Fellow Elevation in IEEE and ComSoc with Focus on Women
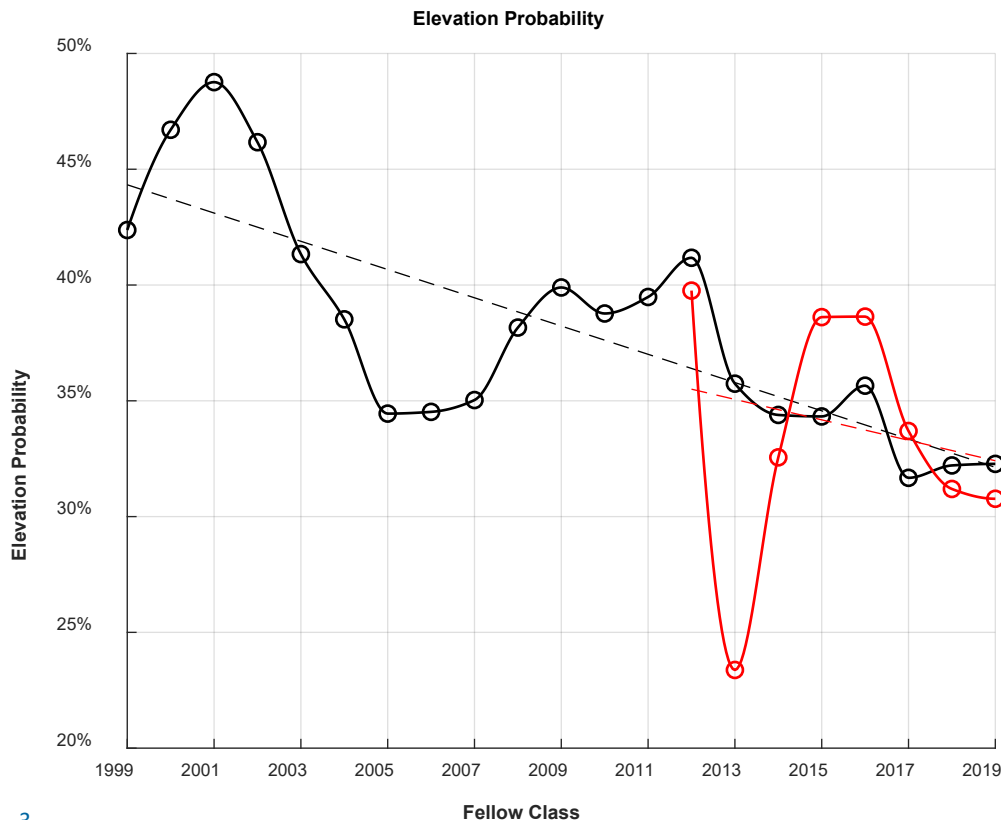
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2019 IEEE Fellow Committee Chair
16 April 2019 – WICE panel @ WCNC

IEEE
Advancing Technology
for Humanity

Fellow Nominations and Elevations – All IEEE

IEEE Data

Nominations (black) & Elevations (red)
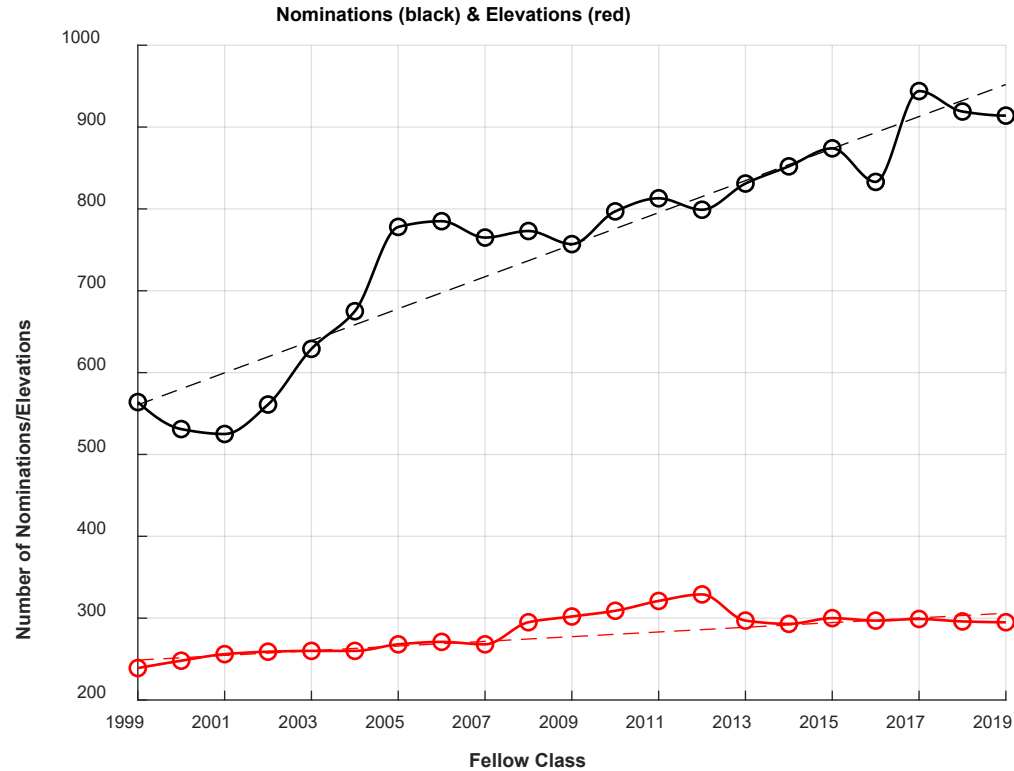
Fellow Elevation Probability – IEEE (blk) and ComSoc (red)

