Women in Computer Science

Presented by

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Topics

- Some heroines
- Some statistics
- Possible explanations for statistics
- Some good news!
- Appendix: We've always been here
- Resources, bibliography

Some Heroines

- Ada Lovelace
- Hedy Lamarr
- Top-secret Rosies
- Hidden Figures
- Grace Hopper
- Radia Perlman
- Sandy Lerner

Ada Lovelace, 1815-1852

- Daughter of Lord Byron
- With Charles Babbage created plans for an Analytical Engine,
  - a machine capable of “developping [sic] and tabulating any function whatever”

Hedy Lamarr, 1913-2000

- Actress and co-inventor of spread-spectrum communications
  - Used by wireless networks and cell phones today!

Top-Secret Rosies

- 80 women worked at the University of Pennsylvania during World War II calculating ballistics trajectories on the ENIAC computer
- First computer programmers

Hidden Figures

- Mathematicians who were critical to the success of the first and subsequent U.S. manned spaceflights
- Katherine Johnson, Dorothy Vaughn, etc.

Grace Hopper, 1906-1992

- Admiral in the U.S. Navy
- Invented the compiler, an intermediate program that translates English language instructions into the language of a computer

Radia Perlman, PhD

- Intel Fellow
- Inventor of the Spanning-Tree Algorithm for network switches
- Her thesis on routing in the presence of malicious failures remains the most important work in routing security.

Sandy Lerner

- Co-founder of Cisco Systems
- Went on to found Urban Decay Cosmetics
  - Does pink make you puke?
  - No animal testing
- Environmentalist

Lack of Diversity at Major Tech Companies

- In 2014, tech companies were pressured into announcing their diversity figures. They are pitiful.

Gender Diversity in Tech Positions

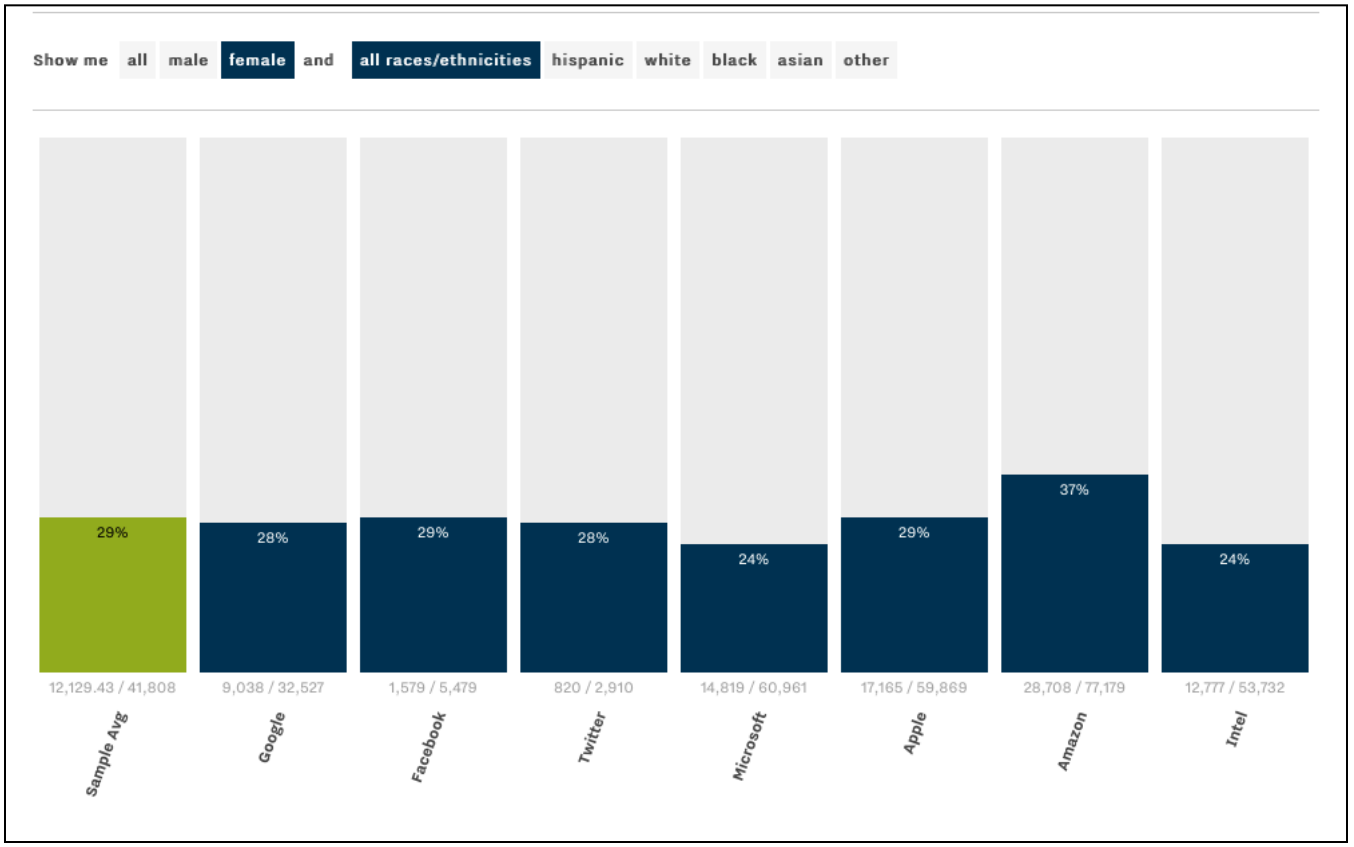
COMPANY	MALE	FEMALE
Apple	80%	20%
Facebook	85%	15%
Google	83%	17%
LinkedIn	83%	17%
Microsoft	76%	24%
Twitter	90%	10%
Yahoo	85%	15%

