosting innovation, and improving knowledge production. Plenary panels and parallel sessions on Thursday focused on diversity in participation and the role of gender dimension in research to address global scientific and societal challenges, with key presenters including college and university presidents, department chairs, and professors; senior leaders of federal agencies; industry vice presidents and managers; and directors at professional associations. The second day also included ten concurrent roadmap development sessions that provided recommendations for milestones and actions going forward. The third and final day of the Summit, Friday, November 15, 2013, offered best practices presentations, with examples, approaches, and methods that have already been implemented and could be taken to scale globally.

North American countries—USA, Canada, and Mexico—agreed to develop a collective commitment and capacity to strengthen human capital development, research and innovation by creating an innovative STEM conceptual framework of transformative opportunities for women in science and engineers as researchers and leaders. The potential collaboration has expanded to be considered a gender-focused multi-continental partnership with collective commitments from Europe and South Africa. All agree that they must promote all aspects of the gender dimension in science and engineering—gender equity, gender equality and gendered science—through international research opportunities to achieve global impact since scientific discovery and innovation is critical to the success of both women and men in a knowledge economy.

The Summit itself was framed around inter-stakeholder collaborations, such as policy, talent development, research design and content, and stewardship of research systems and processes. Critical to each of these emphasis areas is evidence to inform decisions and future explorations for collaboration. Sufficient and compelling research was shared to convey both the need for and the urgency of the incorporation of sex and gender considerations in STEM

education, research and innovation, as well as workforce policy and practice. Gender equity research ranged from research supporting the wellness of women, explaining and embracing gender differences, documenting biases and promoting institutional transformation to reporting positive outcomes for workplace diversity. The progress of these evidence-based discussions is giving greater attention to the need for gendered research in advancing national research priorities in the areas of health, environmental sustainability, climate change, food security and transportation. This research is shifting from pointing out the consequences of research bias resulting from not including the gender dimension to focusing on implications of our new understandings of the gendered research for applications and translation into technological advancements and new markets of competitiveness.

The solutions and best practices are charted to propel the forward thinking of the participants and the movement encouraged by the experts. Presenters offered appropriate, beneficial and impactful actions that can be taken immediately to shape science and society through the inclusion of the gender dimension. Specific solutions include the view of gender diversity as an integral part of excellence and innovation by definition; expanded roles for the collaborative work between higher education and learned societies for training and advancing knowledge as well as delivering economic benefits; improvements to funding mechanisms for promoting the gender considerations in the research proposal, review, and reporting; enhanced outreach and mentoring opportunities to champion the implementation and the contributions of gender equity and gendered science; and inclusive STEM environments that encourage interdisciplinarity and international engagement. There was general agreement that inclusionary approaches across institutions, communities, and geographic borders would transform Gender Summit 3 into the premier international forum for an on-going dialogue to exchange ideas and best practices, resulting in a greater demand for the continuation of the Summit virtual network and resource site(s).

The Roadmap for North America is forthcoming; however, the collective dialogue for intra- and inter-stakeholder collaborations that began at Gender Summit 3 should still be continuing with funding opportunities around several or all of the 10 grand challenges for the gender dimension in the scientific enterprise:

- Cultivate and promote women for leadership roles
- Empower early career scientists
- Integrate gender into research content and methods
- Improve career-life balance
- Create and sustain networks
- Transform the role of gender in STEM and in communication
- Ensure inclusive excellence through merit/peer review
- Enable organizational systems and processes
- Promote and acknowledge pioneers trailblazing the future
- Create bridges between and among funders.

Your continuation in the dialogue, research investigations and/or policy decision making is valued in promoting the theme, *Diversity Fueling Excellence in Research and Innovation!*

Introduction and Context

The Gender Summits are dedicated to supporting and advancing excellence in science, technology, engineering, and mathematics (STEM) and the effectiveness of research and innovation at all levels, through the infusion of gender. The first and second European Gender Summits in 2011 and 2012 had a specific European focus. They provided a forum for stakeholders from research, industry and policy to jointly explore how gendered methodologies can stimulate innovation and advance scientific excellence. The U.S. National Science Foundation ([NSF](#)), partnering with counterpart organizations across North America, hosted the third Gender Summit on November 13-15, 2013, at the Washington Hilton in Washington, DC. The collective dialogue of Gender Summit 3 – North America (GS3) engaged more than 130 speakers/ presenters from the United States, Canada, Mexico, Europe and South Africa, representing perspectives from more than 35 countries. Partners included the Natural Sciences and Engineering Research Council of Canada ([NSERC - CRSNG](#)), Mexico's Consejo Nacional de Ciencia y Tecnología ([CONACYT](#)), the U.S. National Institutes of Health ([NIH](#)), the Canadian Institutes of Health Research ([CIHR](#)), and [Portia Ltd](#) in the UK, in association with the European Commission. The theme was *Diversity Fueling Excellence in Research and Innovation*. GS3 sought to interconnect key stakeholders in a Call to Action to achieve (a) positive change towards greater diversity in the Science, Engineering, Technology and Mathematics (STEM) workforce and in leadership and (b) greater inclusion of sex and gender considerations (the “gender dimension”) in research content and process.

GS3 brought together a diverse group of national and international experts and stakeholders from a variety of institutions to discuss new perspectives emerging from studies of sex and gender differences, with a focus on the science needed to incorporate the “gender dimension” – that is, to show that the research/study design takes into account the needs of both women and men in equal importance. The potential benefits are considerable, not only for the quality and outcomes of research, but also for new opportunities to apply research findings in the creation of new markets for science knowledge.

The goals of the Gender Summit 3 – North America were to:

- Develop a collective commitment to strengthen human capital development, research and innovation through diversity;
- Demonstrate the latest evidence of how the incorporation of sex and gender considerations into STEM research and innovation contribute to excellence;
- Share solutions on how to incorporate gender considerations in institutional structures, funding structures, and peer review process; and
- Expand and transform the Gender Summit into a global forum for collaborative dialogue and activities focused on shaping science and society through the inclusion of the gender dimension in research, innovation and markets for science knowledge.



The Gender Summit 3 – North America was designed to continue the dialogue begun in Brussels in 2011 and 2012 and forge a collective commitment to strengthen human capital development, scientific research and innovations, STEM stewardship and the transformation of higher education institutions via an integrative focus on gender equity, equality and empowerment through research content, methods and analysis, as well as policies and practices (Ward, 2013). The information in these proceedings will address the following questions that were raised during GS3:

What compelling research evidence demands an immediate response?

What are the most appropriate, beneficial and impactful actions that different stakeholders can take?

What mechanisms are needed to strengthen inter-stakeholder collaboration?

What strategies can best achieve global impact?

What are the best strategies for integrating the sex/gender lens in all sectors?

Rich presentations and robust examples permeated panels and sessions throughout the conference. To reinforce the intellectual continuity of the various sessions, they are organized in the pages that follow by common themes, rather than by chronological order. The GS3 partners value the contributions made by all of the speakers. They all contributed to stimulating productive conversations and to the development of the Roadmap for Action. This document summarizes the main issues discussed and, in the interest of brevity, does not necessarily include all presentations. For the full program, a list of the speakers, their biographies, selected video clips, and PowerPoints of the presentations, see www.nsf.gov/od/ija/activities/gendersummit.

Collective Commitment for Global Impact: Multi-National Collaborations

The GS3 partners expressed renewed commitments towards shaping the frontiers of science by working collaboratively to promote gendered research and innovation, as well as equality within the scientific enterprise. As a premier international forum, the Summit showcased collective dialogue on how to leverage resources and address common interests across geographic borders, with attention to gender considerations in research, funding structures and institutional transformation to promote new knowledge, innovation and economic development.

The United States: Interests and Commitment

- **Valerie Jarrett**, JD [Senior Advisor to President Barack Obama and Chair of the White House Council on Women and Girls, USA] shared that the Council ensures that the needs of women and girls are recognized in every program, policy and piece of legislation implemented by federal agencies. Ms. Jarrett began her remarks by outlining President Obama's commitment to changing the U.S. narrative about who can dream of becoming a scientist, an astronaut or an engineer. The outdated narrative often excludes girls and discourages their passions for science and technology. The reality is that girls like to solve problems and build things, and they are just as capable as boys in rolling up their sleeves and shaping their own destinies. The President has absolutely prioritized issues of women and girls and remains committed to ensuring that women and girls can follow their passions into STEM fields.

Ms. Jarrett noted that gender equality in STEM is not just a women's issue, but one that affects all scientists and researchers. The incorporation of the gender dimension into research and innovation benefits everyone. Diversity in STEM brings innovation; it drives science forward and benefits society as a whole. She pointed out that GS3 is more than just about women: it is about our societies and tapping into the power of women to unlock the full potential of global communities. If we truly want to champion innovation and expand the capacity for discovery, everyone has to be involved. President Obama's administration is committed to ensuring that our women and girls are in a position to lead in the future. The President has been quoted as saying, "When women succeed, nations are safer, more secure and more prosperous."

- **Ralph Cicerone**, PhD [President, US National Academy of Sciences and Chair, National Research Council, USA] emphasized (a) the importance of utilizing the full capacity of creative, talented and dedicated people; (b) the collective responsibility for ensuring that women scientists and engineers flourish and that they are supported and encouraged; and (c) the need to confront existing obstacles along their career paths. He stated that the Academy remains committed to enhancing gender inclusion by supporting the creation of networks around the world, including Africa, Latin America and Europe. Establishing these networks and collaborations promotes the creation of goals and strategies for implementation and an awareness of the efforts of others that can bring value to our own.
- To underscore the importance of gender incorporation within global research and development, former NSF Director **Subra Suresh**, PhD [President, Carnegie Mellon University, USA] stated that diversity in education and the workplace accelerates innovation because people have different life experiences that allow them to address the same issue from different vantage points. Diversity fostering global research is becoming

more popular. In May 2012 the Global Research Council was established at NSF as a virtual organization to collectively engage in the development of principles governing scientific merit review, research integrity, pathways for open access to publications and data and mobility of researchers. Nearly 100 countries participated in the most recent meeting where the topics included the mobility of researchers, as well as a discussion of strategic planning for collective action in the near future.

- **Wanda E. Ward**, PhD [Head, Office of International and Integrative Activities, National Science Foundation, USA] posited that North America stood ready to further integrate and leverage the gender dimension in forging new and transformative discoveries and in fostering a diverse and inclusive scientific community. Importantly, the greater inclusion of biological sex and gender considerations in disciplinary and interdisciplinary frameworks is significant as all nations increase their investments in science and technology. Working collaboratively to ensure that scientific research is beneficial to women and men is a transformative moment for the shifting landscape of the scientific enterprise. This time of collective commitment for gender considerations in science and engineering will be beneficial to society at large as North America embraces the new opportunities of the shifting landscape of science innovation marked by emerging fields of science and the demographic changes of the scientific workforce. Attention was given to the fact that the more than 650 registrants comprised a diverse group of women and men interested in women's issues, as well as diversity within the group of women who represent every stage of STEM workforce development, advancement and success.

Dr. Ward's presentation highlighted the NSF's gender considerations in research design and analysis, as well as the Foundation's emphasis on gender equity in the STEM workforce. This Summit was considered exemplary for engaging women of all backgrounds in imagining future work at the frontiers of science and in realizing their full potential in the scientific enterprise. Additionally, pending the availability of funding, NSF is pursuing four major areas for multinational collaboration:

- discovery/frontier research for knowledge generation and translation,
- human capacity/talent development and advancement,
- institutional transformation in higher education systems and practices and
- equity in stewardship activities, such as the merit review process, evaluation and assessment.

Across the participating partners, there are compelling examples of individual contributions of women in basic research, as well as in the advancement of applied research within a gender-focused context. There are also success stories of policy changes and transformative practices emanating from the leadership, mentoring and advocacy roles of well-known women scientists and engineers.

The shared commitment to framing a multi-national strategy was continued with input from the European Commission, Natural Sciences and Engineering Research Council of Canada, the National Council on Science and Technology of Mexico, and the Human Sciences Research Council of South Africa.

Europe: Interests and Commitment

Europe is working aggressively to change the workforce environment by encouraging more females to study science and engineering and to go on to research careers.

- **Marie Geoghegan-Quinn** [Commissioner of Research, Innovation and Science, European Commission] stressed that because gender issues are not unique to Europe, it is important to tackle issues jointly. She stated that we need all of our talented scientists working toward research and innovative efforts and that there is no tradeoff between promoting gender equity and excellence in science. She expressed much interest in collaborating with North America. She stressed that it is logical, for both scientific and economic reasons, to work collaboratively to tackle common challenges. She also highlighted Horizon 2020, Europe's new research funding program, which will champion gender equality in three ways: integrating the gender dimension into funded programs, encouraging balanced participation of men and women on funded research teams and ensuring gender balance in advisory groups and in teams that evaluate applications for funding.
- **Oldřich Vlasák** [Vice-President of the European Parliament] stressed the importance of (a) research and development in future economic growth and (b) investing effectively, given the frequent scarcity of financial and human resources to support research. He stated that both the US and Europe need to invest more and do a better job with regard to human capital: "we can't afford to waste research talent, which means we should not discourage any part of the population from participating in research and innovation." Quoting U.S. Secretary of State John Kerry, he said that "no team can ever win if half of its players are on the bench." Measures to ensure gender equality should be considered an investment in future economic growth, rather than a cost. He stated that "what we pay today will generate returns for the economy as a whole in the medium- and long-term by reducing the ineffectiveness associated with inequality." The gender imbalances are not a self-correcting phenomenon, and Vlasák encouraged discussions during the third Gender Summit to view these issues as a matter of research potential and social justice.
- Remarks by **Dominique Ristori** [Director General, European Commission Directorate General Joint Research Council] focused on the importance of science and society, the latest developments in Europe's gender equality policy and the European interest in a gender focused multi-national collaboration. He described the motivation and challenges for global research and innovation in the context of climate change, clean energy and the improved health and well-being of all citizens. Ensuring gender balance is a necessary condition for the achievement of the objective of Europe's 2020 strategy for 75% employment, an objective that cannot be reached without strong commitment to gender equality, he stated.

Ristori emphasized that the presence of women in science and engineering as experimenters, research subjects and leaders in these grand societal challenges does matter. Historically, gender bias in the science knowledge base has created adverse effects. New research, however, increasingly reports incidents where important biological and psychosocial differences have been shown to influence outcomes for both

women and men. Therefore, it is fundamental that the gender dimension be taken into account in study design. Promoting a balanced agenda or a neutral approach will bring huge benefits, not only for the quality and outcomes of research but also for new opportunities to apply research findings and create new markets for science knowledge.

He pointed out that the European Commission has identified and incorporated in the goals of the Horizon 2020 program (a) gender equality issues that impact how research is organized, thus preventing women's full participation and (b) the gender dimension in research content that potentially impacts its quality and its efficacy for women and men. More specifically, the Joint Research Centre (JRC), with its seven institutes and 2000 researchers, is focused on a limited number of key priorities – namely, financial stability; competitiveness, growth and jobs; low carbon economy; environment and climate change; agriculture and food security; public health and consumer protection; and safety and security, including nuclear. These areas require a crosscutting and multidisciplinary approach and the presence of women as experimenters, research subjects and leaders on these grand societal challenges. Discussions are underway between NSF and JRC to collaborate on a sustained strategy for increased support and actions that will enhance excellence, equality and efficiency in research and innovation through an integrative focus on gender equity and equality. Both agreed that a gender-focused multi-national collaboration in science and engineering would advance common goals for improving the status of women in science and engineering and for addressing key areas where gender inequalities and biases persist in science. He concluded with the following rationale for such a commitment to multinational collaboration: we need to work together because gender inequalities in science and engineering simply ignore borders, and research and innovations are essential ingredients of any approach that seeks to address today's global challenges.

Canada: Interests and Commitment

- **Isabelle Blain** [Vice President, Research Grants and Scholarships Directorate, Canada] conveyed that, for more than 20 years, increasing the role of women in science and engineering has been a key issue for the Natural Sciences and Engineering Research Council (NSERC). While emphasizing that Canada needs to do a better job in attracting and retaining women to the disciplines of sciences and engineering, she pointed out that this is not just a Canadian problem, but one faced almost everywhere in the world. She reiterated that there is an enormous untapped pool of female talent and that we are neglecting a big opportunity if we continue to let this talent go unrealized. NSERC is positioned to support women at every stage of their careers in science and engineering, from undergraduate students all along the continuum to world-class researchers. Actions, however, must be informed by facts and evidence. She noted that the Summit was an extraordinary forum for sharing such facts and evidence. There are common challenges and obstacles that account for the low proportion of women who choose to study and pursue careers in science and engineering. Therefore, collaboration is essential to improve the standing of women in science and engineering everywhere.

Even within Canada, there is a very strong commitment among the members of the Tri-Council (NSERC, Natural Sciences and Engineering Research Council of Canada; SSHRC, Social Sciences and Humanities Research Council; and CIHR, Canadian Institutes of Health Research) to improve opportunities for women in research. In spring 2013, a strategy was developed for harmonizing gender-related policies to the extent possible. While it is important for women to work in an environment where they can advance their academic careers and take time to start and raise a family, there are still issues where wage gaps force women to leave academia for more lucrative careers or deter them from considering these careers at all.