Elevation Probability

- The largest share of all TL nominations across IEEE (13%), followed by the Power & Energy (11.8%) and Computer (9.8%) Societies.

- The second largest share of all RE/S nominations across IEEE (10%), second to the Computer Society (14%) and followed by the Signal Processing Society (8%).

- The third largest share of all AE/P nominations across IEEE (11%), after the Power & Energy (22%) and Industrial Applications (15%) Societies.

- The fourth largest share of all EDU nominations across IEEE (9%), after the Education (20%), Power & Energy (10%), Computer (9.6%) Societies.

The Myth of Industry not Getting Elevated

Average (2012-2019) elevation probabilities in IEEE and ComSoc for Nominees in the four tracked employment types. The 95% Confidence Interval for the estimate of the mean is also shown.

	Academia	Government	Industry	Other
ComSoc Average EP	33.9% ± 7.2%	28.2% ± 22.0%	35.8% ± 8.8%	19.1% ± 35.0%
IEEE Average EP	34.2% ± 2.8%	35.7% ± 4.4%	36.2% ± 4.0%	30.9% ± 15.1%

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# The Real Problem Is Non-Researchers, Not Industry

Average (2012-2019) elevation probabilities in IEEE and ComSoc for Nominees in the four Fellow nomination categories. The 95% Confidence Interval for the estimate of the mean is also shown.

	AE/P	EDU	RE/S	TL
ComSoc Average EP	**24.0% ± 17.0%**	**13.5% ± 16.6%**	**37.4% ± 6.3%**	**23.4% ± 11.5%**
IEEE Average EP	**26.2% ± 4.9%**	**20.6% ± 2.7%**	**36.0% ± 3.0%**	**36.0% ± 4.1%**

We analyze a variety of reasons to explain this result in:

S. Galli and A. Reibman, "Analysis Shows No Evidence of Bias Against Fellow Nominees from Industry," The Institute, Nov. 20, 2017.

IEEE

Women in IEEE
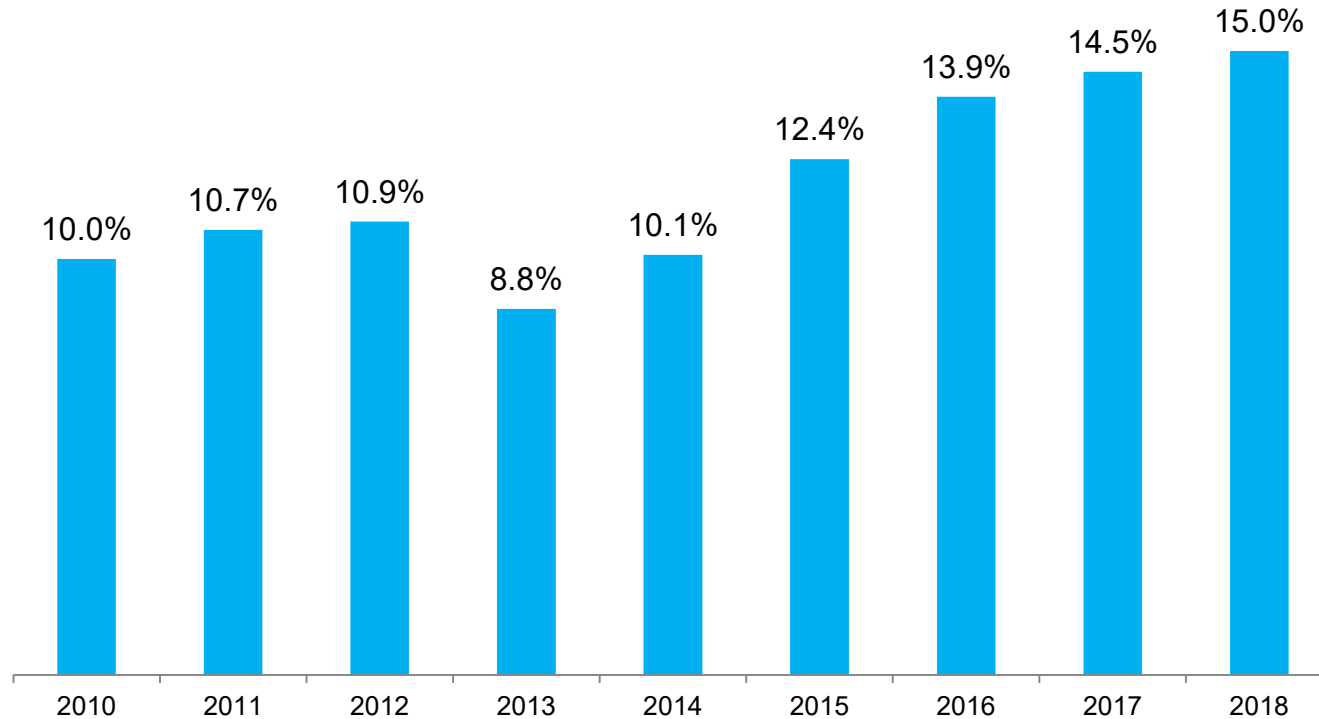
* Since 2013 data was based on those reporting gender to IEEE

