Diversity and Inclusion in EE, the IEEE, and the ITSoC

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Women in EE

Are things better than when we were in college?

- **Students:** % of women undergrads
  - 12% EE, 17% CS, 19% engineering
  - Peak for CS: 36% in ‘84, decreasing since
  - MSEE: 20%, Ph.D in EE: 14%

- **Academia:**
  - 16% of EE/CS faculty are women
  - Less than 10% at Stanford, not unusual

- **Industry:**
  - 13% of the engineering workforce are women
  - 56% of women leave careers in tech. Leaky pipeline moving up company ladder

- **Patents:** Less than 3% of patent holders are women

- **Startups:** 8% of Bay Area Series A startups had women founders last year
  - In dozens of funding pitches for my 2 startups, the only other women in the room were serving the coffee
Does it Matter?

- Not using half the talent pool
- Diverse organizations are more creative, perform better, and have higher job satisfaction
- Women-led startups have great track records
- Girls and women are missing out on great careers

Is this an intractable problem?

There are effective methods to move the needle
How is the IEEE doing on diversity/inclusion?

- Awards statistics (IEEE-wide awards and within societies) abysmally low (low single-digit % in nominations and winners)
- Lack of women representation in publications (as EiCs, within committees and on editorial boards)
  - As well as in papers published and citations
- Low representation of women in conferences (general chairs, TPC chairs, and technical program committees)
- Low number of women as Distinguished Lecturers
- Process issues regarding leadership and committee selection, peer review, etc.
  - Processes often not transparent, not inclusive, and are subject to implicit bias and even abuse.
Award Statistics

- Women have won a total of 19 TFAs and 9 Medals over all time (out of 30 TFAs and 9 Medals given annually)
  - 21 out of 29 TFAs and 8 out of 16 medals have never had a female recipient (including Sumner TFA and Bell/Hamming Medals)
  - Some TFAs have multiple female recipients.
- In 2017 there were no female medal recipients (0%) and 2 female TFA recipients (6.6%)
  - From 2014-2016: Percentage of female medal recipients ranged from (0-22%) and percentage of female TFA recipients ranged from (0-6.6%)
- Nominations:
  - From 2011-2015, 4%-6% of the TFA nominations were female, and 1%-7% of the medal nominations were female.
  - In 2015, two-thirds of all TFAs and half of all medals did not have a single female nominee.
  - In 2011-2014, only 1-4 medals (out of 16) had a female nominee in that timeframe, and only 5-8 TFAs had a female nominee (out of 29).
Why is Diversity important for the IEEE

- Diverse organizations are more creative, perform better, and have higher satisfaction of their members
- IEEE can be a role model for the profession, which is currently struggling to attract/retain diverse members (retention of women in tech under 50%)
- The IEEE is losing women members
  - % of women (self-report): All member grades (12.1%); Student members: (30.3%), Graduate Student Members (8.8%), Members (8.7%), Senior members (7.8%); Fellows: (4.4%)
    - Women are 12% of EE ugrads, 16% of EE profs, 13% of EE workforce
    - Likely the case with URMs as well, but that data isn’t collected.
- The IEEE is not providing the same benefits to its women/URM members as to other members
- The IEEE can make things better for the next generation of women and URM technologists (today 12% EE ugrads are women)
IEEE TAB Ad Hoc Committee on Women and Underrepresented Groups: Recommendations

- Form TAB standing committee with sufficient resources and power to implement recommendations and track impact
- Require women/URM data collection and metrics reporting on all society and IEEE activities; set targets and track progress
- Repository for society best practices; society reviews should collect data about diversity metrics, bylaws language, activities related to diversity and inclusion
- Training for IEEE/society/committee leadership and staff addressing diversity, inclusion, and best practices, incl. implicit bias training
- Create implicit bias briefing to raise awareness in IEEE and beyond
- Make the “face” of IEEE and its marketing more inclusive
- Create IEEE-wide initiatives for URMs
- Support creation of a climate survey for all IEEE members
Diversity/Inclusion Committee Annual Goals

2017

- Establish standing committee on diversity, phase out ad-hoc
- Recommend what data must be gathered annually
- Collect and summarize best practices used by societies to support diversity/inclusion
- Create a draft implicit bias briefing for possible posting on an IEEE website

2018

- Recommendations approved and action plan in place
- Develop diversity metrics and plan for tracking and accountability
- Plan to raise awareness of implicit bias throughout IEEE
- Creation of implicit bias-free marketing guidance
- URG IEEE-wide initiatives in place
- Develop proposal for climate survey
TAB MOTION: **Approved Last Friday**

Approve the formation of the IEEE Technical Activities Board (TAB) Committee on Diversity and Inclusion

**PROs:** Provides for the formation of the subcommittee under established TAB structure of Strategic Planning; risk reduction and oversight.