Ms. Blain reiterated that by taking a collaborative approach, the three councils are better able to learn from one another and find ways to strengthen equality for women, regardless of the field of research. As a result, the agencies are developing an action plan to strengthen and harmonize policies and practices related to peer review, eligible expenses, statistics and reporting, and training and awareness for both staff and committee members. The action plan will be shared shortly with key stakeholders and directives will be prioritized and approved for implementation. Just as other partners and participants in GS3, NSERC is committed to ensuring that there is fair representation for women in science and engineering. Ms. Blain made the observation that collectively “we’re all moving in the same direction at the same time and there are lots of benefits from sharing experience and practices. There is strength in numbers, as they say; collaboration is going to be the key to our ongoing success in increasing the number of women who continue in research.”

Mexico: Interests and Commitment

- **Julia Tagüeña**, PhD [Deputy General Director of Scientific Development, National Council of Science and Technology (CONACYT), Mexico] focused on gender-diversity challenges and opportunities confronting Mexico, underscoring the differential treatment of women in academia. She shared a specific bias: women and people from tropical countries tend to be more expressive in scientific talks. Sometimes in science, there is confusion between having a stony face and being objective, on the one hand, and being expressive and showing passion, on the other. This difference in expression/style is one reason why women may be taken less seriously in the academic world. The lack of respect for cultural diversity must be addressed because freedom from bias is really behind good science. Moreover, she reiterated that the fields where there are fewer women – this is general, all around the world – are engineering (with 30%) and physics and mathematics (with 33%). She also pointed out that Mexico has a legal mandate to analyze data by gender and that data are being analyzed by regions within Mexico because programs need to be tailored to ethnic groups by region.

In closing the discussion about collective commitment, Dr. Tagüeña stressed that CONACYT is supportive of a collaborative agreement with NSF, NSERC and their European counterpart to advance women’s achievement in science and technology. Such multinational collaboration would demonstrate respect for and value of cultural diversity in doing good science. Knowledge is universal and a new knowledge society will need greater engagement of women in international collaboration.

South Africa: Interests and Commitment

During the Summit, South Africa also expressed an interest in international collaboration.

- **Olive Shisana**, PhD [Chief Executive Officer, Human Sciences Research Council (HSRC), South Africa], making her remarks via video, shared some reasons why women are experiencing drastic discrimination. Often in male dominated cultures, traditional roles are encouraged in such a way that women are discouraged from entering roles deemed by society as “masculine.” Another reason is that very few women are present in these workplaces, and those who are, are not in positions to transform the current culture. Women who are present often mimic male behavior and perpetuate disparities in access to STEM training and jobs. National strategies that require intervention at multiple levels must be developed. To demonstrate commitment to gender equality and incorporate women into historically male-dominated fields, workplace policies must be enforced that prevent sexual harassment, create a family-friendly work environment, provide opportunities for women to network and develop mentoring relationships with each other and introduce a diverse culture while monitoring progress.

The HSRC has adopted gender-equality strategies to promote a gender sensitive environment by setting annual targets of 75% for staff to be trained in gender sensitivity and at least 15% to be trained on the use of gender analytic tools. They then use selection tools and competency exercises to ensure that the right person is chosen to undertake the right job. To increase the pipeline of new scientists, retention is encouraged by measuring attrition rates and establishing capacity development at the masters, doctoral and postdoctoral levels. To this end, HSRC engages in international partnerships because global strategies are desperately needed to increase admission rates, provide more women with grant funding, monitor salary disparities, establish agencies that support and track women and identify additional barriers.

Evidence: Research Results/Syntheses

The presence of women in science and engineering as experimenters, research subjects and leaders does matter. The historical trend to not give adequate consideration to the gender dimension has led to research that does not always acknowledge potentially different outcomes for women and men. The exclusion of women in past toxicology research, for example, has created flaws in our understanding of adverse health effects due to exposure to toxic metals (especially arsenic, cadmium, mercury and lead), which constitute serious public health problems worldwide and affect women and men in significantly different ways. While historically, gender bias in research has mostly disadvantaged women – sometimes also affecting men (e.g. diagnosis and treatment of breast cancer) – new research increasingly reports cases where important biological and psychosocial differences influence outcomes for both women and men. [Source: GS3 Agenda Book, 2013]

- **Elizabeth Pollitzer**, PhD [Director, Portia Ltd., UK] pointed out that the past Gender Summits were instrumental in bringing evidence and arguments for gender equity to the

attention of the European Parliament and thus ensuring that gender was not cut from the budget for Horizon 2020 (a new European Union research and innovation program).

- **Maire Geoghegan-Quinn** [Commissioner for Research, Innovation and Science, European Commission] cited first-hand knowledge of how women's talents contribute to knowledge, innovation and growth. She also noted that there is sound evidence that gender diversity improves the performance of research teams and that the gender dimension improves the quality of research results. Despite these contributions to science, women's talents are not fully utilized and too few women are at the top of the research hierarchy.
- **Phyllis Wise**, PhD [Chancellor, University of Illinois at Urbana-Champaign, USA] underscored that there are complex overlapping social, cultural and educational challenges that combine to make the Gender Summits timely, relevant and needed, as a collective effort is required to address the longstanding and emerging challenges and hurdles confronting women scientists at every career stage and at every age. She further asserted that it is important to define diversity broadly, since addressing gender diversity and equality benefits not only women, but other minorities as well (i.e., racial/ethnic minorities). Using national data and personal stories, she shared how both quantitative and qualitative data are needed to understand the challenges and to stimulate actions for change.
- **Kevin Dunbar**, PhD [Professor of Human Development and Quantitative Methodology and Director of Laboratory for Scientific Thinking, Reasoning and Education, University of Maryland College Park, USA] provided insights on how women and men scientists solve problems and interact when conducting experiments. Drawing on his observations of the habits of researchers in different molecular biology labs, he discussed the role that gender plays in how scientists approach the unexpected and learn from mistakes.
- **Rosalind Chow**, PhD [Assistant Professor of Organizational Behavior and Theory, Tepper School of Business, Carnegie Mellon University, USA] discussed the effects of the proportion of women and status differentiation on collective intelligence. She also reported on preliminary results of a study exploring the influence of group gender composition, leadership appointment and leadership stability on group communication patterns. The initial results show that groups with different gender compositions respond differently to hierarchy and that hierarchy in general appears to reduce participation, particularly in mixed gender groups.
- Women make up 25% of the Mexican oil production workforce, according to **Myriam Amezcua Allieri**, PhD [research scientist, Mexican Petroleum Institute, Mexico], who discussed the impact of oil production and the petroleum industry on the environment in Mexico. She highlighted a strategy for environmental protection that includes the care of historical environmental liabilities and pollution prevention, as well as plans for future development from the perspective of environmental sustainability. She noted that Petróleos Mexicanos (Pemex) also places a strong value on the rights of employees and is part of the National System for Equality between Women and Men, taking action to implement social policy for equality and mainstreaming issues of gender and non-discrimination.

- **Joan Reed**, MD [Dean for Diversity and Community Partnership, Harvard Medical School, USA] discussed her research on the “capacity paradigm,” studying the impacts of diversity on authorship, noting entry, productivity, retention, and advancement of the authors. Her study showed that evidence-based data, interdisciplinary teams, and leadership buy-in are essential for increased representation of diverse groups in leadership roles/positions in the medical community.
- **Joel Greenspan**, PhD [Professor and Chair, Department of Neural and Pain Sciences, University of Maryland School of Dentistry and Professor, University of Maryland Program in Neurosciences, USA] reported on a review of 161 published studies, pointing out common chronic pain disorders that are more prevalent in women than men, such as migraine, tension-type headache, temporomandibular disorder (TMD), irritable bowel syndrome (IBS), rheumatoid arthritis, osteoarthritis, interstitial cystitis, and fibromyalgia. He noted that current and future research directions will address the following questions: How do psychological and experimental factors such as stress, mood, and conditioning (expectation) contribute to sex differences in pain/analgesia? How do sex differences in pain/analgesia change over the lifespan? Should diagnostic criteria for certain pain-related conditions differ by sex?

The following pages provide examples of the value-added from scientific research that incorporates the gender dimension.

Research with Gender Considerations

Research with gender considerations is a complex topic. It has implications for (a) personal well-being, (b) explaining and embracing differences, (c) supporting institutional transformation, (d) documenting implicit and explicit biases as barriers, (d) supporting workforce and workplace diversity and (e) research in a number of priority areas, including health, the environment, climate change, food security and transportation.

Research Impacting Health and Well-Being

- **Rita Colwell**, PhD [Chair of Canon US Life Sciences Inc.; Distinguished Professor, University of Maryland and Johns Hopkins University Bloomberg School of Public Health; and former Director of NSF, USA] focused on a practical approach to public health to show how gendered science can help communities and solve problems. She highlighted research on the safety of drinking water in Bangladesh and India. This research demonstrated not only that the environment, the climate and human health were intertwined but also provided evidence of the critical role of women in keeping families healthy through their understanding of these intersections. Dr. Colwell identified the conditions of the health challenge by pointing out the problems of the food chain, improper cooking and poor sanitation as contributing factors to the spread of infectious diseases such as cholera. She explained how the project’s research team, funded by NIH (U.S. National Institutes of Health), taught women to filter water by pouring it through folded cloth, thus reducing cholera by 50%. Dr. Colwell’s message was two-fold. First, we are in a position to bring science and engineering technology together in practical ways to help developing countries. Second, we can empower women to utilize their intellect on behalf of their populations and bring about economic benefits.

- **Sabra Klein**, PhD [Assistant Professor, Molecular Microbiology and Immunology, Johns Hopkins University Bloomberg School of Public Health, USA] reported on sex differences in response to vaccinations and how policy recommendations should take these differences into account. She stated that the role of infectious diseases in global death rates is different for men and women, citing evidence that, for example, across diverse species of viruses, the intensity and prevalence of infections are often higher for men than for women. Despite this difference in intensity and prevalence, however, severe adverse outcomes – that is, those resulting in hospitalization and death – often occur more in women. Dr. Klein reported that not only are there sex differences in response to infection, there are also sex differences in production of antibodies: the production of antibodies is consistently and significantly higher for females, which can lead to a higher incidence of adverse reactions to vaccines for females. She cited data indicating that inflammatory responses to vaccines are higher in women than in men and that childhood mortality following vaccination in developing countries is higher among girls than boys. She noted that a policy response could be that, during times of pandemics and in times when there are concerns about vaccine shortages, females could be given a lower dose, resulting in more vaccine to distribute and fewer adverse reactions in women. She proposed that, from a policy perspective, vaccines could be designed with sex specific applications.
- **Amanda Gálvez**, PhD [Professor, Department of Food and Biotechnology, Universidad Nacional Autónoma de México, México] provided data about diversity issues related to food security, nutrition and gender. In developing countries, according to Food and Agriculture Organization (FAO) information, women produce between 60 to 80% of the food. This means more than half of the world's production comes from women, who make up only half of the global population. In Mexico, there is growing participation of women in the agriculture labor force. Women are occupying men's jobs in agriculture as independent producers or workers. Despite making significant and essential contributions toward agriculture, women lack equal access to resources, investments or services and opportunities that empower them to be more productive. Frequently, women do not control the revenues obtained from the farms. The obstacles faced by women are interconnected and have to be addressed in a holistic manner. If women had the same access to resources, they would be as productive as men who do have access, resulting in increased farm yields. Therefore agricultural production would increase just by creating gender equality. In addition, having better-fed children who learn better and have a better chance to become productive citizens would allow the benefits to expand through generations.

Research Explaining and Embracing Differences

- **Rocío Cassaigne Hernández** [Intellectual Property Manager, CIATEQ, México] noted gender differences in problem solving, contrasting the organized, methodical approach of males to the intuitive and creative approach of females. Both approaches are valid and acceptable for scientific solutions. By embracing the skills of both women and men we will succeed in enhanced engagement in knowledge transfer and product development/distribution in the markets for technology and innovation. She added that the research commitment to gender equity must be more than representation alone; it must be engaging women on research teams looking for real solutions to complex/challenging problems. As more women are encouraged to pursue careers in

technology, for example, they must also be motivated to be leaders in intellectual property, including the increased involvement of women in knowledge/technology transfer for economic development.

- **Janet Stotsky**, PhD [Advisor, Office of Budget and Planning, International Monetary Fund, USA] discussed research on women and risk-taking. There are gender differences in behavior that are systematic enough to have implications at the macroeconomic level. Consumption behavior is critical to how the economy performs at a macroeconomic level. Women account for much of household spending. When given greater empowerment in the household, they tend to spend money in ways that benefit the household and, in particular, their children, thus making a long-term investment in human capital. Women are different from men in their levels of risk aversion, and their choices may lead to more economic stability for both households and country.
- **James P. Byrnes**, PhD [Professor and Department Chair, Educational Psychology, College of Education, Temple University, USA] also reported results on gender differences in risk-taking. Attitudes towards intellectual risk have implications for women's career-related decisions. Studies show males take more intellectual risks in STEM contexts, although they are not inherently more inclined to take other risks. Intervening in how women scientists are socialized, especially at critical junctures in their development, can have major impact on their willingness to take intellectual risks that would benefit their career development and ultimately benefit the STEM field.

Research Supporting Institutional Transformation

- **Allison Sekuler**, PhD [Professor of Psychology, Neuroscience and Behavior, and Associate Vice President and Dean, School of Graduate Studies, McMaster University, Canada] provided a historical research perspective of higher educational institutions functioning as a single unit with a common purpose to advance and enhance opportunities in education and research, thus addressing a contemporary need for innovative higher education partnerships within an ecosystem approach. Dr. Sekuler reported that, when institutions value and enable partnerships across traditional disciplines, they automatically enhance opportunities for women and other underrepresented groups. "Therefore, in fields where women are woefully underrepresented, women are now able to find colleagues and mentors in partnering disciplines." Canada is creating great numbers of interdisciplinary programs to address big issues such as sustainability and neuroscience. Additionally, virtually all of Canada's institutions are engaged in international research, demonstrating that internationalization and globalization approaches are really beneficial for women. She concluded that the more global partnerships we form, the stronger our science will be and the stronger the global support will be for women in science.
- As an historian of science and technology, **Ruby Heap**, PhD [Professor, Department of History, University of Ottawa; and Coordinator of the University of Ottawa Women in Engineering Research Group, Canada] addressed two issues: the barriers faced by women in science and engineering, and the cultural elements tied to science and engineering. She spoke of pioneering women in engineering as "femocrats" (that is, feminists in government bureaucracies who have exerted a lot of influence over the years), the history of women in science policy in Canada and the role that the Natural

Sciences and Engineering Research Council (NSERC) has played in promoting a new scientific and engineering culture in Canada. She cited a groundbreaking 1992 NSERC report that stated it is not enough to bring more women into STEM, you have to transform the learning and working environments. She noted that, after 30 years, many of the same problems are still there but are expressed in different terminology. The only way to retain women in science and engineering is to transform the environment and change the culture. She stressed that the lives of women in STEM are not homogeneous. It is necessary to study the complexity of women's experiences, including the intersection of gender with race, ethnicity, religion, disability, sexual orientation, sector, and institutional type. It is further necessary to determine how to develop policies and action plans that take this complexity into consideration.

- **Ana María Cetto** [Professor of the Institute of Physics, and Lecturer, Faculty of Sciences, Universidad Nacional Autónoma de México (UNAM), Mexico] gave an historical context of why women have been absent in science and of the challenges that persist, thus limiting the incorporation of both women and gender studies into science disciplines. Progress to incorporate women into science has been slow and uneven, but examples now exist of specialized programs that have been created in institutions for the purpose of bringing more women into science. There has also been progress in expanding academic curricula so that gender studies are now recognized programs of study. Despite this progress, there are clear indications that the current scientific system contains intrinsic structural elements that work against diversity and gender inclusion. NIH's recent comparative study on successful grant applications, for example, concluded that there was bias in the peer-review process which favors whites over other groups. Dr. Cetto recommended that, in order to have a significant presence as women in research and a presence in innovating science, women must contribute to changing the structural edifice by openly contributing to defining science and how it is assessed, devising standards, changing institutional culture and establishing new priorities and ways of teaching.

Research Documenting Implicit and Explicit Biases as Barriers

- **Brian Nosek**, PhD [Associate Professor, Department of Psychology, University of Virginia, USA] focused on implicit bias that results from unconscious thought processes. He shared data from experiments showing how we may not have complete knowledge and control over our own minds and how basic cognitive processes used to solve problems also have implications for our social perceptions of gender differences. Dr. Nosek demonstrated the Implicit Association Test, one of the tools used to measure associations that exist in an individual's brain but that may not be consistent with that individual's conscience, beliefs or values. In that test, sets of male and female words and sets of words representing science or the arts are shuffled and sorted. Research using the test finds that most people have an easier time sorting when *male* is associated with *science* and *arts* with *female*, regardless of what their beliefs are and what gender they are. He gave several examples of how these unconscious expectations or associations can impact everyday behavior, including choice of major field of study, attitudes toward math or science or attitudes about the abilities of men or women in science.