IEEE membership by gender and grade (Dec. 2016)

(F): Females; (M): Males; (U): Undisclosed Gender.

Grade	(F)%	F	(M)%	M	(U)%	(U)	Total per grade	Total% per grade
Student	30.3%	15,531	69.7%	35,716	28.5%	20,457	71,704	17.0%
Graduate Stud.	20.9%	6,493	79.1%	24,605	27.6%	11,832	42,930	10.2%
Member	8.7%	18,902	91.3%	198,103	14.1%	35,606	252,611	59.9%
Senior Member	6.4%	2,400	93.6%	35,018	3.0%	1,150	38,568	9.1%
Fellow	4.5%	339	95.5%	7,154	0.6%	49	7,542	1.8%
Associate	15.8%	996	84.2%	5,299	23.7%	1,958	8,253	2.0%
Honorary	4.3%	1	95.7%	22	28.1%	9	32	0.0%
Totals	12.7%	44,662	87.3%	305,917	16.9%	71,061	421,640	100.0%

1) Percentage of female members decreases monotonically as members move up the membership grades.
2) The 12.7% number is inflated by students, without students it would be just 8.4% vs 12%-14% in the world.
3) Female SM are 12.7% of M, but male are 17.7%. Female F are 14.1% of SM, but male are 20.4%.

IEEE Senior members with at least 5 years (Mar. 2019)

These are the Senor members that are eligible to be nominate for Fellow elevation

	Life Senior Member	Senior Member	Grand Total
Female	137	2673	2810
Male	7595	27824	35419
Unknown	6	1193	1199
Grand Total	**7738**	**31690**	**39428**

Female SM (7.4%) are on par with the share of female Fellow nominees (7.3%)

