

EWLSE Updates

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Nearly 30 men and women gathered at the INCOSE International Workshop (IW 2019) to participate in the Empowering Women as Leaders in Systems Engineering (EWLSE) working session, outreach session, or both. The meetings kicked off with participants contributing their top empowering event of 2018, examples include:

- Closing the doors of a business and opening a new door for what is next
- Securing a challenging management role
- Being part of the Boeing Women in Leadership (BWIL) organization
- Recruiting 30 students for a CubeSat team
- Meeting Marillyn Hewson, chairman, president, and CEO of Lockheed Martin when invited to a women's leadership forum
- Being nominated to be INCOSE Secretary
- Hearing from the project manager after some difficult discussions on a challenging project, "We couldn't have done it without you."
- Being asked by company executives to officially work on life cycle management and systems engineering activities for the company
- Writing an e-book, *Dandelion Wishes: A World Where We Collaborate as Equals*
- Helping Tyler Trent fundraise for cancer research in the last months of his career for Purdue University Center for Cancer Research
- Taking my first timed midterm after 15 years while holding my baby the entire time and earning an A
- Being selected to start on a new program because of my systems engineering background
- Leaving the Air Force and starting a consulting career with Deloitte
- Supporting the Medtronics NSC STEM project for the Works Museum Girl Time K-12 program
- Advising a high school team on building a greenhouse with water bottles
- Finding a position at my company where I can work remotely and live where I want
- Leading outreach for EWLSE at the Society of Women Engineers (SWE) Conference, mentoring students for systems engineering and the INCOSE certificate program
- Helping a junior team member take on a bigger role

During the working session, Marilee Wheaton and Alice Squires led a discussion on a notional table of contents for a book on systems engineering for the IEEE Women in Engineering (WIE) series (published by Springer Hill), Lauren Stolzar and Stephanie Chiesi led a group discussion on mentoring and leadership resources, and Lisa Hoverman and Marilee Wheaton led a discussion on inreach and outreach in support of a world where women and men are equally represented in engineering. The team also discussed possibilities of supporting an INCOSE grand challenge effort that is potentially underway and brainstormed how to integrate diversity-related topics, such as user and stakeholder diversity and cognitive diversity, into the INCOSE Systems Engineering Handbook V5.0.

Mike Pennotti of the INCOSE Technical Leadership Institute (TLI) made a guest appearance and encouraged systems engineering leaders interested in applying to the institute to further their leadership reach and take on the next INCOSE-led leadership initiative, to work with their chapter or working group leaders, and apply by 15 March for the next cohort. The 2018 TLI cohort includes three members of EWLSE: Heidi Davidz, Heather Feli, and Lauren Stolzar. EWLSE member, Stephanie Chiesi, from the original 2014 TLI cohort, commented on the value of the experience.

The theme of EWLSE's outreach session was "Teaching Females, and Males, Science and Engineering." Facilitators Allison Weigel, Lisa Hoverman, and Alice Squires led three round-robin activities focused on developing projects, identifying role models, and acknowledging



Figure 1. The EWLSE team at INCOSE IW 2019

a time when another person made you feel empowered. The conference ended with a presentation at the closing marketplace of EWLSE accomplishments and plans for the year (see Figure 2).

Informal activities completed at the INCOSE IW 2019 included work on the “Letters to My Younger Self” and the systems engineering and diversity-themed edition of the third quarter INCOSE *INSIGHT* by the EWLSE publications team—Lisa Hoverman, David Long, and Alice Squires; work on these initiatives is ongoing. For further information, email ewlsepubs@incose.org. EWLSE team members Lisa Hoverman and Alice Squires, with support from Brad Spenses, met with Gretchen Peacock, associate director for Technical Operations, on the establishment of a new best paper on topics related to diversity, including working across cultural boundaries and institutional considerations for creating the right culture.

Summaries of the working and outreach sessions are included in the next section, and there is an open invitation for participation in activities that you are passionate about pursuing. Please email ewlse@incose.org with your interests. We invite and encourage men and women to join EWLSE and support women in engineering by adding “Empowering Women” to your committee/working groups under your

INCOSE profile (click on your name after you log into INCOSE, select Profile, and proceed from there).

A New Kind of Book, Mentoring, Resources, Inreach, and Outreach

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Marilee Wheaton kicked off the work portion of the working session by presenting the Springer Women in Engineering and Science series which highlights women’s accomplishments in critical fields such as security, sustainable agriculture and food biology, and industrial



Figure 2. President-elect Kerry Lunney and EWLSE founder Alice Squires discuss future plans for EWLSE at the Working Group Marketplace

and systems engineering. Marilee explained that the foundational volume in the series provides a broad overview of women's multi-faceted contributions to engineering over the last century. Each subsequent volume is dedicated to illuminating women's research and achievements in key, targeted areas of contemporary engineering and science endeavors. The goal for the series is to raise awareness of the pivotal work women are undertaking in areas of keen importance to our global community. The series includes author's biographies to motivate and inspire those entering the field. Marilee proposed the idea of EWLSE members writing a new book in the series focused on systems engineering content. Marilee and Alice Squires facilitated a session where the group brainstormed topics that we can bring to the table that are novel and different than current textbooks, such as persistence in engineering, workforce culture, technical satisfaction, emerging topics in systems engineering, soft skill advantage, systems engineers as superheroes, and other fun and energizing topics.