- **Jo Handelsman**, PhD [Howard Hughes Medical Institute Professor and Frederick Phineas Rose Professor in Biology, Department of Molecular, Cellular and Developmental Biology, Yale University, USA] presented her work on understanding the gender bias that exists in the STEM professoriate. Even though STEM faculty strive to make objective decisions when evaluating men and women students or professionals, evidence shows that implicit bias affects the perception faculty have of women in STEM disciplines. In a study led by Dr. Handelsman, a group of scientists were given the task to evaluate a summary of student accomplishments. Scientists received identical summaries, except for one variable – whether the student’s name was John or Jennifer. Evaluators were consistently more likely to hire the male student, mentor him and offer him a higher salary. No differences was observed when accounting for evaluators’ gender, discipline or rank, thus emphasizing that implicit bias is a systemic concern. It is important to create awareness of this issue, especially when it can be difficult to convince individuals that they are not immune to implicit bias. There have been a few studies investigating possible interventions, but the effects are not permanent and are mostly short-lived. Further studies of interventions for implicit bias are needed, along with a greater awareness of this problem in the STEM academic field.
- **Shirin Heidari**, PhD [Senior Manager, *Journal of the International AIDS Society* and Member of Council and Chair of the Gender Policy Committee, European Association of Science Editors, Europe] provided a different perspective of how gatekeepers at different stages of the research process can promote gender-sensitive research and the reporting of scientific data. Gender differences are poorly understood and there is a potential for gender bias in published scientific literature (e.g., omitting the sex of animals used in research, failing to disaggregate results of clinical trials by gender). The peer review process can be a checkpoint to promote the inclusion of data disaggregated by sex. As Executive Editor of the *Journal of the International AIDS Society*, for example, Dr. Heidari implemented an editorial policy that strongly encourages authors to disaggregate data by sex and provide gender analyses in submitting manuscripts. A survey conducted by the European Association of Science Editors, however, shows that only a small fraction of journals include a policy that encourages the reporting of gender-sensitive data. Further, only a quarter of survey respondents agreed with the inclusion of such a policy in their journals. There is an urgent need to generate awareness of the rationale for collecting and including sex-disaggregated data in scientific research, to start shifting the mind set and producing higher quality scientific results.

Research Supporting Workforce and Workplace Diversity

- **Nancy C. Carter**, PhD [Senior Vice President, Research, Catalyst, USA] presented key findings from a 2012 Catalyst survey about why diversity in business matters. She reflected on how the findings inform development of measures to promote women’s advancement in business and other professions. Catalyst works globally with businesses to build inclusive workplaces and expand opportunities for women. Research shows that companies with more female board directors experienced higher survival and lower insolvency rates. Additionally, more diverse organizational climates are associated with higher retention and employee satisfaction. Research also shows that diverse workgroups are more innovative and better problem-solvers. The survey gave strong evidence that counters the myths about why high-potential women lag their male counterparts in salary and career progress.

- **Stephen M. Fiore**, PhD [Associate Professor of Cognitive Science, University of Central Florida, USA] discussed career paths in group and team research and what it means to be interdisciplinary. A recent increase in cross-disciplinary, collaborative team science initiatives has prompted interest by multiple stakeholders in empirical research on scientific teams. This interest has created an emergent field referred to as the *science of team science* (SciTS). Dr. Fiore discussed this in the context of gender and group dynamics within science collaborations.
- **Krunali Patel**, MS [Business Manager, Storage Products Group, Texas Instruments, USA] shared data about diversity that fueled innovation at Texas Instruments, a leader in application-specific electronics and a global enterprise. She emphasized that diverse talent is needed to respond to a growing range of applications and demand for electronic devices. Diversity in hiring enables the ability to solve problems differently. Moreover, hiring for diversity of thought fosters a diverse environment and drives innovation. Texas Instruments has over 24 diversity initiatives and maintains a corporate philosophy that is committed to fostering an environment that keeps women engaged and curious. Half of Texas Instrument’s new hires are women.
- **Martina Schraudner**, PhD [Head, Department of Gender and Diversity in Organizations, Technical University, Berlin; and Director of Responsible Research and Innovation Unit, Fraunhofer Gesellschaft, Germany, Europe] detailed the importance of including relevant groups, particularly women, within responsible research and innovation to ensure societal relevance. The Discover Markets process addresses three stages of traditional innovation: generating and refining ideas, development and creating prototypes to test applications. More participation by women is needed in each of these, especially in the ideas phase. Dr. Schrauder shared two examples, CareJack and MyRehab, which demonstrate the value of a participatory approach to innovation.
- **Kecia Thomas**, PhD [Interim Associate Dean, University of Georgia and Founding Director, Center for Research and Engagement in Diversity, USA] presented research on the psychology of workplace diversity – specifically, how individuals and organizations resist or demonstrate readiness for diversity, impacts on marginalized groups (e.g., women of color) and the impact their work and professional experiences have on career mobility and overall well-being. Dr. Thomas conducted a literature review to determine if the STEM academic workplace is safe for the well-being (psychological and physical) of women of color. She discussed diversity climate and ideologies, micro-aggressions, access discrimination, consequences of isolation and the “Pet versus Threat” phenomenon that many women of color experience.

Gendered Research in Five Priority Areas

Despite some progress, scant attention has been given to sex or gender in research areas that encompass five major societal challenges for the 21st century: health, environment, climate change, food security and transportation. Presenters at GS3 focused on the new understandings that the gender dimension can carry for research, its application, communication and translation into technology and into markets.

Including the “gender dimension” (i.e., sex and gender) in research is critical to advancing knowledge and eliminating the bias that disadvantages both men and women. Gender bias

takes its toll in terms of quality of life and financial costs, and it limits creativity. These studies showed that differences between men and women can have a crucial effect on how data are interpreted. Moreover, it is important to not limit analyses to sex/gender considerations, but to include other social and environmental factors that can also influence outcomes.

Health

- **Jeffrey Henderson**, PhD [Assistant Professor of Medicine and Molecular Microbiology, Washington University School of Medicine, USA] presented his research on urinary tract infections (UTIs) and described how his group incorporated sex and gender into their studies of bacterial virulence. There is a pronounced difference between males and females in the prevalence of UTIs and in the likelihood of experiencing UTI complications. Because gender discrepancies in UTI research are poorly understood, it is important to study the biological factors that play a role. The urgency of understanding the biological causes of UTIs is heightened by the increase of antibiotic resistant bacterial strains in the last decade. To understand possible gender differences in the pathogenic bacteria affecting male and female patients, Dr. Henderson and colleagues conducted a gene network analysis of uropathogenic *Escherichia coli* strains, the predominant cause of UTIs, and identified two genes that correlated with bacterial virulence but not with sex or gender. Further analyses identified groups of pathogens that **do** correlate with sex or gender. Recent metabolic studies of human urinary composition reveal systematic differences on the molecules observed in male and female urine, shedding light on the biochemical differences between the sexes. This work suggests that human sex factors may shape pathogen evolution. Consequently, incorporating sex/gender in research is essential for understanding the differences observed between males and females in infectious disease outcomes.
- **Gillian Einstein**, PhD [Associate Professor of Psychology and Public Health, University of Toronto, Canada] presented her work on estrogen's effect on the central nervous system (CNS). Estrogens are growth factors that can play important roles in the formation of gender-specific brain circuits. Even though the levels of hormones are commonly thought to affect the mood of women, a review of the literature conducted by Dr. Einstein and colleagues showed no association with mood and hormone levels, although stress and social support were factors associated with mood fluctuations. Even though estrogen levels do not seem to correlate with mood changes, they do show a link with cognitive processes. Women who do not produce estrogen due to surgical removal of ovaries have a significant decline in immediate memory and recall. Moreover, estrogen deprivation can lead to global memory decreases and vulnerability for Alzheimer's disease. This work illustrates that body systems are interconnected and that the reproductive system not only influences reproduction, but also cognition. It is important to understand how reproductive systems can have a differential effect on the CNS of both women and men.
- **Susan Phillips**, MD [Professor, School of Medicine, Queen's University, Canada] focused on the importance of considering multiple factors, including sex and gender, when interpreting results from health research. The health of individuals is influenced by the context in which they live – their environment and social input, which can include sex and/or gender. Clinical studies need categorization to allow for data analysis. However,

this requirement also homogenizes individuals in the categories, which can result in making incorrect assumptions between and within groups. The effect of wealth on an individual's health, for example, might be more important than gender. A woman and a man from a high socioeconomic status (SES) might present more similar health outcomes than two women from different SES. There are a number of research areas where more comprehensive attention to sex/gender categorization is strongly needed. In health services research, for example, wealth predicts health in both men and women but appears to be a stronger predictor in men. Other more comprehensive measures, such as deprivation indices – which take into account different dimensions of poverty – can have better predictive values. Also, being sensitive to gender differences regarding SES is important. Calculating wealth as a measure of individual income, for example, would misclassify women from wealthy households with no individual income. In this case, household income would be a more appropriate measure. Even though it is necessary to stratify health data by sex or gender, it is crucial to consider other indicators simultaneously that might affect males and females differently. Examples of such factors include adverse childhood experiences, community characteristics or exposure to violence. It is important to incorporate sex/gender considerations, along with other contextual measures, in order to have a more appropriate interpretation of health studies.

In a second presentation Professor Phillips spoke about measuring the health effects of gender. She explored the nature of gender as a determinant of health and how the effects of gender inequities can be included in the health outcomes research that shapes health planning and policy. Health-affirming policies tend to homogenize groups (i.e., assuming that all women are the same) or target individual behaviors, and do so in a gender-blind fashion rather than addressing structural biases and inequities that undermine those behaviors. Integrating gender (a social construct) into medicine (biological) is a challenge because results are “blind” to sex, gender, race, socioeconomics and other factors. A recent systematic review of effects of statins in treating cardiovascular disease, for example, concluded that statins are safe and effective. No implications were mentioned with regard to effectiveness or risk differences in men and women. The review failed to factor in any modifying factors (e.g., race, sex) that might influence how statins work. The more traits that can be considered, the more accurate and valuable the research will be. Researchers often treat modifying categories (e.g., socioeconomics, childhood experiences, exposure to violence) as “noise” to avoid and control for, rather than important potential impacts on health outcome and susceptibility to disease. The studies that do consider these factors are rare and the results show that impacts tend to be different for men and women. It is necessary but not sufficient to document non-biological traits that will allow researchers to develop more robust methods.

- **Donald Adjero**, PhD [Professor of Computer Science, West Virginia University, USA] discussed his work on human metrology and human health. His research aims to develop automated, anonymous and non-invasive technologies that allow the analysis of videos and images to obtain body measures. Research indicates that anthropometric data—the collection of measurements from the human body—can have predictive power in regard to health. Measurements of head dimensions or facial metrology, for example,

can predict gender and ancestry. These data can also be used as predictors of health status. For instance, combining different body measures (e.g., body surface area, face measurements, body circumferences) can better predict body mass index. The predictive power of such analyses does vary with gender. It is more difficult to generate predictions from female subjects than from male subjects. Thus, incorporating gender as one of the analysis factors is necessary for evaluating the statistical power of predictive technologies.

- **Clara Gorodezky Lauferman**, PhD [Professor and Director of the Department of Immunology and Immunogenetics, Instituto de Diagnóstico y Referencia Epidemiológicos, México City, Mexico] examined sex effects in susceptibility to cervical cancer and introduced sex and gender as variables relevant to immunogenetics, specifically in cancer. Although cervical cancer (CC) is commonly diagnosed in women across the globe, regions with the greatest prevalence include Mexico, parts of South America, Africa, India, South Asia and Eastern Europe. Medical research has shown that CC results from genetic factors, with contributing socioeconomic factors (e.g., culture and education). CC is caused by the human papillomavirus (HPV) and is the most common killer of women. However, survival is nearly 90% when women under 40 years of age are diagnosed. Screening by pap smears is absent or ineffective in much of the world, especially in developing nations. Most at risk are women with a sister or mother who has CC. Smoking, sexual behavior, hygiene, diet, etc., also seem to influence risk. For effective treatment, vaccination must occur in girls younger than age 15. However, the existence of many different types of HPV (some higher risk of leading to CC than others) complicates the treatment landscape. Dr. Lauferman's work indicates interactions between many genes and many environmental factors are important. Moreover, subtle differences in genetic factors cause people to respond differently to the same environmental factors.
- **Phyllis Greenberger**, MSW [President and CEO, Society for Women's Health Research, USA] discussed the importance of promoting best practices and knowledge for more gender-aware diagnoses and treatment. She stressed that sex and gender are not interchangeable. Sex is a classification of living things, generally as male or female, according to their reproductive organs and functions assigned by the chromosomal complement. Gender, however is a person's self-representation as male or female, or the responses of social institutions to the individual's gender presentation. Gender is shaped by environment and experience. Differences between the sexes exist. Whether a person is male or female matters in the prevalence and severity of a broad range of diseases, disorders and conditions, which affect diagnoses and treatment. Relevant examples of sex and disease were presented. Post-menopausal women who carry a particular type of estrogen receptor variant, for example, are at increased risk of myocardial infarction and ischemic heart disease, independent of known cardiovascular disease risk factors. This association has not been observed in men. As another example, Alzheimer's disease (AD) pathology is more likely to manifest as dementia in women than in men, and for each additional unit of AD pathology, women have a nearly three-fold increase in the odds of being diagnosed with AD.

Environment

- **Arjun Makhyani**, PhD [President, Institute for Energy and Environmental Research, Maryland, USA] discussed his research on radiation exposure, sex and the *Reference Man*. The *Reference Man* is a hypothetical 20 to 30 year old, 154 pound, five foot, seven inch, Caucasian male that is used to develop radiation protection regulations and guidelines. Using a *Reference Man* is scientifically inappropriate because the vast majority of people, including women and children, fall outside the narrow demographic used to develop radiation guidelines. Of special importance is the fact that, in using a *Reference Man*, those most at risk for radiation exposure – women and children – are not protected. Given the increased use of radiation for medical purposes, improving the ways in which maximum radiation dosage is calculated can contribute to a reduction in secondary cancers.
- **Donna Mergler**, PhD [Professor Emerita, Interdisciplinary Research Centre on Biology, Health, Society and Environment, Université du Québec à Montréal, Canada] discussed trans-disciplinary methods to better understand complex relations among gender, environment, health and well-being. Two examples of how integral sex and gender are to occupational health can be found in the disproportion of women who experienced lead poisoning in the United States during the 1920s and 30s, and, more recently, in women experiencing pesticide poisoning in South Africa during 2002. The prevalent notion was that women workers were more susceptible to lead poisoning than men workers. By taking into account job category and socio-economic status, Alice Hamilton (considered the mother of modern occupational health) showed that, when men and women were doing the same job, there were no differences in their blood lead levels. Her key conclusion was that women had higher blood lead levels than men because more women worked in poorer-paying jobs with higher exposures. A similar circumstance of pesticide exposure in South Africa was examined in 2002. It was determined that the reason women had a higher prevalence of pesticide poisonings than men was because women did more seasonal work with high pesticide exposures and were more exposed than men. Women's occupation-related health problems are often misdiagnosed or attributed to other causes. More research must be done to further understand how environment affects health—specifically, how potential exposure to chemicals affects men and women differently. To address this concern, a research center was created at the Université du Québec à Montréal, Canada, that uses quantitative and qualitative methods to integrate gender, sex and research.

Climate Change

- **Aaron M. McCright**, PhD [Associate Professor, Lyman Briggs College, Michigan State University, USA] reported on the differences between women and men's beliefs regarding climate change. Men still claim they have a better understanding of global warming than women, even though women's beliefs align more closely with the scientific consensus (McCright, Aaron M., and Riley E. Dunlap. 2011. "Cool Dudes: The Denial of Climate Change among Conservative White Males in the United States." *Global Environmental Change* 21:1163-1172). A gender divide within climate science and global warming exists: evidence indicates that gender socialization dictates beliefs and concerns about climate change. A greater percentage of women than men, for example, believe that: the effects of global warming have already begun; pollution from human activities are the primary cause of global warming; global warming will threaten their way

of life; and that the seriousness of global warming is underestimated. Interestingly, this gender divide on climate change, also referred to as climate change denial, is not limited to the United States; 27 European countries were also surveyed.