Female Fellow elevations since 1966

Female Elevations

Female Fellow nominations & elevations
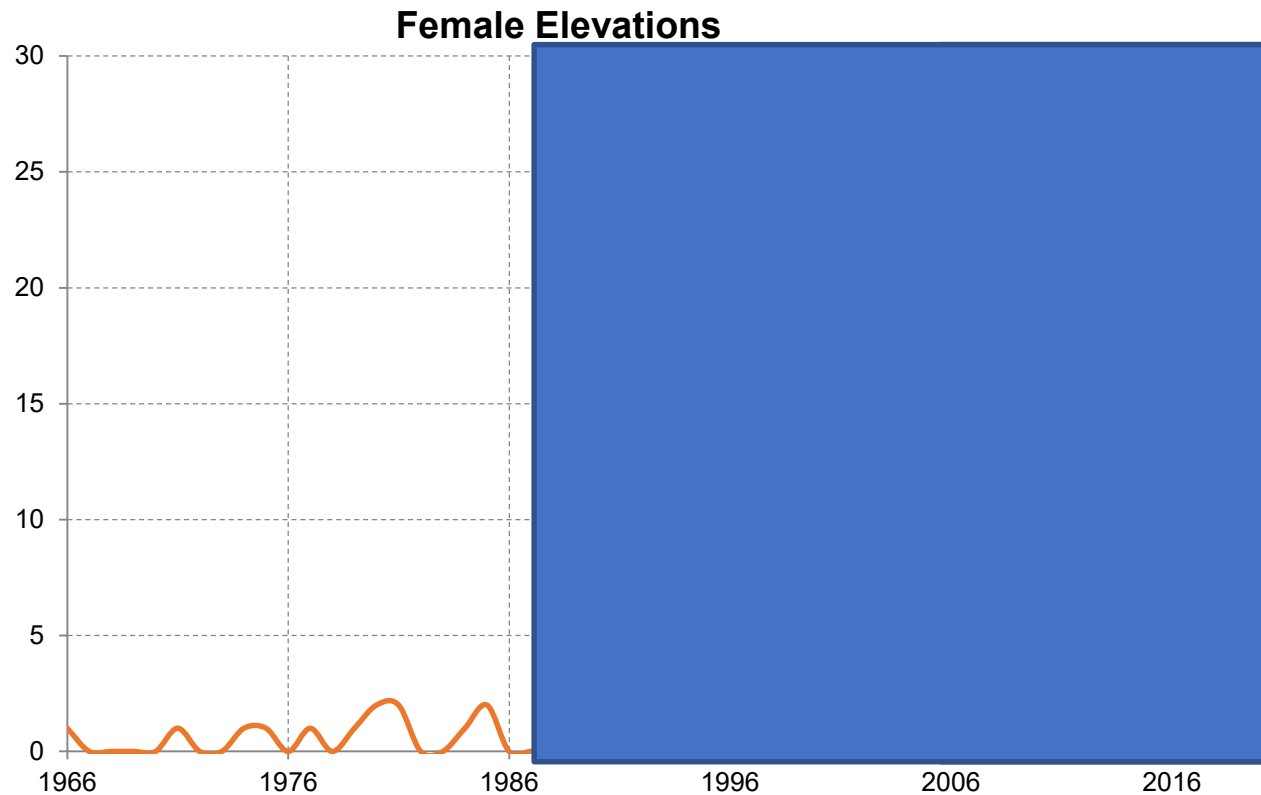
Fellow Nominations & Elevation - Women only
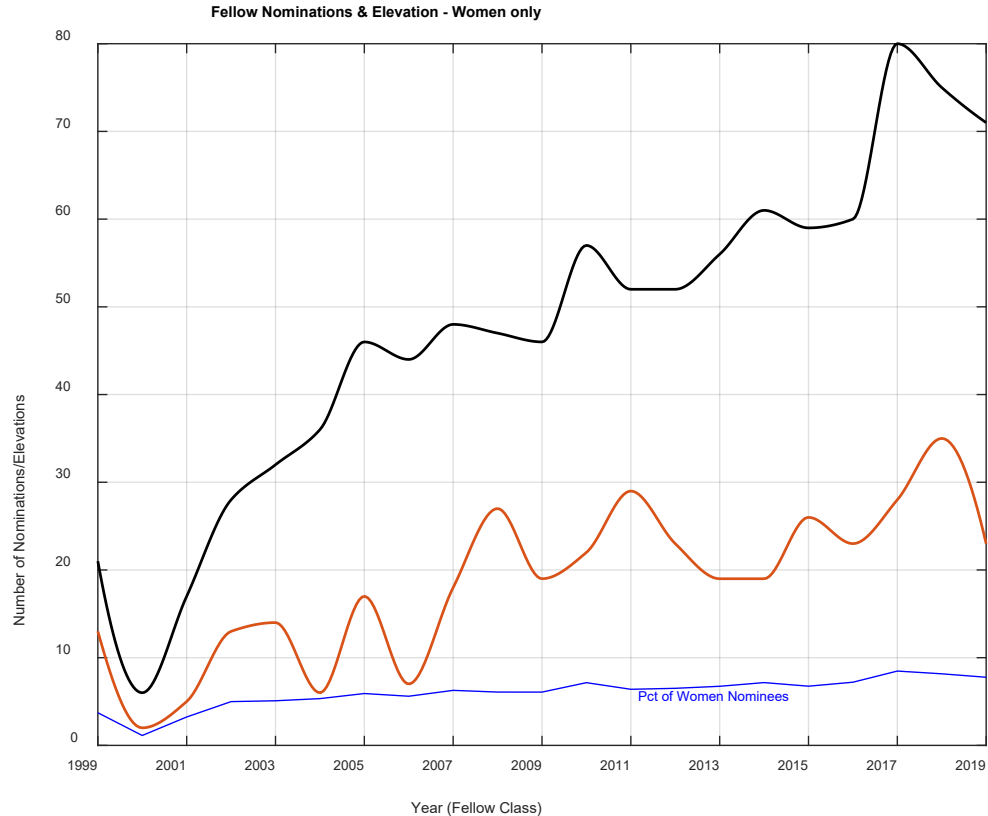
Breakdown of female nominees