Lauren Stolzar and Stephanie Chiesi kicked off the next session on mentoring and resources. The team discussed the newly created mentor/mentee program, which will be available to all INCOSE members (see Figure 3). Ideas for making the program more widely useful included adding structure around the program. This included ideas such as providing training and workshops for mentors and mentees to help people get the most out of a mentor/mentee relationship. It also included the idea of providing online events and resources for everybody to use. Finally, the group wanted to encourage the use of peer mentors as a way to engage with other people at similar stages in their career. Members also suggested building a database of existing mentor relationships as a way to provide outreach and support for those currently working with mentors. Finally, the team suggested advertising via the INCOSE LinkedIn and utilizing the INCOSE LinkedIn space as a way to provide resources.

Lisa Hoverman and Marilee Wheaton rounded out the working sessions with a discussion on inreach (within INCOSE) and outreach activities. Members suggested establishing an EWLSE liaison in every INCOSE chapter around the



Figure 3. INCOSE needs you! For mentors and mentees: <https://bit.ly/2G6TJPL>

world. Plans for 2019 include a sponsored INCOSE/EWLSE booth at the Society of Women Engineers (SWE) Conference in Anaheim, US-CA, 7-9 November, and potentially sponsoring attendance at a second leadership conference.

Teaching Females, and Males, Science and Engineering

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For EWLSE's outreach session, the audience was divided into three groups to perform activities in support of the "SciGirls Seven: How to Engage Girls in STEM" resource (see www.incose.org/ewlse and click on the Resources tab). The team used guidance from a prior workshop led by Rose Delaney, president of the Society of Women Engineers student chapter of the University of New Mexico (see "Educating Future Female Engineers," by Delaney Rose Heileman in the Q4 INCOSE 2018 newsletter). Everyone in attendance participated and worked on the following three activities, each group working simultaneously on one of the activities at a time in a round-robin approach with a summary of outcomes included below.

Activity 1: Define a lab project for a student team that supports the SciGirls Seven strategies for engaging girls in STEM. Include the problem or opportunity for the students to address, objectives of the lab, anticipated steps, and the anticipated outcomes.

The three groups developed ideas for projects that emphasized collaboration with fair participation and communication, personally relevant projects, hand-on/open-ended projects, and projects that they could apply their own creativity, talent, and learning styles

to. These projects supported the SciGirls Seven, but did not limit the projects to something just girls would be participating in. Participants considered not just the projects themselves, but also what age ranges and timeframes would be appropriate for the projects, and what type of resources the projects would require. They focused the projects on systems engineering principles and practices such as modeling, integration, and understanding stakeholder requirements. Groups were able to come up with multiple projects and concepts that could be used across many ages and backgrounds that would allow project participants to make a change to their environment.

Activity 2: Create a list of female role models. For each, you must include a bit about them, their characteristics, and what characteristics you have in common—tally them up! This activity supports the SciGirl strategy that girls benefit from relationships with role models and mentors.

The three groups did an excellent job identifying female role models and then focused on not only what attributes they shared with them, but also the type of attributes that were important for the future.

Activity 3: Think about a time that someone else did something that made you feel empowered. Describe the situation to the group and then write a short letter to yourself about the event and how it made you feel. This activity supports the SciGirl strategy that girls gain confidence and improve performance with specific positive feedback on effort, strategies, behavior, and when encouraged to think critically.

The three groups talked about how others have in the past said or done something that made them feel empowered and then wrote a private letter to themselves about the experience and how it made them feel. Examples of empowering moments are included in the beginning of this article.

Are you interested in supporting the field of systems engineering by becoming a mentor for a systems engineer, or are you seeking an experienced systems engineer as a mentor who can help you navigate the field and INCOSE? Please email incose-mentor@incose.org or complete the brief survey at the QR code in Figure 3 or at <https://bit.ly/2G6TJPL>.

INSIGHT Preview

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We are pleased to announce the April 2019 issue of INSIGHT published in cooperation with John Wiley & Sons as a magazine for systems engineering practitioners. The INSIGHT mission is to provide informative articles on advancing the state of the practice of systems engineering. The intent is to accelerate the dissemination of knowledge to close the gap between the state of practice and the state of the art as captured in Systems Engineering, the Journal of INCOSE, also published by Wiley. The focus of this April issue of INSIGHT is systems science and systems engineering principles as foundations for the future of systems engineering.

We thank theme editor Michael Watson, who leads off with the context for the future of systems engineering. Systems engineering has evolved as a practice-based discipline with

a matured set of processes covering the life cycle of the system. The engineering basis is, however, tenuous, as we cannot always ensure the system will be successful. All engineering disciplines have started in practice, and over time evolve with the discovery of the underlying scientific principles that provide a solid foundation for the discipline. Systems engineering is following a similar course, with the recognition that it is also a sociological endeavor, integrating, coordinating, and facilitating all the engineering disciplines. As a direct step from the systems engineering heuristics, a set of systems engineering principles have emerged that incorporate the engineering basis and the sociological basis and are broader than system principles, that is, principles that define how a system functions. Systems scientists have researched the