- **Amelia H.X. Goh** [Associate Knowledge Management Officer, Environment, Social and Governance Department, International Finance Corporation (IFC), USA] presented her findings from a literature review of gender-differentiated impacts of climate change in developing countries (Sub-Saharan Africa, Southeast Asia, and Latin America). She highlighted the potentially disastrous impact of climate change on global agriculture and the poor. Poor, vulnerable and marginalized people are predicted to be the hardest hit by climate change. Her analysis showed that climate change affects women's and men's assets and well-being differently in six impact areas: agricultural production, food security, health, water and energy resources, climate-induced migration and conflict, and climate-related natural disasters. Ms. Goh's literature review included several key observations: (1) evidence of gender-differentiated impacts of climate change in developing countries is limited, varied and highly contextual; (2) women seem to suffer more negative impacts of climate change in terms of their assets and well-being because of their roles and because of social and cultural norms; (3) women cannot be treated as a monolithic group given other factors, such as race, ethnicity and role in the household; (4) it is important to see climate change in the context of differential gender roles; (5) when collecting gender-disaggregated data, asking the right questions is crucial to better understand if there are differences in the way climate change impacts women and men.
- **Margarita Velázquez Gutierrez**, PhD [Director, Regional Center for Multidisciplinary Research (CRIM) of National Autonomous University of Mexico, Mexico] described his research on sustainability and climate change from a gender perspective and defined a few important terms: *aridity* is a permanent water deficit, while *drought* is a temporary water deficit; *arid ecosystems* are places where evapotranspiration is higher than the volume of rainfall, while a *hyperarid ecosystem* is one type of arid ecosystem that receive less than 50-100 millimeters of annual rainfall. The most common misperceptions of arid ecosystems are that (1) they are empty, unproductive places where people cannot survive and (2) they cannot sustain plant or animal life. Using irrigation and limited pastoralism, communities thrive in these regions. There are, however, social science constructs to consider when discussing climate sustainability. Women and men have different roles, expectations and behaviors and cannot be studied as a homogenous population.

Food Security

- **Annemieke Farenhorst**, PhD [Professor of Soil Science, Faculty of Agricultural and Food Sciences, University of Manitoba, Canada] discussed gender equity issues in relation to food security and agriculture. In surveys of perceptions of farmers, children and the media overwhelmingly portray farmers as men who wear hats, wear denim overalls and hold pitchforks. Images of female farmers are less prominent and they are often portrayed as less confident. In North America, one in three farmers is a woman. Moreover, 43% of world farmers are women. Despite these statistics, farmers are not referred to using gender-neutral pronouns but as "he," causing researchers to examine whether or not women farmers are taken seriously and what, if any, differences exist

between male and female farmers. According to a 2010 report from the Food and Agriculture Organization of the United Nations, there are differences. Men have access to resources seldom available to female farmers (e.g., financing and technology). In what is coined the *Grass Ceiling*, women are overrepresented among lower income farmers. Grass ceilings exist not only at the farm level but also within the leadership of agricultural societies. With regard to food security and vulnerability of women in Latin America and Asia, differences in concerns about pesticide exposure exist. Women farmers are more at risk than men because their bare skin is exposed. Women farmers wear skirts, slippers and short sleeves while spraying pesticides. Often, mothers carry babies on their backs. Because men in these regions typically farm with long pants and shirts, their skin is less exposed and their threat of pesticide exposure is less than for women.

- **Burkhard Schulz**, PhD [Professor of Plant Biochemical and Molecular Genetics, Department of Horticulture and Landscape Architecture, Purdue University, USA] has investigated how research on sex differences in plant genetics lead to shorter and sturdier corn. As the most important economic crop in the world, corn production is increasing in Africa and Asia. Hybrid seed production has impacted food security and allowed agricultural regions harshly impacted by climate change to maintain corn farms and profit using a genetic trick of crossing different inbred parents to yield bigger, better corn. Hybrid corn seeds produce plants with only female kernels where male tassels should be present. This finding may help the seed industry by producing corn with female organs only and thus eliminate the laborious detasseling step in maize hybrid seed production.
- **Carmen Diana Deere**, PhD [Distinguished Professor of Latin American Studies and Food & Resource Economics, University of Florida, USA] focused on the relation between women's ownership of land and their roles in agricultural decision-making. Dr. Deere's research examined farm managers in developing countries (Ecuador, Ghana and India). Current data collection tends toward assuming the head of household is a man. This assumption excludes family farms and joint owners, and it ignores the participation of women. In many cases, women are land owners and the ones making decisions about farming. A consequence of this bias is that the data collected for gender-disaggregated analysis on farming systems ignores the participation of women in male-headed households. Decision-making varies by country, marital status and the form of land ownership (individual or joint). Specific decisions about what to grow, what to sell and how the income from sales will be used may not be made by male "heads." By not recognizing females as important decision-makers, the data on farming systems is inaccurate. Marital status is another important factor. Un-partnered women in all three countries studied have higher rates of participation than partnered women. This means that female heads of households participate in all decisions about their land. Dr. Deere's conclusion highlighted the importance of interviewing both men and women when determining land ownership.

Transportation

- **Catherine Morency**, PhD [Associate Professor, Department of Civil, Geological and Mining Engineering, Polytechnique Montreal, Canada] shared that in the transportation field, gender is not always considered in studies evaluating transportation safety or injury/death data. One example of why gender is important to transportation safety can be found in the development of safety airbags which were originally designed for a generic male weighing 175 pounds. The result of not considering gender in the design of airbags was that they were harmful or useless to a significant portion of the population, namely women and children.
- **Dipan Bose**, PhD [Transport Specialist, Global Road Safety Facility (GRSF), World Bank, USA] also reported that crash test dummies used to determine road safety, especially those for women and children, are not adequately representative. Current crash test dummies inaccurately represent gender, body mass and age and do not contain enough sensors to measure force. There is a need to redesign crash test dummies, especially for women and children, to more accurately represent average people and to collect a wider range of impact data. Additional sensors, including abdominal sensors, should be added. Moreover, female-specific injury assessment tools are recommended to collect biomechanical data unique to women. Given that road injuries are a major cause of death for all ages globally and the most important cause of death for 15 to 29 year olds, adequate representation is a matter of life or death.
- **Janet Brelin-Fornari**, PhD [Professor of Mechanical Engineering, and Director of the Crash Safety Center, Kettering University, USA] reported that educating young people about the importance of wearing seatbelts has contributed to a decrease in fatalities. Kettering University has a two-week residential program to introduce 11th grade girls to what engineers do and how they significantly improve people's lives by applying mathematics, science and technology to human problems. The program has found a substantial increase in seatbelt use among its program graduates, suggesting that educating people about the dangers of transportation can increase their safety awareness and personal practices.

Solutions and Best Practices

The 2013 Summit leveraged the international expertise across a variety of presentations and exhibits to advance the knowledge base with lessons learned and successful efforts in advancing the gender dimension in the scientific enterprise. The following table represents an integrative analysis that summarizes the intellectual contributions of the more than 130 presenters from the United States, Canada, Mexico, and across Europe. Specifically, the table links the solutions that have made a difference in promoting gendered innovation with best practices in various aspects of science and engineering, such as policy, institutional transformation, equity research and programs, mentoring, career advancement, budgeting, outreach and networking.

<i>Policy</i>	
<i>Solutions</i>	<p>Monitor compliance with Title IX and gender equality legislation (Improving Career-Life Balance, 2013).</p> <p>Go beyond legal compliance and promote gender diversity as an integral part of excellence by definition (Wise, 2013).</p> <p>Support more women in senior academic positions and on scientific boards who can influence not only science policy, but also the entire policy-making process (Ristori, 2013).</p> <p>Gender mainstreaming in regulation and policy is needed to improve access and participation of women in both public and private Mexican media industries (Montiel, 2013).</p>
<i>Best Practices/ Exemplars</i>	<p>Directorate for Biological Sciences at NSF has a policy statement that reinforces the inclusion of women and others from underrepresented groups in the planning activities and program agenda when seeking support for workshops and conferences (Ward, 2013).</p> <p>All NSF directorates are participating in the Career-Life Balance (CLB) Initiative. In addition to direct financial support to reduce the career barriers related to dependent care, NSF activities have included harmonizing family-friendly policy language in collaboration with NIH and the development and use of an implicit bias informational briefing for NSF program directors, reviewers, and principal investigators (Ward, 2013).</p> <p>NSF has integrated the legal requirement of IX with its core value of being broadly inclusive, to give a real focus on women commensurate with future excellence in NSF programs, panels and awards (Ward, 2013; Wise, 2013).</p>

The University of Illinois has a standing council on gender equity that guides policymaking on all aspects of the work environment – from salary, to child care to promotion and tenure – as well as an internal networking group to help women in the academy explore leadership opportunities within the University. Having permanent investments in the commitment to diversity is a starting point for ensuring that diversity is part of the university's DNA (Wise 2013).

NSERC revised its policy statement on gender equality to mandate stronger commitments to supporting opportunities for women to have successful careers in research (Blain, 2013).

NSERC published funding competition results and statistics to include breakdown by gender. As a commitment to accountability, these results are posted on the website within two months of the release of the competition results (Blain, 2013).

Important steps taken by McMaster University included the following: every major committee was required to have at least one woman member; undergraduates were engaged in research at beginning stages; and faculty searches had to include at least one candidate from an underrepresented group (Sekuler, 2013).

The inclusion of women and minorities in NIH funded or supported clinical research is mandated by law, 42USC 289a-2 (Sierra-Rivera, 2013).

Canada shared its written policy regarding peer review that “each committee should reflect the gender balance of the community it represents and, as a minimum, include two women and two men” (Blain, 2013).

The European Research Council's concern for gender balance in all phases of the ERC calls led to the creation of the Gender Balance Working Group, which in 2010 formulated a Gender equality Plan. There are three main objectives: to raise awareness of ERC gender policy among potential applicants in all research fields, to identify and challenge any potential gender bias in the ERC evaluation procedure, and to improve the gender balance within the ERC's peer review system (Vernos, 2013).

National Aeronautics and Space Administration (NASA) has conducted Title IX compliance reviews to see how NASA grantees are increasing gender diversity and prohibiting discrimination in their STEM education programs. The NASA review also involves an examination of the learning environment of the programs (e.g., program policies, student experiences in classroom and laboratory settings, faculty advising, high-stake testing, climate issues, etc.). This legal requirement has become a powerful vehicle for changes in STEM, including removing sources of gender bias and improving the program climate (Manuel, 2013).

Institutional Change/Transformation

Solutions

Five collaborative roles for institutions of higher education and learned societies in our various nations are (Falcone, 2013):

- I. Education and training: Gender issues relative to access and participation can improve the culture of teaching, promote sensitivity to cognitive knowledge and support the use of mentoring and role models.
- II. Research for advancing knowledge: Gender considerations in knowledge generation may include issues of access, climate and policies related to the research environment, as well as work-life.
- III. Delivery of economic benefits: The role and contributions of women in translating research into economic and societal benefits must be more intentional, purposeful and visible. Such focus can help attract and increase the participation of women in science and engineering, as the female perspective on product development is critical for economic benefit.
- IV. Excellence in doing research at IHE (Institutions of Higher Education) and in participating in professional meetings of learned societies: The emphasis is on how to frame good questions, seek answers and disseminate results broadly. Both partners are tasked to focus on policies and problems and both need the full engagement of women.
- V. Provision of high quality and technically informed policy advice: The professionals in our institutions and learned societies need the engagement of women in helping policymakers understand the impact of research for innovation, as well as the implications of the technical facts.

Universities must organize themselves to create graduate, postgraduate and faculty experiences where a diverse population results from a sustained, strategic and collectively shared commitment (Wise, 2013).
Institutional climate needs to be transformed to promote equal opportunities for the advancement of all faculty and the recruitment, retention and promotion of women of color scientists (Moore, 2013).

Majority-minority institutional linkages/ partnerships can be mutually beneficial (Posters about the NSF Louis Stokes Alliances for Minority Participation program).

<p>Best Practices/ Exemplars</p>	<p>The NSF AGEP (Alliances for Graduate Education and the Professoriate) program has been a successful example. Here the University is part of a consortium that is increasing the number of postdocs prepared for faculty positions and working with hiring committees to reduce bias and embrace diversity. The results are showing undeniable progress because of the intensive diversity focus of this partnership involving networks among public universities and networks between universities and federal agencies, as well as with private philanthropic foundations (Wise, 2013).</p> <p>JSU ADVANCE at Jackson State University is a model program that supports the scholarly careers of women faculty by fostering a climate and culture that seeks inclusion of all faculty regardless of gender, race and other characteristics, and informs the larger academic community about the unique challenges of women in general and women of color in particular (Moore, 2013).</p> <p>The collaboration between Kansas University (KU) and Haskell Indian Nations University has greatly enhanced Native American education in the biomedical sciences. In six years, KU has more than doubled the number of STEM American Indian students matriculating through their undergraduate program. Retention has also increased: 79% of students enrolled in the Haskell/KU Bridges program are retained, compared with 34% of students not enrolled in the Bridges Program (Linton, 2013).</p> <p>When NSERC started asking why scientists might have a gap in their research programs (e.g., children, illness), it allowed promotion and tenure committees across the country to begin consideration of those issues as well. When NSERC highlighted the role on mentoring in research, faculty responded. In areas where women are underrepresented on high profile awards or collaborative group grants, granting agencies could take a “comply-or-explain” approach: the more extensive and public the explanations, the more likely the compliance. Additionally, universities need to partner more with the business community. It should be possible for women to choose a move into the private sector while remaining connected to universities, thus enhancing mentoring opportunities for students and enabling a greater exchange of resources across sectors. Further, because technology has made it easy to connect globally, research and education no longer need acknowledge national boundaries (Sekuler, 2013).</p> <p>Partnering with organizations that have relevant expertise can expand opportunities for women (Cultivating and Promoting Future Leaders, 2013).</p> <p>It is beneficial to improve the alignment of career/funding incentives (faculty vs. universities vs. funding bodies vs. students/trainees), address the disconnect between the team nature of STEM vs. individual incentives, and better recognize non-traditional types of service (e.g., mentoring) (Empowering the Voices of Early-Career Scientists, 2013).</p>
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	<p>The current generation of researchers needs to be brought up to date in methods of sex/gender analysis through graduate courses and modern curricula (Integrating Gender into Research Content and Methods, 2013).</p> <p>Rewarding public scholarships and cross-sector collaboration has been key in changing the institutional culture from the outside in at Syracuse University. It has entailed the promotion of the departmental culture of self-assessment, professional development to learn how to engage industry, flexible faculty tracks, incentives for interdisciplinary research and a mix of scientific and public policy publications (Cantor, 2013).</p>
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Programming in Support of the Gender Research and Gender Equity

<p><i>Solutions</i></p>	<p>Embrace risk and challenges to traditional ways of thinking about and doing science, and support promising research agendas that reflect creativity and remove barriers to excellence and diversity in STEM (Ward, 2013).</p> <p>Ensure that funding is available for researchers to work at the intersections of knowledge (Sekuler, 2013).</p> <p>Ask applicants to explain how sex and gender analysis is relevant to their proposed research and adopt a “merit-related-to-opportunity” philosophy (Integrating Gender into Research Content and Methods, 2013).</p> <p>Provide reviewers with training so they can identify and reduce bias: where gender is a significant component in the topic of the research, ensure that it is appropriately incorporated in the methodology and collect data to monitor outcomes and detect bias (Ensuring Inclusive Excellence through Meritor/Peer Review, 2013).</p> <p>Strive to achieve gender balance in expert panels that reviews proposals (Omling, 2013).</p> <p>Provide gender equality funding to develop teaching in gender medicine. Establish a database on gender research contents that supports potential gender researchers. (Regitz-Zagrosek, 2013).</p> <p>Ask research applicants how they would integrate gender issues and stimulate recruitment of women researchers and research leaders (Borchgrevink, 2013).</p>
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<p>Best Practices/ Exemplars</p>	<p>The NSF Research on Gender in Science and Engineering (GSE) program has given increased attention to women of color, with one example being the annual conclave of women of color.</p> <p>The NSF Directorate for Engineering is coordinating research and education support for veterans, giving special attention to the needs of female veterans.</p> <p>Diverse Communities in STEM (an investment in novel methods to promote diversity in emerging fields of STEM) and the ADVANCE program (an investment in addressing structural issues at US universities that result in transformative policies, programs and practices in support of the recruitment, retention and advancement of women in academic careers) are addressing gender-specific concerns (Ward, 2013).</p> <p>Specific scientific competitions have been disseminated to attract a wider pool of women. The gender in research toolkit training is being delivered at all JRC sites and is also promoted among the external scientific networks of JRC staff. The toolkit aims to give researchers tools for integrating the gender dimension in research projects (Ristori, 2013).</p> <p>Canada is creating great numbers of interdisciplinary programs addressing large issues such as water, sustainability, neuroscience, and poverty (Sekuler, 2013).</p> <p>Canadian Institutes of Health Research call attention to the integration of sex and gender considerations in all of its funding opportunities (Johnson, 2013). Report the sex of research subjects. Recognize differences within groups and overlap between groups. Analyze and report results by sex and report null findings. Also, collect and report data on factors intersecting with sex, such as age, socioeconomic status, ethnicity, co-morbidities, reproductive status, etc. (Schiebinger, 2013).</p> <p>Gendered Innovations are being used for medical research training at the Institute of Gender in Medicine. A novel graduate course on myocardial hypertrophy was the first where gender was explicitly introduced in biomedical research training projects. Students were trained on sex and gender in cardiovascular disease. The formation of this course increased visibility and awareness of gender issues in medicine and facilitated the permanent incorporation of sex and gender in medical training. Several follow up research projects with gender considerations have resulted from this change in medical curriculum, along with recognition of gender as a research topic in biomedical areas (Regitz-Zagrosek, 2013).</p>
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Mentoring/Role Models	
Solutions	<p>Mentoring in particular was highlighted as necessary for encouraging more women to continue their education in science/engineering fields. Students represent the next generation of scientists and they should see more young women entering those careers. At the other end of the spectrum, senior administrators and full professors should be considered for leadership positions so they can serve as champions and role models for young women (Blain, 2013).</p> <p>Mentoring was found to be beneficial in one experimental study as well as hundreds of survey studies in STEM and outside of STEM. The mentoring circle approach works to normalize problems and facilitate group problem solving (Crosby, 2013).</p> <p>It is useful to increase the sense of belonging for women in STEM, expose boys early to successful women in STEM to dilute biases over the long term, increase the numbers of same sex mentors for women, decrease potential implicit attitudes, address diversity in the context of the organization objectives to increase buy-in from senior leaders, begin conversations acknowledging personal biases and provide leadership training earlier in career development (“Cultivating and Promoting Future Leaders”).</p>
Best Practices/ Exemplars	<p>In 1996, NSERC expanded to five the network of chairs for women in science/engineering. The Chairs for women in science/engineering are showing young women the range of career opportunities and demonstrating that there is no such thing as a traditional career (Blain, 2013).</p> <p>Mentoring/coaching circles/small group discussions on issues of concern are beneficial (Cultivating and Promoting Future Leaders, 2013).</p> <p>Multiple mentors are needed for different career paths/responsibilities, namely research, teaching, and service. Current discussion is shifting to the value of sponsors because they take a more pro-active role in nominating, suggesting and raising the profile of women (Rankin, 2013).</p> <p>Building Interdisciplinary Research Careers in Women’s Health (BIRCWH) is a very successful program for connecting junior faculty scholars with experienced mentors and collaborators, and for increasing their likelihood of obtaining research grants. The National BIRCWH program model is used in 29 sites across the U.S. and is an innovative, interdisciplinary initiative led by the NIH Office of Research on Women’s Health. It is a widely used model for interdisciplinary career development. BIRCWH projects provide a mentored environment for junior faculty to develop into successful, independent, clinical and non-clinical scientific leaders who conduct women’s health research and/or research into sex and gender differences. Factors associated with success include: measures ensuring sufficient protected time for</p>