Affiliation	AE/P	EDU	TL	RE/S	No. Nom.
Industry	27.0%	0.0%	16.8%	56.3%	8
Academia	1.0%	7.3%	3.2%	88.5%	47
Government	2.4%	0.0%	28.0%	69.6%	5.5
Other	0.0%	0.0%	66.7%	33.3%	<1

| Nom. Cat.	Acad.	Govt.	Ind.	Other	No. Nom.
AE/P	17.2%	3.3%	79.4%	0.0%	2.8
EDU	100.0%	0.0%	0.0%	0.0%	3.3
TL	31.0%	33.2%	28.3%	7.5%	4.8
RE/S	82.1%	7.5%	9.3%	1.0%	50.3

1. By far, female RE/S nominees are the largest group with an average of 50.3 nominees per year. This is not dissimilar from the male case.

2. By far, female academic nominees are the largest group with an average of 47 nominees per year. This is not dissimilar from the male case.

3. Differently from the male case, AE/P, EDU, and RE/S categories are dominated by nominees in a single employment affiliation type: industry (80%), academics (100%!), and again academics (82%), respectively.

4. Female TL nominees are equally distributed across academia, Government, and industry, while for male nominees 50% of TLs are from Industry.

5. **Additional efforts should be directed at increasing the diversity of female nominees in terms of employment type: vast majority of female nominees today is from academia.**

An interesting finding

On the statistical independence of elevation and gender

- ▸ Data suggests that the "gender" and "elevation" events can be considered *independent events* over the last 20 years (Fellow Class 2000-2019).
  - ▪ The direct (Pr{Pass|Gender}) conditional elevation probability of male (38.2%) and female (39.4%) nominees is very close to the unconditional probability of elevation (38.3%).
  - ▪ The reverse Pr{Gender|Pass} conditional elevation probabilities (93.6% for males and 6.4% for females) are very close to the a priori unconditional distribution of male (94%) and female nominees (6%).
- ▸ For the 5-year average 2015-2019, the independence noted above for the 20-year average does not hold anymore. The conditional elevation for females has kept steady to 39% while the unconditional one has decreased to 33.5% like the male conditional one which is 33%.
- ▸ The elevation for female nominees exhibits high variability over the past 20 years. However, in the past 10 years, the outcomes have been more consistently advantageous for a female when compared to a male nominee.

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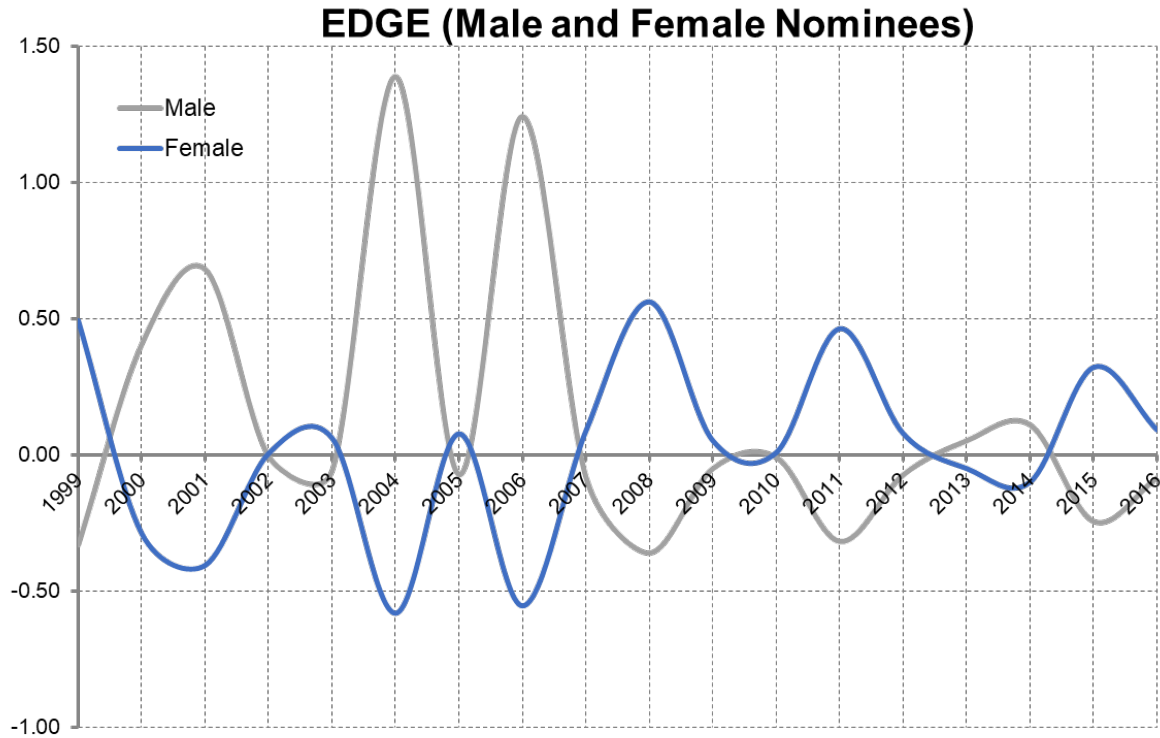# Elevation Probability