**FINANCIAL IMPLICATIONS TO TAB ADMINISTRATION:** 31K/year

**STRATEGIC IMPACT and/or PROJECT RELATIONSHIP TO THE STRATEGIC PLAN:** Expand and enable dynamic, nimble, flexible, and diverse communities to help individuals from around the world to share, collaborate, network, debate, and engage with one another.

**IMPLEMENTATION TIMELINE:** Motion approval; ready to implement 2017/2018 goals.
Implicit Bias? Really? In 2017???

My awareness of this issue in awards came out of chairing the IEEE Bell Medal Committee
- Led to co-authoring with D. Messerschmidt a document on implicit bias for IEEE Awards Committees
- The Royal Society and White House Office of Science and Technology have similar briefings

Many scientific studies have investigated implicit gender bias against women in STEM fields:
- American Assoc. of University Women found that stereotypes, gender bias (often implicit), and climate of university science and engineering depts block women’s progress in science and engineering fields.
- A study on implicit gender bias in science/math research awards found that men win a higher proportion of research awards than expected based on their representation in the nomination pool.
  - Implicit bias and committee chairs are the dominant contributing factors
- Science conference abstracts rated lower for excellence when (fictitious) author is female versus male
- Science publications with women versus men as dominant authors are cited less frequently
- Women are underrepresented as invited speakers and authors in prestigious conferences and journals
- In recommendation letters for science faculty positions, for candidates with similar accomplishments, recommenders used significantly more standout adjectives to describe male vs. female candidates
- Most studies in fields of math and science, much higher percentage of women than in EE
How is ITSoC Doing on Diversity/Inclusion?

- Flashback to 2004: that year and previously
  - Zero women Presidents/elected officers; 2004 BoG had 3 women members out of 13 (23%)
  - Zero Women IT Transactions EiCs; First female AE appointed in 1997 (out of ~30 annually)
    - The next one was appointed in 2001
    - In 2004 there were 2 female AEs out of 29
  - Zero female recipients of the Shannon Award, ITSoC paper award, joint ITSoC/ComSoc paper award (only ITSoC awards)
  - Two women plenary speakers over all ISITs since 1970
  - No women ISIT TP Chairs, ISIT’04 TPC had 5 women (< 10%)
  - Awards committee had no women (out of 10 members)
  - Zero women had been elevated to IEEE Fellow through ITSoC (first was in 2009)
And today?

- The ISIT’04 discussions led to formation of the ITSoC Student Committee (first of its kind in any society)
- Outreach subcommittee formed in 2008, WITHITS in 2009
- Distinguished lecturer program founded in 2010
  - 8 women have served in this role out of 40 (20%)
- 3 Women ITSoC Presidents to date, 1 more in the pipeline
- BOG: 3 women officers out of 5, 5 women members out of 16 (31%)
- Awards committee has 3 women out of 9 (including 2 officers)
  - Many more ITSoC Awards than in 2004
- Informal group of senior women formed to help generate award and Fellow nominations for women.
- Several women IEEE Fellows have come up through ITSoC
- 1 female recipient of Shannon Award (Marton in 2013)
- ITSoC paper award has never gone to a women. Joint ITSoC/ComSoc paper award has twice gone to women authors (over 16 years).
- No women ITTrans EiC to date, 4 women AEs out of 48 (8.3%)
- A few women ISIT TPC Chairs
- ISIT’17 TPC has 19 women out of 119 members (16%)
Much work is needed to make the road ahead for the next generation of women in EE (and IT) a bit easier.

To make progress, need to collect statistics, raise awareness, track diversity/inclusion progress, & recruit advocates: we need the guys.

These activities must take place in professional organizations (IEEE and its Societies), universities and companies.