	regular mentoring; mentors promoting the research independence of the scholar; a team mentoring approach, including career as well as content mentors; and explicit and clear expectations outlined between the scholar and mentor (Regensteiner, 2013; Guise, 2013).
Outreach	
Solutions	<p>Outreach activities aimed at girls in grades K-12 can plant seeds of interest in science and engineering and get them to consider and pursue STEM careers (Blain, 2013).</p> <p>The underrepresentation of women/girls in STEM is not a problem of girls' abilities or interests; it is the obstacles and stereotypes. Girls need to be empowered to make a choice to study science and engineering and progress through educational/career ladders. Women need to be encouraged to overcome their doubts, have access to networks and be promoted; family-friendly policies are needed at work; and positive images of scientists/engineers and women in science/engineering need to be encouraged at work (Payette, 2013).</p> <p>A number of health professions agree that sex and gender differences in individual well-being are important. Additional women's health topics are needed to enhance health professional knowledge. Although women's health topics exist in curricula, additional work is needed to translate some areas into practice and strengthen women's health competencies. One method for accomplishing this is to use web-based tools, technology, and interactive media to enhance women's health learning opportunities (Rice, 2013).</p>
Best Practices/ Exemplars	<p>The PromoScience grant holders have been successful in attracting students to a workshop on careers. Go ENG Girl, for example, is a province-wide event in Ontario for females in grades 7-10. Recently, 1600 girls, parents and volunteers at the event learned about programs and careers in engineering (Blain, 2013).</p> <p>Efforts are needed for the image problem surrounding engineering as a career choice. Future Ingénieure or Future Woman Engineer is designed to demystify the engineering profession for high school seniors by spending four hours to a day with an engineer or a group of engineers in the field of their choice (Ghazzali, 2013).</p> <p>It is beneficial to focus on youth as well as parents and teachers and to be sensitive to differences in perceptions since research shows that girls are more influenced by parents and teachers, while boys are more influenced by non-STEM role models (Cultivating and Promoting Future Leaders, 2013).</p>

	<p>Actua is a youth STEM outreach organization. The group believes that all youth should be reached. It has an Aboriginal outreach program, a “Go Where Kids Are” program, and a National Girls’ program. Activities include summer day camps, in-school workshops and other events. Actua’s work with aboriginal communities has engaged elders and bridged Western and traditional ways of knowing (Hall, 2013).</p> <p>The Fraunhofer Institute has designed new concepts for young female scientists to establish new ways of providing information on scientific careers. In particular, they’ve developed a workshop format for exposing early-career female scientist to multiple opportunities. This includes connecting art and design methods with methods for knowledge transfer and the sharing of CVs of scientists across disciplines. Participants, including students, learn what kinds of activities help build resumes for what careers. Workshops have been conducted in Berlin, TelAviv and Zurich, with each being a very different experience (Schrauner, 2013).</p>
<p>Employment and Advancement</p>	
<p>Solutions</p>	<p>Have diverse search committees. Hiring strategies should focus on diversity of thought, experience, and background. You can make the team as diverse as possible, but the organization is responsible for creating an environment for the team members to thrive (Upton, 2013).</p> <p>Increase participation of women in the evaluation committees and levels of management and representation, at least in a proportion that reflects their specific academic gravity (Bustamante, 2013).</p> <p>Hire a critical mass of women and minorities instead of continuing the practice of hiring a single individual who meets the need of the moment (Wise 2013).</p> <p>Create re-entry and re-training postdoc programs (Improving Career-Life Balance, 2013).</p> <p>Broad and transparent family-support policies can help recruit, retain and advance faculty in STEM. A common misperception is that career-life balance is a personal problem to be solved by each individual faculty member. By engaging the whole institution and the community in the exchange of ideas, as well as encouraging the use of policies, the design of systematic processes, collection and reporting of data, and the creation of systems for institutional assessment and accountability, family support policies can be integrated as an essential part of the institution (McDermott, 2013).</p>
<p>Best Practices/ Exemplars</p>	<p>Grow-Your-Own Practice: There is a five-year effort to bring doctoral students into the academy, train them well and recruit them into careers where they can be successful (Wise, 2013).</p>

Internships are one of the professional experiences that can influence career decisions. Even though male engineering majors are more likely to pursue engineering careers than women, for example, this gendered difference disappears if the engineering majors participate in a professional internship. The selection process for internships and job openings can create obstacles for women and underrepresented minorities. However, successful practices on how to make this process more equitable include the following: (1) when attending career fairs to recruit students, mirror in the recruiting team the types/diversity of students that the company would like to attract; (2) empower recruiters to hire or conduct interviews during the career fair – or otherwise reduce the number of steps required to hire an individual – as this will also reduce the amount of bias that goes into the selection process; (3) use “cluster hirings” as a strategy for increasing diversity – in addition to hiring a single individual, consider also making offers to her qualified friends, thus creating immediate social support and increasing productivity and employee retention; (4) use internship programs to help achieve diversity; and (5) utilize the dynamics of informal networking in the hiring process. This is crucial, as individuals are more likely to refer someone from their same gender and for positions in their own firms. These strategies can turn recruiting gatekeepers into recruiting integrators (Rubineau, 2013).

Project EDGE (Enhancing Diversity and Guiding Excellence) at the University of Illinois is designed to integrate diversity into faculty recruitment, student recruitment and budget activities. This work is revealing the value of cluster hiring by creating a critical mass of individuals applying for research grants that engage teams of people (Wise, 2013).

The STEM Women Faculty as Entrepreneurs at Ohio State University effort is working to inspire female entrepreneurship through Gender Initiatives in STEM. Project CEOS (Comprehensive Equity at Ohio State) sponsors a signature program called REACH to help women entrepreneurs and address the Entrepreneur Gender Gap. According to data, women are more risk-averse, not as comfortable with self-promotion, choose areas of research that are less amenable to commercialization and have smaller networks. All of this contributes to women having fewer opportunities to learn about or pursue commercialization efforts. Project CEOS addresses this by: introducing numerous pathways to entrepreneurship, providing a supportive network of female entrepreneurs, connecting women with resources on campus and supporting industrial networking connections (Juhás, 2013).

The European Commission has highlighted the need to promote better work-life balance – in particular, for adequate child care, more access to flexible working arrangement, and by making sure tax and benefit systems do not penalize second earners (Ristori, 2013).

	<p>Methods of supporting career-life balance at institutions with NSF ADVANCE awards include:</p> <ul style="list-style-type: none"> • Washington State University’s focus on support for child-care as well as elder care and back-up care, along with informational and emotional support initiatives (Leibnitz, 2013). • University of Maryland Baltimore County's emphasis on family support policies covering parental leave, flexible family leave, automatic tenure clock extension, and modification of duties to sustain research (McDermott, 2013). • University of Rhode Island's modeling of best practices for dual career hiring – URI is nationally recognized for formalizing a dual hire policy in which they are committed to offering placement advice and assistance when feasible and appropriate. This policy has influenced formalized guidelines for procedures in advertising, providing information, responding to and accommodating requests for dual career assistance, and monitoring the process (Silver, 2013). <p>Additionally, important strategies for postdoctoral fellows include not only educating postdocs on the resources available and helping them create a connected community but have career-life policies (e.g., maternity leave, child-care, and travel subsidies to conferences for dependents) as an essential aspect of increasing the recruitment of female candidates to STEM tenure-track faculty positions (Johnson-Phillips, 2013).</p> <p>The NSF ADVANCE program funds projects to develop systemic approaches to increase the representation and advancement of women in STEM faculty positions in universities (Methods of Supporting Career-Life Balance in Institutions, 2013).</p> <p>The Chairs for Women in Science and Engineering Program was established in 1996 to increase the participation of women in science and engineering (S & E) and provide role models for women active in or considering S & E careers in Canada. This NSERC model is a very successful, multifaceted program that fosters science promotion, outreach and research partnerships. Five regional chairs are selected for appointments across Canada. They focus on addressing regional needs of vast areas and developing targeted programs to address unique regional needs. This national component allows synergy among chairs and institutions to develop national projects. Chairs serve an initial term of five years, renewable for three years. Since the Chairs are selected from Canadian universities, they are able to maintain their research programs via funding that supports postdoctoral fellows while the Chair is in the program. As a peer reviewed program, it has been evaluated and improved and offers a unique and innovative approach to promoting women scientific leaders (The NSERC Model: Chairs for Women in Science and Engineering Program, 2013).</p>
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STEM Environment	
Solutions	<p>Ensure a holistic approach to recruitment, retention, career development, and a respectful work environment (Ristori, 2013).</p> <p>Gender diversity in science boosts creativity and innovation by adding complementary knowledge, skills and experience. Diversity also brings more alternatives in research; therefore, mixed research teams are needed (Ristori, 2013).</p> <p>Ensure successful collaboration and interaction in interdisciplinary and collaborative sciences by including effective technologies, establishing shared assets and/or knowledge-based alliances, and gaining buy-in-by providing clear incentives for joining and contributing to interdisciplinary and collaborative science initiatives. (Winter, 2013).</p> <p>Change stereotypes, create threat-free environments, foster community and belonging, increase awareness and education, provide training in recognizing and minimizing cues to threat and demand accountability (Transforming the Role of Gender in STEM and in Communication, 2013).</p> <p>Increase the representation of women in STEM leadership, enhance the climate and credit to women, broaden definitions of research and service to allow recognition of diverse approaches, enable and educate about flexible career paths, and enhance funding opportunities for women (Enabling Organizational Systems and Processes, 2013).</p> <p>Develop frameworks for more inclusive leadership that include personal strategies (e.g., maximizing potential within set constraints); organizational strategies (e.g., revising policies, practices, etc.); and governmental strategies (e.g., policies and laws such as the Equal Pay Act) (Holloway, 2013).</p> <p>Attend to the following areas in postdoctoral training to ensure secure and sustainable STEM careers: formal and informal mentoring, consideration of career-life issues, improved training for non-academic jobs, education about the job market, and networking opportunities (Harvey, 2013).</p> <p>Include women in administrative network and actively recruit women as Deans, Department Chairs, Center Heads and Presidents.</p> <p>Reward administrators who successfully recruit exceptional women and minority candidates (Hopkins, 2013).</p> <p>Encourage teamwork with equal opportunities (Bustamante, 2013).</p> <p>Introduce a Gender Indicator into the EU Innovation Union Scoreboard, as well as national and international indicator systems. (Borchgrevink, 2013).</p>

The JRC competition notices highlight the JRC's commitment to equal opportunity and non-discriminatory practices in the workplace. Publicity included outreach to women in science networks, dissemination through top universities in member states and social media, as well as through promotion events (e.g., fairs, career days). These efforts are producing tangible results. Last year, for example, 50% of senior- and middle-management recruits were women. This included the appointment of a female director of the largest JRC Institute, the Institute for Environmental Sustainability (Ristori, 2013).

Engineers Canada supports and encourages diversity in engineering. Their goal is to have women be 30% of newly licensed engineers by 2030. The strategies being used to increase women in science and engineering are: raising the profile of engineering degrees, encouraging girls to consider engineering careers, marketing to recruit more girls into the field, fostering bridge programs, creating a welcoming workplace and fighting for salary equality. Engineers Canada is trying to encourage people who may not consider engineering to take a closer look. Career Focus is a decision support tool for high school students that predict the likelihood of success in engineering, based on 86 different traits (Allen, 2013).

Visit toolsforchangeinstem.org to learn additional best practices for dealing with gender bias at the individual level (Williams, 2013).

Career development resources for early stage female scientists include:

- ADVANCE grants help women faculty members. WISE supports undergraduate mentoring program; this program has students with higher GPAs, when compared with students in non-WISE projects. (Emerson, 2013).
- BIRCWH grants for junior faculty scholars. Scholars are paired with accomplished mentors in women's health.
- BIRCH program at NIH is focused on women's health:
(<http://orwh.od.nih.gov/interdisciplinary/bircwh/>)
- The AWIS Work-Life Integration Toolkit helps women in the areas of personal life, career and community through workshops, case studies, and discussions (Dean, 2013).
- "Beyond Solutions for retaining a robust STEM workforce" (AWIS) will be released in February 2014.
- Women Leadership Program-SETT.
(<http://www.ccwestt.org/LinkClick.aspx?fileticket=RrHHdm73NTQ%3D&tabid=56>)

	<ul style="list-style-type: none"> • Caterpillar (Building Engineering Skills and Talent-BEST) (Delvecchio, 2013). • “Just Desserts” seminars provide opportunity for women to eat desserts, share experiences of success and connect with other women (New Approaches to Career Development Support for Early Stage Female Scientists, 2013). • ELAM (Executive Leadership in Academic Medicine) is a year-long professional and personal development program (Geller, 2013). <p>Workplace strategies to stay on the fast track include: leaves (e.g., paid maternal leave, parental leave for fathers and mothers, centralized funding form maternity and parental leaves, family leave for up to a year at any time to accommodate family illness), part time track of up to five years with right to return to full-time, stop the clock for promotion policies, and childcare (e.g., childcare center with spaces for infants, secure childcare positions for recruitment purposes, offer dependent care travel grants, and emergency childcare) (Mason, 2013).</p>
International Engagement	
Solutions	<p>We are in a position to bring science and engineering technology together in practical ways to help developing countries and empower women to utilize their intellect on behalf of their populations and bring about economic benefits (Colwell, 2013).</p> <p>Professional organizations can use their global influence to improve the standards of living for populations across the world and increase their access to basic needs.</p> <p>International collaboration is important for gender equity and the gender dimension in science and technology (Geoghegan-Quinn, 2013).</p>
Best Practices/ Exemplars	<p>The US Patent and Trademark Office has made positive global impact on empowering young people and underserved populations by using patents and intellectual property to collaborate globally. The USPTO is proud that 36% of their workforce is female. In February 2012, President Obama announced the USPTO Patents for Humanity Program which was designed to solve long-standing challenges in the developing world. The Program was a competition to recognize patent owners and licensees who brought affordable, scalable, sustainable and life-saving technologies to underserved regions of the world. The pilot program went from February 2012 to April 2013 and provided business incentives for doing social good. There were five categories for patent applicants: medicines and vaccines, devices and diagnostics, nutrition, clean technology and information technology. More than 80 submissions were received. Program judges selected a diverse group of winners with a wide range of solutions that benefit humanity (Rea, 2013).</p>