Fellow Elevation Probability
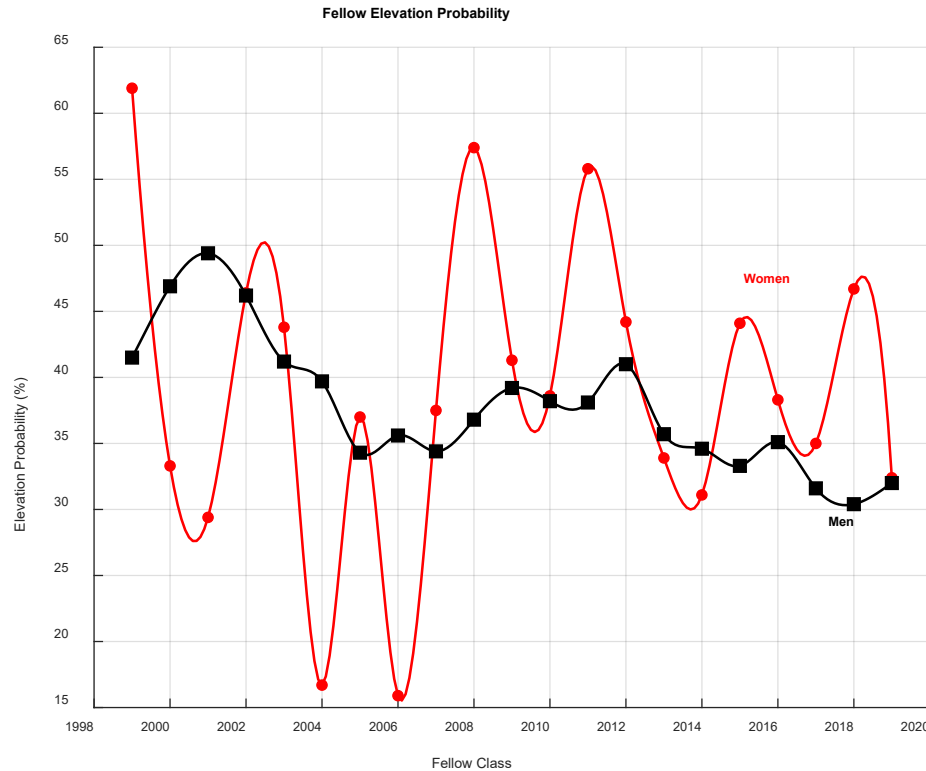
20-year average*:   + 2%
10-year average*:   +13%
 5-year average*:   +19%