	<p>The American Society of Mechanical Engineers (ASME) collaborates with other organizations to build affordable solutions for populations in developing countries. The Engineering for Change Initiative (www.engineeringforchange.org) provides an open platform to foster collaborations among parties (e.g., local governments, NGOs, community advocates, social scientists, engineers and technologists) in order to offer solutions that improve the quality of life of populations around the globe. To be sustainable, it is important that these solutions be sensitive to cultural issues and adapt to the social and economic context of the targeted populations. Consequently, it is important to foster partnerships that include different perspectives. By creating bridges between potential collaborators and providing needed resources, organizations like ASME can transform themselves from gatekeepers to equity advocates (Kotb, 2013).</p> <p>Professorship for Gender and Diversity in Engineering (GDE) bridges teaching and research by incorporating guidance from university administration and companies to foster interdisciplinarity, dialogue, and internationalization. Recognizing that current economic, social, and political conditions demand new strategies for addressing global challenges, GDE integrates gender and diversity aspects into curricula and focuses on innovative research that emphasizes how gender and diversity impact major global challenges such as health, demography, and climate issues. (Leich-Scholten, 2013).</p>
Gender Budgeting	
Solutions	Reduce gender disparities through gender budgeting that involves systematic examination of budget programs and policies for impact on women (Stotsky, 2013).
Best Practices/ Exemplars	<p>Reducing gender gaps leads to faster growth, which justifies government intervention. It can also lead to greater economic stability, thus reinforcing that good gender budgeting is good economics. Gender budgeting, which has gained prominence in recent years, refers to the systematic examination of budget programs and policies for their impact on women. The goal of gender budgeting is to examine how the budget (which controls the agenda) impacts women, and how to address gender gaps by a focus on where those gaps are and how they can be most effectively addressed (Stotsky, 2013).</p> <p>Make visible the products and systems that incorporate the smartest aspects of gender considerations, in order to stimulate new markets, global competitiveness and sustainability (Integrating Gender into Research Content and Methods, 2013).</p>

Networking, Convening and Dissemination

<p>Solutions</p>	<p>Survey networking approaches among communities of practice and disseminate findings; research what works to create and sustain networks; identify best practices; address the reluctance of some professionals to network, especially young professionals; adopt networking as standard practice among stakeholders. Also create bridges among the different generations, experiment with new networking strategies to diversify their membership, highlight available tools to enable collaborations (Creating and Sustaining Networks, 2013).</p> <p>Report null findings in sex differences; require sex and gender analysis when selecting papers (Integrating Gender into Research Content and Methods, 2013).</p> <p>Further open access of science and data to encourage networking, collaboration, improve technology transfer through education of stakeholders and allow access to scholarly publications and worldwide statistics (Pioneers Trailblazing the Future, 2013).</p> <p>Publish statistics on race and gender, make incentivized recommendations, develop guidelines, and create widely accessible toolkits, host trainings and mock panels (Creating Bridges with European Funders, 2013).</p> <p>Develop and implement a communication and networking strategy to ensure regional and national impact on opportunities for women in science and engineering (Ghazzali, 2013).</p>
<p>Best Practices/ Exemplars</p>	<p>Canadian Women’s Summit was held in 2010, focused on maximizing opportunities and developing achievable steps toward supporting career development for women. The Summit examined what business and higher education were doing to attract and retain women in science and engineering careers, discussed effective strategies, and outlined steps that organizations could take to encourage more women in science and engineering (Blain, 2013).</p> <p>Inter-American Network of Academies of Sciences (IANAS) brings together the efforts of 23 national academies in North, Central and South America to promote collaboration, transform the academies into independent actors, and provide advice to their respective governments. IANAS’s program for Women for Science, which has been in effect for four years, aims for full inclusion and empowerment of women in science and technology. The Program has organized groups to address gender issues. One project is to collect inspiring biographies of women scientists and publish them to attract the attention of decision-makers and inspire young people (Laclette, 2013).</p> <p>Acknowledging the fact that sex matters, the Society for Women’s Health Research (SWHR) has an extensive history for advocating on behalf of research into sex to encourage understanding of sex differences and establish best</p>

practices. Using education and outreach, SWHR has raised awareness by publishing in women’s health magazines and an open access journal, *Biology of Sex Differences*; partnering with the FDA; and requesting that journals publish articles that include sex in findings (Greenberger, 2013).

The Women in STEM Experts Portal is a public database that maps the intellectual network of female researchers at Northwestern, the University of Chicago, Fermilab and Argonne National Lab. The portal currently profiles 158 women; 300 will be added in the next few months, all in an opt-in model. The information about participants was obtained via data mining from publications (including all SCOPUS data), LinkedIn and other sources, but participants are able to edit and correct their profiles. This service links and exposes the connections between female researchers at these institutions. The database also connects researchers to those on other networking systems, is accessible to other federated networking programs, and has a variety of visualization and analytics tools. This project aims to make women more visible and discoverable, and it should also be beneficial for others. The data are in the public domain, so it should be useful for social science researchers. Further research will be enabled by de-identification of the data, with a goal of evidence-based interventions. Efforts are underway to add other types of publications, such as book-based publications, with plans for automation in about six months. Future efforts also include identifying networking with men (Falk-Krzesinski, 2013).

Networking to foster a diverse environment has the potential to deliver business results, attract new or more diverse talent, fuel the innovation pipeline and give back to the community (Butler, 2013).

Multi-faceted communications campaign is most impactful when it covers a messaging matrix for recruitment to the STEM professions through outreach efforts at elementary and secondary schools and university-based program to retain and attract more women to S&E fields as well as the retention and the advancement of those professionals already employed. Such a campaign includes the precollege message that there are opportunities for you in STEM, the postsecondary message that STEM professionals are helping to make the world a better place through innovation, and the messaging of the responsibility of STEM professionals that you have the opportunity to share your story and inspire the next generation of STEM women (Mavriplis, 2013).

The Society of Women Engineers (SWE) was founded in 1950 to empower women establish and succeed in engineering careers. SWE helps women to advance in their career aspirations and receive the recognition and credit for their life-changing contributions and achievements as engineers and leaders (Shanahan, 2013).

Next Steps

An outcome of this Summit is to build on the extensive evidence available and jointly develop a Roadmap for Action, which will set out specific milestones to be achieved by various stakeholders within the scientific enterprise. Key points and recommendations from concurrent roadmap sessions will help frame the details of the Roadmap for Action and are the drivers for challenging an immediate response of appropriate, beneficial and impactful actions to achieve gender diversity and gender equality.

Participants were reminded that there will be future summits, bringing scientists, gender scholars and policy makers together to understand and integrate the four Gender Summit areas: Science Knowledge-Making, Institutional Practices, Human Capital Development and Compliance with Regulations (Pollitzer, 2013). Moreover, **Nancy Cantor**, PhD [Chancellor and President, Syracuse University, USA] reminded all that gender equality is both a problem to solve and an enormous opportunity for global benefit. Gender Summit 3 – North America provided a catalytic opportunity to transform the scientific enterprise and advance the following multi-national call to action.

Cultivating and promoting women for future leadership roles

Cultivating and promoting future leaders is important because organizations need a pipeline of diverse talent to equip them for a diverse set of future leaders. Leadership is a learned behavior, to be undertaken early. Some achievable actions and measures for cultivating and promoting future leaders are: having mentoring/coaching circles and small group discussions about issues of concern; using group problem-solving to promote employee-led initiatives and insight groups to provide recommendations to management; partnering with organizations that have expertise in expanding opportunities for women; focusing efforts on youth, as well as parents and teachers; being sensitive to differences in perceptions, given that research shows girls to be more influenced by parents and teachers, while boys are more influenced by non-STEM role models (Villemure, Cohen, Crosby, Buitendijk, Upton & Franz-Odenaal, 2013).

Empowering voices of early-career scientists

Understanding the science landscape and how the science enterprise functions is essential to effective career development. Strategies that make the knowledge of opportunities and obstacles less opaque can facilitate more informed and effective career development decisions. The priorities and objectives for empowering voices of early-career scientists are to adopt policies that (a) ensure that science is an attractive and viable long-term career option, especially given the special circumstances women face (e.g., family building years and responsibilities), (b) improve institutional and funding support for women at critical stages of their careers (e.g., postdoctoral years, pre-tenure) and (c) target issues of particular importance for determining outcomes in the early career stage (e.g., work/ life balance, dual careers) (Sargent, Kelly, Harvey, Alonso, Rubin, Melnyk, Ault, & Cobb, 2013).

Integrating gender into research content and methods

Sex and gender bias in research is expensive in personal terms and in terms of financial costs. It further limits scientific creativity and excellence that benefits society. It is important to recognize that science sometimes ignores gender when its inclusion would be beneficial and that meritocracy sometimes limits gender equity. The current omissions of

sex/gender as a variable in study design, the unintended sex/gender bias in research analyses and the under- or non-reporting of data by sex needs to be corrected in order to improve both quality and efficacy of research and innovation. In integrating gender into research content and methods, priorities and objectives are to: (a) integrate sex/gender analysis into each step of the scientific process; (b) analyze why, in meritocratic systems, women academics (as a group and individually) are judged less able, less deserving and less valuable; and (c) understand gender differences and similarities in healthcare. Increased diversity in STEM is critical for better research, new ideas and an improved knowledge base (Tagüeña, Miller, Greenspan, Schiebinger, Oliffe & Cooper, 2013).

Improving career-life balance

Providing women and men with the same opportunities to do scientific work and also have time for family life and other commitments should be feasible in the 21st century. The priorities and objectives for improving career-life balance are to (a) support career development decisions at all ages and stages, (b) support postdocs and early-career scientists and engineers, (c) make provision for child and elder care, (d) increase the advocates that serve as role models, mentors, coaches, champions and sponsors and e) develop and support institutional policies that recognize and account for career-life balance (Pollitzer, Tull, Ward, Mason, Jameson, & Ghazzali, 2013).

Creating and sustaining networks

Professional networks are an essential component of contemporary science. Networking is important for professional development and effectiveness: it promotes diversity and enhances research productivity, it builds social capital and provides access to tacit knowledge and it is important for implementation of diversity objectives in research and innovation policies. The value of networking is proven for both institutions and individuals; the challenge is to capture these values. Successful approaches to networking range from linking different fields and sectors to using networks as tools for the professional empowerment of women and as opportunities to influence attitudes around their professional advancement (D'Amours, Proctor, Rankin, Butler, Steffen-Fluhr, & Shanahan, 2013).

Transforming the role of gender in STEM and in communication

Women face gender bias in the workplace and are chronically under-represented in media industries. This under-representation potentially reinforces negative perceptions. Additionally, in terms of the deliverer's and receiver's perceptions, women and men communicate differently. The priorities and objectives for transforming the role of gender in STEM and in communication are to (a) document the extent of under-representation, (b) identify the intricacies of gender biases, to better understand how social context influences interactions, (c) identify the psychological aspects of these interactions and (d) understand the differences in communication styles that exist between men and women (Graydon, Pell, Smith, Vega Montiel, Mavriplis, Schmader, 2013).

Ensuring inclusive excellence through merit/peer review

Peer review, the most important component of effective science knowledge-acquisition, must be a fair and efficient process that acknowledges known gender issues while improving the transparency and quality of decisions made. It is important to develop a more complete

understanding of the way the evaluation process works in different settings, to develop a deeper understanding of the merit review process – from the way funding opportunities are designed and communicated, to what awards are made – and to develop effective techniques for mitigating bias in the merit review process (Meacham, Bonier, Droegemeier, Omling, Blain, Sierra-Rivera, & Lamont, 2013).

Enabling organizational systems and processes

Structural changes are needed to improve established institutional practices and processes and to ensure that institutions treat their female and male researchers in the same way, so that research cultures do not unfairly benefit the advancement of men. The work for these pressing changes requires the engagement of everyone, especially leaders at the top of organizations, men in STEM who advocate for women and gender equality, people with power and knowledge and strong women role models (Croft, Grumbling, Hopkins, Cantor, Diez, and Manuel, 2013).

Pioneers trailblazing the future

The influential actions of individuals who work within the scientific enterprise and who hold leadership positions can create a vision and the right conditions to challenge established cultures and attitudes about gender roles. Trailblazing is needed. These pioneers need to be honored for their influential efforts, as they also encourage others to follow their lead. To counter biases against gender/sex that limit the potential for excellence in the educational workforce pipeline, trailblazers help counter economic gaps in gender/sex and workforce inequalities among cultural, ethnic and LGBT communities. Trailblazers are important in improving the welfare of all communities and populations (Mack, Filart, Woteki, Armour, Regitz-Zagrosek, & de la Torre, 2013).

Creating bridges with European funders

Making the science endeavor more sensitive and responsive to the needs and talents of both women and men requires cross-border and cross-institutional collaborations on a number of levels, from setting out research priorities to creating a research environment that recognizes and prevents gender inequalities and biases in knowledge production, application and communication. Creating bridges with European funders is important to increase excellence in research by improving women's participation, fostering gender equality (gender balance, mitigating unconscious bias) and the integration of the gender dimension in funded research. It is also important to share best practices and collaborate to reach collective goals (Madriaga, Pépin, Vernos, Borchgrevink, Reichwein & Beales, 2013).

Continue to visit the GS3 website to learn of opportunities to maintain the momentum of the Summits and contribute to your country's work in incorporating the gender dimension in human capital development, research and innovation in the scientific enterprise. The expectation is for you to become a visible partner in continuing the theme, *Diversity Fueling Excellence in Research and Innovation*.

Acknowledgements

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Appendices

Appendix A

The US National Science Foundation (NSF) is an independent federal agency created by Congress in 1950 "to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense." With an annual budget of about \$7 billion (FY 2012), the agency is the funding source for approximately 20 percent of all federally supported basic research conducted by America's colleges and universities. In many fields such as mathematics, computer science and the social sciences, NSF is the major source of federal backing. The agency fulfills its mission chiefly by issuing limited-term grants—currently about 11,000 new awards per year, with an average duration of three years—to fund research proposals that have been judged the most promising by a rigorous and objective merit review system. Most awards go to individuals or small groups of investigators. Others provide funding for research centers, instruments and facilities that allow scientists, engineers and students to work at the frontiers of knowledge.

Appendix B

The Natural Sciences and Engineering Research Council of Canada (NSERC) is a federal agency that makes investments in people, discovery and innovation to increase Canada's scientific and technological capabilities for the benefit of all Canadians. With an annual budget of \$1.1 billion, the agency supports almost 30,000 post-secondary students and postdoctoral fellows in their advanced studies. NSERC promotes discovery by funding approximately 12,000 professors every year and fosters innovation by encouraging over 2,700 Canadian companies to participate and invest in post-secondary research projects.

Appendix C

The National Council on Science and Technology of Mexico (CONACYT) is an autonomous government organization created by the Mexican Congress in 1970, with responsibility for the elaboration of Science and Technology (S&T) policies. The agency's main goal is to create a National System of S&T able to respond to the demands of society and improve the quality of life of Mexico's population. CONACYT works to promote S&T in society, innovate towards the development and application of knowledge, link S & T with the private sector and strengthen institutional capacity for scientific, technological and humanistic research. To achieve its goals, CONACYT funds 27 Research Centers specialized in science and technology, innovation, social sciences and humanities. The organization makes hundreds of grant awards for undergraduate and graduate studies in Mexico and other countries, issues the monthly publication of the "Science and Development" Journal and provides funding for research proposals and for the collaboration of Mexican researchers with the international scientific community.

Appendix D

The National Institutes of Health (NIH), a component of the US Department of Health and Human Services, is the largest source of public funding for medical research in the world and the driving force behind many health advances in the US and throughout the world. NIH is the primary US federal agency conducting and supporting basic, clinical, and translational medical research to help prevent, detect, diagnose and treat diseases and disabling conditions. NIH plays a key leadership role in encouraging young people to pursue careers in science and medicine, providing them with training at all levels of their careers, both at universities and research institutions across the country and at NIH itself. This sustained commitment to training the next generation of researchers and maintaining a diverse and inclusive pool of scientific talent will help maintain the US position as the world's leader in biomedical research. NIH funds and conducts scientific studies and supports research training in all 50 states and internationally.

Appendix E

The Canadian Institutes of Health Research (CIHR) is the Government of Canada's health research investment agency. CIHR's mission is to create new scientific knowledge and to enable its translation into improved health, more effective health services and products and a strengthened health care system for Canadians. Composed of 13 Institutes, CIHR provides leadership and support to more than 14,100 health researchers and trainees across Canada.

Appendix F

Portia Ltd, in association with the European Commission, designs and implements effective strategies for gender equality in science, engineering and technology. Work is organized around four key elements: evidence, dialogue, consensus and actions. Using this methodology, Portia creates effective strategies that promote gender equality in: science knowledge-making, its applications and communication; science and engineering disciplines; education; research and innovation; and the commercialization of technical knowledge. The

evidence — recent empirical studies, critical reviews, evaluated examples of good practice — starts the process and frames the content of the dialogue, the consensus and the actions. A demonstration of how this works in practice is provided by the genSET project where a panel of science leaders considered evidence from more than 120 research studies to establish a consensus on recommendations for action targeting science institutions. The Gender Summit began in 2012 as part of Portia's genSET project, in partnership with the European Science Foundation. It has since evolved into an influential, high-level platform that brings together scientists from diverse fields, policy makers in science-related areas, gender scholars and the R&D industry.

Inner Cover Art

The word cloud on the cover is a visualization of the words used in this summary. The most prominent words are highlighted based on frequency of use. A word cloud is a beautiful, informative image that communicates much in a single glance.

DAY ONE

Video Addresses from European Leaders

- **Oldřich Vlasák**, Vice-President of the European Parliament, Europe
- **Marie Geoghegan-Quinn**, Commissioner for Research, Innovation & Science, European Commission, Europe

Keynote Address

- **Valerie Jarrett**, Senior Advisor to President Barack Obama and Chair of the White House Council on Women and Girls, USA

Plenary Panel: Develop a Collective Commitment to Strengthen Human Capital Development, Research and Innovation through Diversity

Chair and Summit Overview: **Wanda E. Ward**, PhD, Head, Office of International and Integrative Activities, **National Science Foundation (NSF)**, USA

- **European Commission (EC)**, **Dominique Ristori**, Director General, European Commission Directorate General Joint Research Council, Europe (video)
- **Natural Sciences and Engineering Research Council of Canada (NSERC – CRSNG)**, **Isabelle Blain**, Vice-President, Research Grants and Scholarships Directorate, Canada
- **The National Council on Science and Technology of Mexico (CONACYT)**, **Julia Tagüeña**, PhD, Deputy General Director of Scientific Development, Mexico

Plenary Panel: Develop Joint Policies for Innovation and Partnership in STEM Higher Education as a Means of Widening Access to Knowledge

Chair: **Patricia Falcone**, PhD, Associate Director, White House Office of Science and Technology Policy, USA

- ***Developing an International Network on Emerging Scientific Frontiers and Addressing Issues of Women in Science in a Global Context***
Rita Colwell, PhD, Chair of Canon US Life Sciences Inc. and Distinguished Professor, University of Maryland and Johns Hopkins University Bloomberg School of Public Health, and former Director of NSF, USA
- ***Partnerships for Wider Access to Quality Higher Education***
Phyllis Wise, PhD, Chancellor, University of Illinois at Urbana-Champaign, USA
- ***Educating for Standards Led Technology Transfer***
Rocío Cassaigne Hernández, Intellectual Property Manager, CIATEQ, Mexico
- ***Building Partnerships to Advance the Educational Experience and Research Opportunities***
Allison B. Sekuler, PhD, Associate Vice-President & Dean, Graduate Studies, Canada Research Chair in Cognitive Neuroscience, Professor of Psychology, Neuroscience & Behavior (PNB), McMaster University, Associate Member, The Brain-Body Institute, Canada

Keynote Address and Lunch

- ***Introduction of Speaker***
Joy Johnson, PhD, Scientific Director of the Institute of Gender and Health (IGH), Canadian Institutes of Health Research (CIHR), Canada
- ***Keynote speaker***
Julie Payette, MAS, Chief Operating Officer, Montreal Science Centre and Vice-President of Canada Lands Company; Former NASA/CSA Astronaut, Canada

Plenary Panel: Demonstrate Evidence of How Incorporating Sex and Gender Consideration into STEM Research and Innovation Informs Policy

Chair: **Juan Pedro Lactette**, PhD, Professor, National Autonomous University of Mexico, Co-Chair of the Interamerican Network of the Academies of Science at the Mexican Academy of Sciences, Mexico

- ***Improving the Efficacy of Vaccinations for Women, Men and Children and Consequences for Public Health Policies***
Sabra Klein, PhD, Assistant Professor, Molecular Microbiology and Immunology, Johns Hopkins Bloomberg School of Public Health, USA
- ***The Prevalence of Science-Gender Stereotypes and its Impact on Education and Policy***
Brian Nosek, PhD, Associate Professor, Department of Psychology, University of Virginia, USA
- ***Encouraging Young Women to Study Engineering and Sciences, and Enhancing the Status of Women in the Profession***
Ruby Heap, PhD, Professor, Department of History at the University of Ottawa, Coordinator of the University of Ottawa Women in Engineering Research Group, Canada

DAY TWO

Keynote Address

- ***Introduction of Speaker***
Julia Tagüeña, PhD, Deputy General Director of Scientific Development, The National Council on Science and Technology of Mexico (CONACYT), Mexico
- ***Keynote speaker***
Ana María Cetto, PhD, Professor of the Institute of Physics, and lecturer, Faculty of Sciences, Universidad Nacional Autónoma de México (UNAM), Mexico

Plenary Panel: Harnessing Gender Dimensions to Address Global Scientific and Societal Challenges

Chair: **Simone Buitendijk**, PhD, MPH, MD, Vice-Rector Magnificus and member of the Board of the Leiden University; Professor and Chair of Women's and Family Health at the Leiden University Medical Center, Netherlands, Europe

- ***Cross Border Research Collaboration***
Subra Suresh, PhD, President of Carnegie Mellon University, former NSF Director, USA (Video)
- ***Patents for Humanity: Building a Better Modern World***
Teresa Stanek Rea, JD, Deputy Under Secretary of Commerce for Intellectual Property and Deputy Director of the US Patents and Trademark Office, USA
- ***Why Gender Budgeting Empowers Women and Can Boost Economic and Social Development***
Janet Stotsky, PhD, Advisor, Office of Budget and Planning, International Monetary Fund, USA
- ***Women and Agricultural and Nutritional Knowledge***
Amanda Gálvez, PhD, Professor, Department of Food and Biotechnology, National Autonomous University of Mexico, Mexico

Parallel Sessions: Stream 1 – Diversity in Participation

1. Equity for Excellence in Research Teams

Discussant: **Kellina Craig-Henderson**, PhD, Deputy Division Director, Directorate for Social, Behavioral and Economic Sciences, National Science Foundation, USA

- ***Problem Solving Strategies in the Labs of Female and Male Researchers*** **Kevin Dunbar**, PhD, Professor of Human Development and Quantitative Methodology and Director of Laboratory for Scientific Thinking, Reasoning, & Education, U of Maryland College Park, USA

- ***How Gender Balance of Teams and the Gender of Team Leaders Influences Team Performance***
Rosalind Chow, PhD, Assistant Professor of Organizational Behavior and Theory, Tepper School of Business, Carnegie Mellon University, USA
- ***Balancing Risk Taking by Balancing Gender***
James P. Byrnes, PhD, BS, Department Chair and Professor of Educational Psychology, College of Education, Temple University, USA
- ***Performance and Women's Performance on Boards***
Nancy M. Carter, PhD, Senior Vice President, Research, Catalyst, USA

2. Openness and Diversity in Innovation and Collective Problem Solving

Discussant: **Janet Abbate**, PhD, Associate Professor and Co-Director of Graduate Program in STS

- National Capital Region Campus, Virginia Tech, USA
- ***Task and Compositional Factors in Individual and Group Problem Solving***
Stephen M. Fiore, PhD, Associate Professor of Cognitive Science, University of Central Florida, USA
- ***Innovating Together the New Future of Electronics***
Krunali Patel, MS, Business Manager, Storage Products Group, Texas Instruments (TI), USA
- ***Discovering Markets with the Help of Citizens***
Martina Schraudner, PhD, Head of the Department of Gender and Diversity in Organizations, Technical University Berlin, and Director of Responsible Research and Innovation Unit, Fraunhofer Gesellschaft, Germany, Europe
- ***STEM Women Faculty as Entrepreneurs***
Mary Juhas, PhD, Associate Vice President, Gender Initiatives in STEM, Office of Research, Clinical Professor, Materials Science & Engineering Co-investigator, Project CEOS (Comprehensive Equity at Ohio State), An NSF ADVANCE Program Award, Ohio State University, USA

3. Opportunities and Challenges for Women of Color in STEM and Society

Discussant: **Kelly Mack**, PhD, Vice President for Undergraduate Science Education and Executive Director, Project Kaleidoscope, Association of American Colleges and Universities (AAC&U), USA

- ***Supporting Scholarly Careers of Underrepresented Faculty***
Loretta A. Moore, PhD, Interim Vice President for Research and Federal Relations and Professor, Department of Computer Science, Jackson State University, USA
- ***Social Psychology Research on Women of Color in the STEM Disciplines***
Kecia Thomas, PhD, Professor of Industrial/Organizational Psychology, University of Georgia, Founding Director, Center for Research and Engagement in Diversity, USA
- ***Advancing American Indians in the Sciences***
Marigold Linton, PhD, Director, American Indian Outreach, University of Kansas, USA

4. Diversity in Leadership

Discussant: **Grace Jinliu Wang**, PhD, Division Director, Directorate for Engineering, National Science Foundation, USA

- ***Enhancing Performance and the Position of Women -- a Win-Win Opportunity for University Leaders***
Curt Rice, PhD, Professor, University of Tromsø, Norway, and Netherlands Institute for Advanced Study (NIAS), Netherlands, Europe
- ***The Creation of a Graduate Course***
Beth M. Holloway, PhD Candidate, Director, Women in Engineering Program, Purdue

University, USA

- ***Enhancing Academic Performance of Underrepresented Minorities***
Joan Y. Reede, MD, MS, MPH, MBA, Dean for Diversity and Community Partnership, Harvard Medical School, USA
- ***Germany Gender and Diversity in Teaching – Added Value for Science***
Carmen Leicht-Scholten, PhD, BS, Professor of “Gender and Diversity in Engineering”, Faculty of Civil Engineering, RWTH Aachen University, Germany, Europe

5. Diversity and Gatekeepers in STEM Participation

Discussant: **Carla Fehr**, PhD, Associate Professor, (Wolfe Chair in Scientific and Technological Literacy), Department of Philosophy, University of Waterloo, Canada

- ***Changing Faculty Gender Bias***
Jo Handelsman, PhD, Howard Hughes Medical Institute Professor and Frederick Phineas Rose Professor in the Department of Molecular, Cellular and Developmental Biology, Yale University, USA
- ***Platforms for Engineering Global Development***
Madiha El Mehelmy Kotb, President, The American Society of Mechanical Engineers, Canada/USA
- ***Gatekeepers in Recruiting and Organizational Solutions***
Brian Rubineau, PhD, Assistant Professor, Department of Organizational Behavior, School of Industrial and Labor Relations, Cornell University, USA
- ***Survey of Science Editors’ Policies on Standards for Reporting Gender***
Shirin Heidari, PhD, Executive Editor, Journal of the International AIDS Society and Member of Council and Chair of the Gender Policy Committee, European Association of Science Editors, Europe

Keynote Addresses and Lunch

- ***Introduction of Speaker***
Elizabeth Pollitzer, PhD, Director, Portia Ltd, UK, Europe
- ***Keynote Remarks***
Ralph J. Cicerone, PhD, President, National Academy of Sciences, and Chair, National Research Council, USA
- ***The Future of the Gender Summits***
Elizabeth Pollitzer, PhD, Director, Portia Ltd, UK, Europe
- ***Video Remarks from Africa***
Olive Shisana, PhD, Chief Executive Officer, Human Sciences Research Council (HRSC), South Africa

Parallel Roadmap Development Sessions

1. Cultivating and Promoting Future Leaders

Chair: **Serge Villemure**, Director, Research Grants & Scholarships, Natural Sciences and Engineering Research Council of Canada (NSERC), Canada

Rapporteur: **Jennifer R. Cohen**, PhD, American Association for the Advancement of Science (AAAS) Fellow, Office of International & Integrative Activities, National Science Foundation (NSF), USA

- ***The Value of Mentoring: Impact of Lack of Access to Mentoring for Women***
Faye Crosby PhD, Distinguished Professor of Psychology and Provost of Cowell College, University of California at Santa Cruz, USA

- ***To the Top through the Maze***
Simone Buitendijk, PhD, MPH, MD, Vice-rector Magnificus and member of the Board of the University of Leiden, Netherlands, Professor and Chair of Women's and Family Health at the Leiden University Medical Center, Netherlands, Europe
- ***Diverse Workforce Leads to Excellence***
Ray Upton, Vice President and general manager, Americas Sales and Applications team, Texas Instruments, USA
- ***Leadership Starts Early: The Impact of Role Models***
Tamara Franz-Odendaal, PhD, Associate Professor, Mount Saint Vincent University, Halifax, Nova Scotia, Canada

2. Empowering Voices of Early-Career Scientists

Chair: **Risa Sargent**, PhD, Associate Professor, Department of Biology, University of Ottawa, Canada

Rapporteur: **Joel Kelly**, PhD, Postdoctoral Research Fellow, University of British Columbia, Canada

- ***The Value and Role of Post-doctoral Periods in Shaping and Securing Sustainable Career Pathways***
Louise Harvey, PhD, Postdoctoral Fellow, Douglas Institute Research Centre, Canada
- ***Single Discipline or Interdisciplinary Career Directions: What is Best and Most Practical at Early Career Stage?***
Ingrid Kuri Alonso, PhD, Professor of Law and Economics, Latin American and Caribbean Law and Economics Association, Mexico
- ***My Pathway into an Interdisciplinary Research Career***
Leah Rubin, PhD, Assistant Professor, Department of Psychiatry, University of Illinois at Chicago, USA
- ***Woman on the Verge: Transitioning from Graduate School to the 'Real World'***
Anita Melnyk, PhD Candidate, University of Ottawa
- ***Preparing for a Career in Earth Sciences***
Kim Cobb, PhD, Associate Professor, School of Earth and Atmospheric Sciences, Georgia Institute of Technology, USA
- ***Preparing for a Career in Geoscience***
Alexis K. Ault, PhD, National Science Foundation (NSF) Postdoctoral Fellow, Department of Geoscience, University of Arizona, USA

3. Integrating Gender into Research Content and Methods

Chair: **Julia Tagüeña**, PhD, Deputy General Director of Scientific Development, The National Council on Science and Technology of Mexico (CONACYT), Mexico

Rapporteur: **Sarah Miller**, PhD, American Association for the Advancement of Science (AAAS) Fellow, Directorate for Computer & Information Science & Engineering, National Science Foundation (NSF), USA

- ***Consensus on Studying Sex and Gender Differences in Pain and Analgesia***
Joel D. Greenspan, PhD, Professor and Chair of the Department of Neural and Pain Sciences, University of Maryland School of Dentistry, USA
- ***Gendered Innovations: Tools of Sex and Gender Analysis for Research***
Londa Schiebinger, PhD, John L. Hinds Professor of History of Science, Stanford University and Director, Gendered Innovations in Science, Health & Medicine, Engineering, and Environment project, USA
- ***Gender, Masculinity and Men's Health***

John Oliffe, PhD, Professor, School of Nursing, University of British Columbia, Canada

- ***Institutionalization of Gender Perspective at the University***

Jennifer Ann Cooper, PhD, Professor, Postgraduate School of Economics, National Autonomous University of Mexico, Mexico

4. Improving Career-Life Balance

Chair: **Elizabeth Pollitzer**, PhD, Director, Portia Ltd, UK, Europe

Rapporteur: **Renetta Tull**, PhD, Associate Vice Provost for Graduate Student Development and Postdoctoral Affairs at the University of Maryland, USA

- ***Career-Life Balance Initiative***

Wanda E. Ward, PhD, Head, Office of International and Integrative Activities, National Science Foundation, USA

- ***Do Babies Matter in Science?***

Mary Ann Mason, PhD, Professor and co-director, Center of Economics & Family Security, University of California, Berkeley, School of Law, USA

- ***Supporting Academic Women in STEM: The Post-Doc Institute***

Cynthia J. Jameson, PhD, Professor Emerita of Chemistry and Chemical Engineering, University of Illinois-Chicago, USA

- ***Positive Climate that Encourages the Recruitment of Females in STEM***

Nadia Ghazzali, PhD, Full Professor, Department of Mathematics and Statistics, Université Laval in Quebec City, Canada

5. Creating and Sustaining Networks

Chair: **Sophie D'Amours**, PhD, Vice Rector, Research and Innovation, Université Laval, Canada

Rapporteur: **David Proctor**, PhD, American Association for the Advancement of Science (AAAS) Fellow, Office of the Director, Office of Cyberinfrastructure, National Science Foundation (NSF), USA

- ***Why Advancing Women Requires Networking***

Patricia Rankin, PhD, Associate Vice Chancellor for Research, Interim Director, Office of Contracts and Grants, University of Colorado, Boulder, USA

- ***Networking Workplace Leaders***

Stephanie Watts Butler, PhD, Technology Innovation Manager, Texas Instruments, USA

- ***Leveraging Network Data to Support Women STEM Faculty: Recommendations from NJIT ADVANCE***

Nancy Steffen-Fluhr, PhD, Associate Professor, Department of Humanities New Jersey Institute of Technology, Director, Murray Center for Women in Technology, USA

- ***Institutionalizing 'Networking 2.0'***

Betty Shanahan, Executive Director & Chief Executive Officer, Society of Women Engineers (SWE), USA

6. Transforming the Role of Gender in STEM and in Communication

Chair: **Shari Graydon**, Communications Consultant and Journalist, Founder of Informed Opinions, Canada

Rapporteur: **Susan Pell**, PhD American Association for the Advancement of Science (AAAS) Fellow, Office of Legislative and Public Affairs, National Science Foundation (NSF), USA

- ***Gender and Race in Film and TV Content***

Stacey Smith, PhD, Associate Professor, School of Communication and Journalism, University of Southern California, USA