(*) Average of Pr{Pass/F}/Pr{Pass}

Plot of "Edge": Pr{P/G}/Pr{P/G'} -1
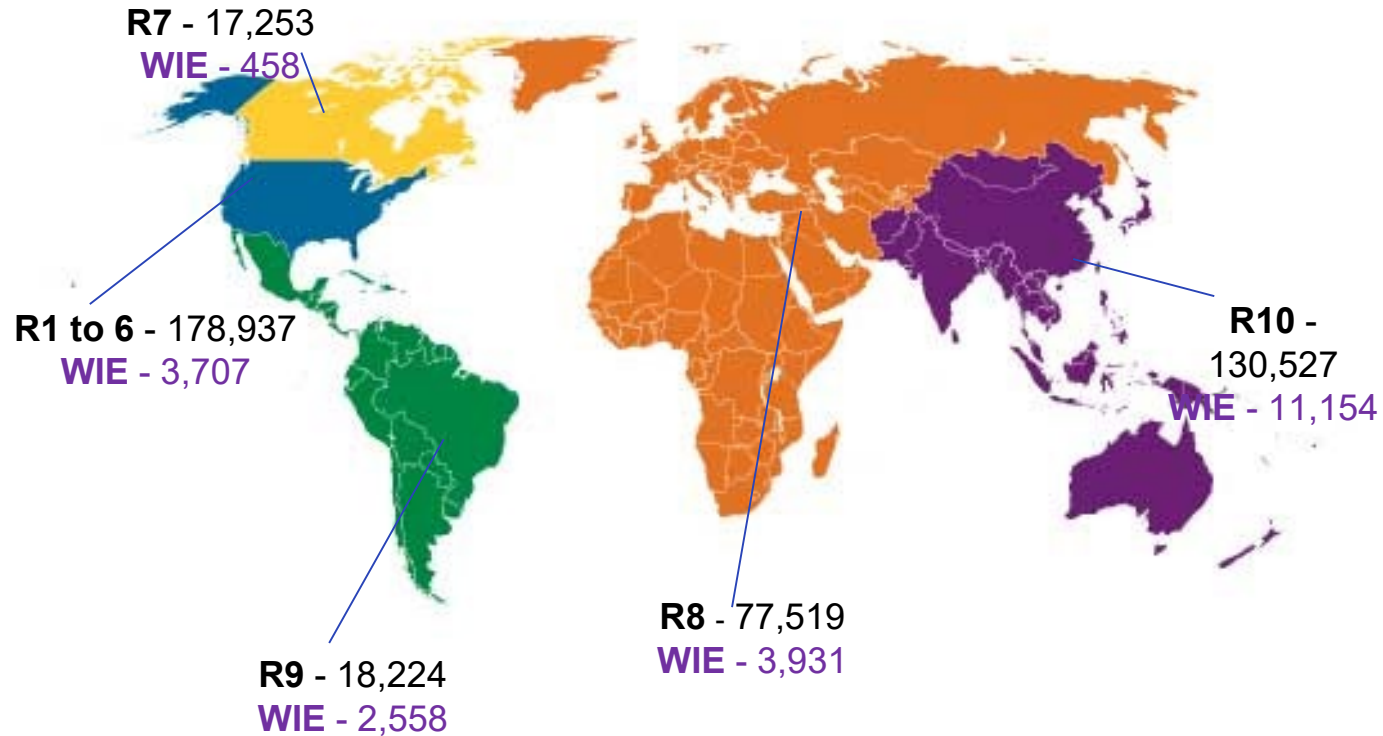

EDGE (Male and Female Nominees)

Other Interesting Statistics

▶ The average (2012-2017) age of female nominees is 53.9 versus 56.3 for male nominees. For female and male nominees elevated in 2012-2016 the average age is 53.5 and 56.3, respectively.
  - Females are 2.5-3 years younger than males in nominations and elevations.

▶ Women in the IEEE Fellow Committee
  - 2019: 19% (including the Vice-Chair)
  - 2018: 12%
  - 2017: 12% (including the Chair)
  - 2016: 23% (including the Chair)
  - 2015: 18% (including the Vice-Chair)
  - 2014: 18% (including the Vice-Chair)
  - 2013: 12%
  - 2012: 10%
  - 2011: 10%

▶ Women S/TC Fellow Committee Chairs
  - 2019: Educ, IT, SP,
  - 2018: COMP, MTT, PSE, SMC, SP, UFFC
  - 2017: MTT, NPS, PHOT, SP, UFFC
  - 2016: NPS, UFFC
  - 2015: NPS, UFFC
  - 2014: CEDA, ED, EMB, NPS, RA
  - 2013: AP, ED, EMB, NPS
  - 2012: EMB, NPS
  - 2011: CEDA, NPS

Thank You!

IEEE & WIE Membership By Region

R7 - 17,253
WIE - 458

R1 to 6 - 178,937
WIE - 3,707

R10 - 130,527
WIE - 11,154

R8 - 77,519
WIE - 3,931

R9 - 18,224
WIE - 2,558

TOTAL MEMBERSHIP – 422,460

IEEE & WIE Membership By Region (12/2018)

Region	IEEE	WIE	% WIE
R1	30,491	636	2.2%
R2	25,960	544	2.2%
R3	28,291	591	2.1%
R4	20,490	463	2.3%
R5	26,226	467	1.8%
R6	53,053	1,006	2.0%
R7	17,743	458	2.7%
R8	79,970	3,931	5.1%
R9	18,493	2,558	14.0%
R10	134,179	11,154	8.5%

Total IEEE and WIE Membership

Year	IEEE	WIE	% WIE
2010	407,541	12,707	3.1%
2011	415,989	14,662	3.5%
2012	429,085	14,723	3.4%
2013	431,191	15,455	3.6%
2014	426,488	15,681	3.7%
2015	421,355	17,554	4.2%
2016	423,566	20,379	4.8%
2017	417,429	22,968	5.5%
2018	422,460	21,808	5.2%