- ***Access and Participation of Women in the Media Industry***

Aimée Vega Montiel, PhD, Professor and the Coordinator of the foreign graduate program

of Communication Studies, Universidad Nacional Autónoma de México, Mexico

- ***Cultural Diversity & Communications for Men & Women***

Catherine Mavriplis, PhD, NSERC – Pratt & Whitney Canada Chair for Women in Science and Engineering and Associate Professor, Faculty of Engineering, University of Ottawa, Canada

- ***The Biases that Bind Us: How Stereotypes Constrain Women's Experience in STEM***

Toni Schmader, PhD, Canada Research Chair in Social Psychology, Professor at University of British Columbia (UBC), Canada

7. Ensuring Inclusive Excellence through Merit/Peer Review

Chair: **Stephen P. Meacham**, PhD, Senior Staff Associate, Office of International and Integrative Activities, National Science Foundation, USA

Rapporteur: **Frances Bonier**, PhD, Assistant Professor, Queen's University, Canada

- ***Merit Review at the National Science Foundation***

Kelvin K. Droegemeier, PhD, Vice President for Research, University of Oklahoma and Vice Chairman, National Science Board, USA (Video)

- ***European Peer Review Guide***

Pär Omling, PhD, President, European Science Foundation and vice-President, Science Europe, Europe

- ***Peer Review Policies and Practices at NSERC and CIHR***

Isabelle Blain, Vice-President, Research Grants and Scholarships Directorate, Natural Sciences and Engineering Research Council of Canada (NSERC), Canada

- ***Policies for Including Women and Minority Groups in Clinical Research***

Elaine Sierra-Rivera, PhD, Scientific Review Officer, Division of Basic and Integrative Biological Sciences, Cancer Etiology Study Section, National Institutes of Health, USA

- ***Epistemological Diversity and Procedural Fairness in Peer Review***

Michèle Lamont, PhD, Professor of Sociology and African and African American Studies, Robert I. Goldman Professor of European Studies, Harvard University, USA

8. Enabling Organizational Systems and Processes

Chair: **Elizabeth Croft**, PhD, Professor and NSERC Chair for Women in Science and Engineering (BC/Yukon Region), University of British Columbia, Canada

Rapporteur: **Emily Grumblin**, PhD, American Association for the Advancement of Science (AAAS) Fellow, Office of the Director, Office of Cyberinfrastructure, National, National Science Foundation (NSF), USA

- ***Recognizing and Removing Barriers: The Lessons from MIT***

Nancy Hopkins, PhD, Amgen, Inc., Professor of Molecular Biology, Massachusetts Institute of Technology (MIT), USA

- ***Changing Institutional Cultures from the Outside In: Rewarding Public Scholarship and Cross Sector Collaboration***

Nancy Cantor, PhD, Chancellor, Syracuse University, USA

- ***Connecting Women into the Provision of Higher Education and Industrial Development Needs***

Yoloxóchitl Bustamante, Director General, National Polytechnic Institute (IPN), Mexico

- ***Title IX and Culture Change: Advancing Gender Diversity in STEM Fields***

Brenda R. Manuel, Esq., Associate Administrator for Diversity and Equal Opportunity, National Aeronautics and Space Administration (NASA), USA

9. Pioneers Trailblazing the Future

Chair: **Kelly Mack**, PhD, Vice President for Undergraduate Science Education and Executive Director, Project Kaleidoscope, Association of American Colleges and Universities (AAC&U), USA

Rapporteur: **Rosemarie Filart**, MD, MPH, MBA, Office of Research on Women's Health, National Institutes of Health Sciences, USA

- **Title (TBD)**
Catherine E. Woteki, PhD, Under Secretary, Chief Scientist, United States Department of Agriculture, USA
- **WISEST—Women in Scholarship, Engineering, Science and Technology Margaret-Ann Armour**, PhD, Associate Dean of Science, Diversity, Faculty of Science, University of Alberta, Canada
- **Establishing the First Gender and Medicine institute**
Vera Regitz-Zagrosek, MD, Director, Institute of Gender in Medicine, Charité - Universitätsmedizin Berlin, Germany, Europe
- **Organization for Women in Science for the Developing World (OWSD)**
Mayra de la Torre, PhD, Full Professor, Department of Food Sciences, the Centro de Investigacion en Alimentacion y Desarrollo A.C. in Sonora, Mexico

10. Creating Bridges with European Funders

Chair: **Inés Sánchez de Madariaga**, Arch., PhD, MSc, Director, Women and Science Unit, Cabinet of the Secretary of State for Research and Innovation, Spain, Europe

Rapporteur: **Anne Pépin**, PhD, Director, Mission for the Place of Women, Centre National de la Recherche Scientifique (CNRS), France, Europe

A panel of European Funding bodies

- **European Research Council (ERC)**
Isabelle Vernos, PhD, ICREA Research Professor, Center for Genomic Regulation (CRG, Spain), Member of the European Research Council (ERC) Scientific Council, Europe
- **Research Council of Norway (RCN)**
Hans M. Borchgrevink, MD, Special Adviser, International Staff, The Research Council Norway (RCN), Norway, Europe
- **German Research Foundation (DFG)**
Eva Reichwein, PhD, In-House Counsel, Quality Assurance and Programme Development, Deutsche Forschungsgemeinschaft (DFG), Germany, Europe
- **Research Councils United Kingdom (RCUK)**
Rosie Beales, Senior Policy Manager, Research Careers and Diversity at Research Councils UK, Research Council UK (RCUK), UK, Europe

Plenary Session: **Gender Roadmap for Research and Innovation Systems. Addressing the Needs of Different Stakeholders**

- **Introduction of Speaker**
Betty Shanahan, Executive Director & Chief Executive Officer, Society of Women Engineers (SWE), USA
- **Speaker and Chair**
Kim Allen, Chief Executive Officer, Engineers Canada, Canada
- **Report from Roadmapping Parallel Sessions:**
Chairs from parallel sessions, report on key conclusions arrived at in their session
- **Looking Forward**
Nancy Cantor, PhD, Chancellor, Syracuse University, USA

DAY THREE

Parallel Sessions Stream 2 – The Gender Dimension in the Research Continuum (Basic -> Applied -> Innovation -> Markets)

1. Health

Discussant: **Adriana Ortiz Ortega**, PhD, National University of Mexico, Mexico

- ***Sex, Gender and the Brain***

Gillian Einstein, PhD, Associate Professor of Psychology and Public Health, University of Toronto, Canada

- ***New Approaches to Understanding Bacterial Virulence and Improving Future Management of Urinary Tract Infections***

Jeffrey Henderson, PhD, Assistant Professor of Medicine and Molecular Microbiology, Center for Women's Infectious Diseases Research, Division of Infectious Diseases, Washington University School of Medicine, USA

- ***Measuring the Health Effects for Gender***

Susan Phillips, MD, Professor, School of Medicine, Queen's University, Kingston, Canada

- ***Predictability and Correlation in Human Metrology***

Don Adjero, PhD, Professor & Graduate Coordinator of Computer Science, Department of Computer Science and Electrical Engineering, West Virginia University, USA

2. Environment

Discussant: **Itzá Castañeda**, Senior Gender Adviser, United Nations Development Programme (UNDP), Mexico Country Office, Mexico

- ***Radiation Exposure, Sex and the Reference Man***

Arjun Makhijani, PhD, President, Institute for Energy and Environmental Research, Maryland, USA

- ***Gender, Environment and Health***

Donna Mergler, PhD, Professor Emerita, Interdisciplinary Research Centre on Biology, Health, Society and Environment, Université du Québec à Montréal, Canada

- ***Impact of Oil Production on the Environment in Mexico***

Myriam Amezcua Allieri, PhD, Research Scientist, Mexican Petroleum Institute, Mexico

3. Climate Change

Discussant: **Billy M. Williams**, PhD, Director of Science, American Geophysical Union (AGU), USA

- ***Gender Data in Climate Change Research***

Aaron M. McCright, PhD, Associate Professor, Lyman Briggs College at Michigan State University, USA

- ***Gender-differentiated Impact of Climate Change***

Amelia H. X. Goh, PhD, Associate Knowledge Management Officer in the Environment, Social and Governance Department, International Finance Corporation (IFC), International, USA

- ***Arid Land Management Under Gender Perspective***

Margarita Velázquez Gutierrez, Director of the Regional Center for Multidisciplinary Research (CRIM) of National Autonomous University of Mexico, Mexico

4. Food Security

Discussant: **Jenna Rapai**, PhD Candidate, Individual Interdisciplinary Studies Program, University of Manitoba, Canada

- ***Gender Equity in the World of Agriculture***

Annemieke Farenhorst, PhD, Professor of Soil Science, Faculty of Agricultural and Food Sciences, University of Manitoba, Canada

- ***Maize, Sex, and Feeding the World***
Burkhard Schulz, PhD, Professor for Plant Biochemical and Molecular Genetics, Department of Horticulture and Landscape Architecture, Purdue University, USA
- ***Relation Between Women's Ownership of Land and Their Role in Agricultural Decision-Making***
Carmen Diana Deere, PhD, Distinguished Professor of Latin American Studies and Food & Resource Economics, University of Florida, USA

5. Transportation

Discussant: **Graham Harrison**, PhD, Program Officer, International Science and Engineering, National Science Foundation (NSF), USA

- ***Gender and Safety in Transportation***
Dipan Bose, PhD, Road Safety Specialist, Global Road Safety Facility (GRSF), World Bank's Transport Anchor, USA
- ***Car Crashes and Improving Safety for Women and Men***
Janet Brelin-Fornari, PhD, Professor of Mechanical Engineering, and Director of the Crash Safety Center, Kettering University, USA
- ***How Equitable is Access to Transportation Options?***
Catherine Morency, PhD, Associate Professor, Department of Civil, Geological and Mining Engineering, Polytechnique Montreal, Canada

Parallel Sessions: Best Practice Training Workshops

1. **Integrating Gender Dimension into Medical Researcher Training**
Moderator: **Janine Clayton**, MD, Director, Office of Research on Women's Health (ORWH), National Institutes of Health (NIH), USA
 - ***How Gendered Innovations can be used for training***
Vera Regitz-Zagrosek, MD, Director, Institute of Gender in Medicine, Charité - Universitätsmedizin Berlin, Germany, Europe
 - ***Measuring the Health Effects of Gender***
Susan Phillips, MD, Professor, School of Medicine, Queen's University, Kingston, Canada
 - ***Researching Sex Effects in Susceptibility to Cancer***
Clara Gorodezky Lauferman, PhD, Professor and Director of the Department of Immunology and Immunogenetics, Instituto de Diagnostico y Referencia Epidemiologicos, México City, Mexico
 - ***Promoting Best Practice and Knowledge for More Gender Aware Diagnosing and Treatment***
Phyllis E. Greenberger, MSW, President and Chief Executive Officer, Society for Women's Health Research, USA
- Women's Health Curricula and Interprofessional Collaboration across the Health Professions***
 - Commander **Morrissa B. Rice**, MHA, Senior Public Health Analyst, Health Resources and Services Administration, Office of Women's Health, USA
2. **New Approaches to Career Development Support for Early Stage Female Scientists**
Moderator: **Elizabeth Pollitzer**, Director, Portia Ltd, UK, Europe
 - ***Best Practices in Mentoring***
Stacie Geller, PhD, G. William Arends Professor of Obstetrics and Gynecology, University of Illinois College of Medicine, Director, UIC Center for Research on Women, Director, Gender and the National Center of Excellence in Women's Health, USA

- **Work-life Integration Toolkit**
Donna J. Dean, PhD, Executive Consultant, Past President, Association for Women in Science (AWIS), USA
- **The Recruitment, Retention and Advancement of Women in STEM Fields**
Carolyn Emerson, Project Coordinator, Canadian Coalition for Women in Science, Engineering, Trades and Technology, Canada
- **Rotation Programs**
Stacey DelVecchio, Manager, Caterpillar Inc., and President, Society for Women Engineers, USA
- 3. Making Women in the System Visible**
Moderator: **Abigail Forson**, MA, Assistant Director, Institute of Gender and Health (IGH), Canadian Institutes of Health Research (CIHR), Canada
- **What Works for Women At Work in STEM: Success Strategies for Navigating Careers Shaped by Implicit Bias**
Joan C. Williams, JD, MA, Distinguished Professor of Law, UC Hastings Foundation Chair and Director of the Center for WorkLife Law, USA
- **The Chicago Collaboration for Women in Science Expert Portal**
Holly Falk-Krzesinski, PhD, Vice President of Global Academic and Research Relations, Elsevier, USA
- **Actua National Girls Program – Engaging Girls: The Importance of All-Girls Programs in STEM**
Virginia Hall, Director of Operations and Research, Actua, Canada
- **Learning from Role Models and Scenarios**
Martina Schraudner, PhD, Head of the Department of Gender and Diversity in Organizations, Technical University Berlin, and Director of Responsible Research and Innovation Unit, Fraunhofer Gesellschaft, Germany, Europe
- 4. Methods of Supporting Career-Life Balance in Institutions**
Moderator: **Kelly Mack**, PhD, Vice President for Undergraduate Science Education and Executive Director, Project Kaleidoscope, Association of American Colleges and Universities (AAC&U), USA
- **ADVANCE Example: Methods of Supporting Career-Life Integration in Higher Education**
Gretalyn (Gretal) Leibnitz, PhD, Director, ADVANCE Implementation Mentors (AIM) Network & Assistant Director, ADVANCE at WSU Excellence in Science and Engineering (EXCELinSE) Center, Washington State University, USA
- **ADVANCE Example: Institutional Transparency in Leave Policies**
Patrice McDermott, PhD, Vice Provost for Faculty Affairs, University of Maryland, USA
- **ADVANCE Example: University of Rhode Island**
Barb Silver, PhD, Research Coordinator, University of Rhode Island Schmidt Labor Research Center, USA
- **ADVANCE Example: National Postdoc Association**
Cathee Johnson Phillips, MA, Executive Director, Foothills Child Advocacy Center, Charlottesville, USA
- 5. Fostering Interdisciplinary Careers**
Moderator: **Joan Davis Nagel**, MD, MPH, Medical Officer, Office of Research on Women’s Health (ORWH), DPCPSI, National Institutes of Health, USA
- **Best Practices and Pearls in Interdisciplinary Mentoring from Building Interdisciplinary Research Careers in Women’s Health Directors**

Judy Regensteiner, PhD, Professor of Medicine, Department of Medicine, University of Colorado School of Medicine; Principal Investigator, NIH Building Interdisciplinary Research Careers in Women's Health; The Judith and Joseph Wagner Chair in Women's Health Research; Director, Center for Women's Health Research, USA

- ***The National BIRCWH program***

Jeanne-Marie Guise, MD, MPH, Professor of Obstetrics and Gynecology, Medical Informatics, and Clinical Epidemiology, Principal Investigator, NIH Building Interdisciplinary Research Careers in Women's Health (BIRCWH), Oregon Health and Science University, USA

- ***Collaborative Science: Designing the Future***

Susan Winter, PhD, Lecturer and Assistant Program Director, College of Information Studies, University of Maryland, USA

- ***The Emerging Field of the Science of Team Science***

Stephen M. Fiore, PhD, Associate Professor of Cognitive Science, University of Central Florida, USA

6. ***The NSERC Model: Chairs for Women in Science and Engineering Program***

Moderator: **Serge Villemure**, Director, Research Grants & Scholarships, Natural Sciences and Engineering Research Council of Canada (NSERC), Canada

- ***The Chairs for Women in Science and Engineering Program: An Introduction***

Céline Bérubé, PhD, Team Leader, Scholarships and Fellowships Division, and Manager, Chairs for Women in Science and Engineering Program, Natural Sciences and Engineering Research Council of Canada (NSERC), Canada

- ***A Positive Approach to Opening Up the Gender Diversity Discussion: Non-Threatening Activities for Men and Women, Empowerment for STEM Women and a Positive Communications Campaign***

Catherine Mavriplis, PhD, NSERC-Pratt & Whitney Canada Chair for Women in Science and Engineering and Associate Professor, Faculty of Engineering, University of Ottawa, Canada

- ***Including First Nations Histories and Time-Honored Traditions in University Science and Engineering Training as Part of Best Practices for Recruitment and Retention***

Annemieke Farenhorst, PhD, Chair for Women in Science and Engineering Prairie region and Professor, Faculty of Agricultural and Food Sciences, University of Manitoba, Canada

- ***Strategies to Support, Train and Develop Self-Sustained Practices in Outreach Groups, Providing Services and Activities for a Broad Spectrum of Audiences, Ages, and Interests***

Elizabeth Croft, PhD, Professor and NSERC Chair for Women in Science and Engineering (BC/Yukon Region) and Professor, Faculty of Engineering, University of British Columbia, Canada

- ***Strategies to Enable Girls in Junior and Senior High School to Meet and Interact with Role Models, to Expand Their Limited View of the Science Fields and to Experience Hands-On and Fun Activities***

Tamara Franz-Odenaal, PhD, Associate Professor, Mount Saint Vincent University, Halifax, Nova Scotia, Canada

Full Schedule, Videos and Powerpoints are available at www.nsf.gov/od/iaa/activities/gendersummit.



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