Total WIE Membership 2010 to 2018

Bar chart legend: ■ Higher Grade ■ Students

Year	Higher Grade	Students	Total
2010	3999	8708	12707
2011	4027	10635	14662
2012	4,509	10,214	14723
2013	4,414	11,041	15455
2014	4,760	10,921	15681
2015	4,911	12,643	17554
2016	5,515	14,864	20379
2017	5,825	17,143	22968
2018	6,495	15,313	21808
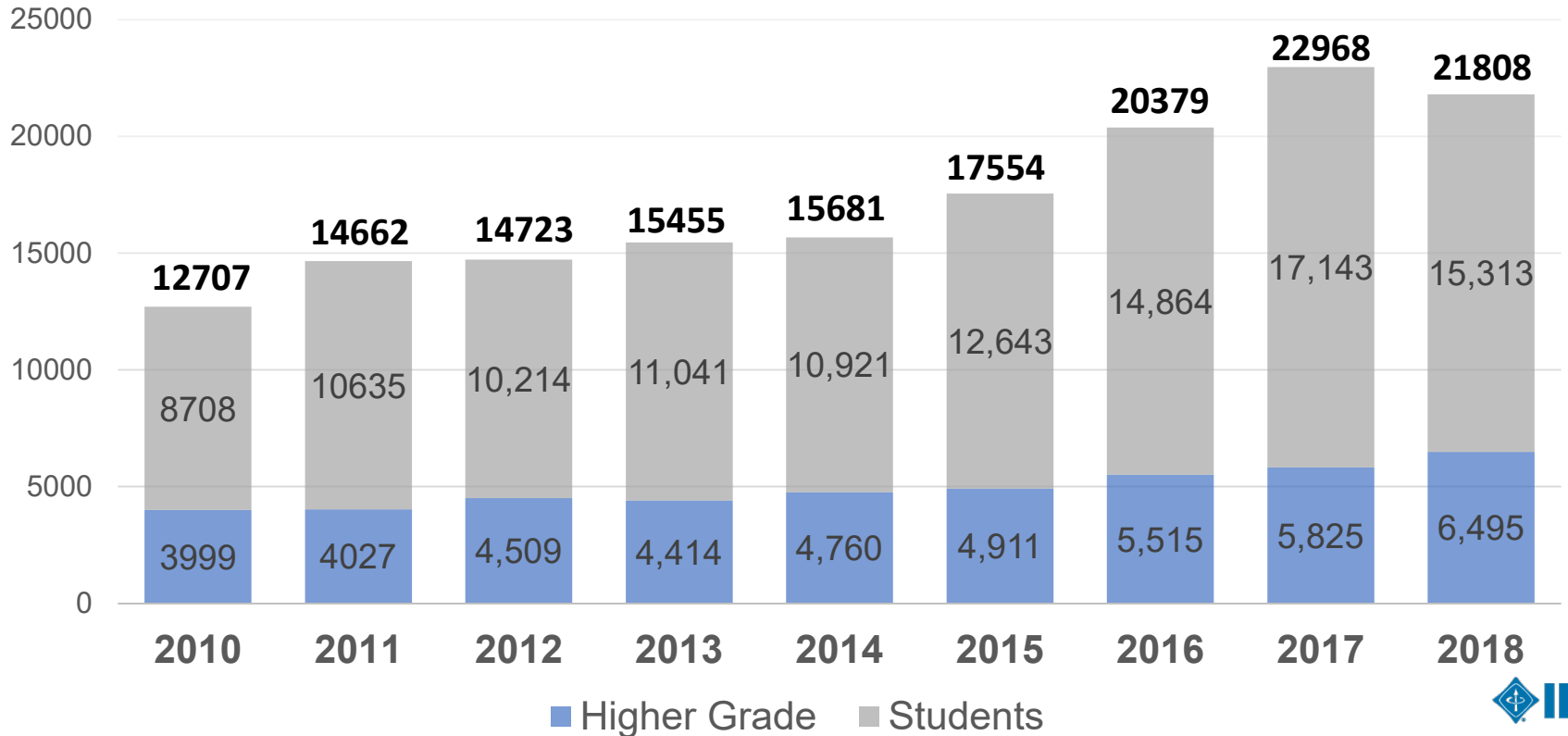
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IEEE WIE Membership 2017 and 2018

Grade	Dec-17	Dec-18	% change
Honorary	1		-100%
Fellow	119	122	3%
Senior Member	833	974	17%
Member	4,722	5,187	10%
Associate Member	150	212	41%
Graduate Student	2,343	2,086	-11%
Student	14,800	13,227	-11%
Affiliates	1		-100%
Total	**22,968**	**21,808**	**-5%**

Region	Dec-17	Dec-18	% change
US	3,587	3,707	3%
Canada	453	458	1%
Europe, Africa & Middle East	4,040	3,931	-3%
Latin America	2,886	2,558	-11%
Asia & Pacific	12,002	11,154	-7%
Total	**22,968**	**21,808**	**-5%**

Gender	Dec-17	Dec-18	% change
Female	12,464	12,423	0%
Male	6,563	6,214	-5%
Not Provided	3,941	3,171	-20%
Total	**22,968**	**21,808**	**-5%**

* Data is based on those reporting gender to IEEE