Ethnic Diversity in Tech Positions

COMPANY	WHITE	ASIAN	HISPANIC	BLACK	MIXED	OTHER OR UNDECLARED
Apple	54%	23%	7%	6%	2%	8%
Facebook	53%	41%	3%	1%	2%	0%
Google	60%	34%	2%	1%	3%	<1%
LinkedIn	34%	60%	3%	1%	1%	<1%
Microsoft	61.8%	N/A	N/A	N/A	N/A	38.2%
Twitter	58%	34%	3%	1%	2%	2%
Yahoo	35%	57%	3%	1%	1%	2%

http://pxlnv.com/blog/tech-company-diversity-stats/

Lack of Diversity in Tech



https://www.theverge.com/2015/8/20/9179853/tech-diversity-scorecard-apple-google-microsoft-facebook-intel-twitter-amazon

Where Did the Women Go?

- The number of women in CS peaked in the mid-1980s.
  - In **1984, 37.1%** of undergraduate CS degrees were awarded to women.
    - In **2016**, it was **18%**.
  - In the mid-1980s, women represented **38%** of the computing and information technology workforce.
    - Today it stands at about **25%**.

Why It Matters

- Economic security for a region and for the women themselves.
- Organizations can't find enough people with CS skills to hire.
  - They're missing 1/2 the population!
- Research shows that diversity leads to better decisions, creativity, performance, innovation.
  - Helps eliminate groupthink.
  - Allows organizations to better cater to a variety of clients.

Women's Contributions (Generalization)

- Applications-orientation, understand the business case
- Collaboration
- Analytical, synthesizing, holistic thinking
- Good at design, troubleshooting
- Good at networking and communications
- Superb programmers

Where Are the Jobs?

- Bureau of Labor Statistics rates the job outlook for the following jobs as excellent with employment expected to grow faster or much faster than for the average job:
  - Computer and information systems managers
  - Computer network, systems, and database administrators
  - Software engineers and computer programmers
  - Computer support specialists

Taulbee Survey

- Survey is conducted annually by the Computing Research Association (CRA) to document trends in computer science and engineering student enrollment, employment of graduates, and faculty hiring at U.S. and Canadian universities.
- Information is gathered during the Fall from PhD-granting institutions.

http://cra.org/crn/wp-content/uploads/sites/7/2017/05/2016-Taulbee-Survey.pdf

2016 Taulbee Survey, PhDs

Table D2. PhDs Awarded by Gender

	CS		CE	
Male	1,368	82.9%	78	87.6%
Female	282	17.1%	11	12.4%
Total Known Gender	1,650		89	
Gender Unknown	9		1	
Grand Total	1,659		90	

2016 Taulbee Survey, Masters

Table M2. Master's Degrees Awarded by Gender

	CS		CE	
Male	8,041	74.8%	562	78.6%
Female	2,715	25.2%	153	21.4%
Total Known Gender	10,756		715	
Gender Unknown	483		22	
Grand Total	11,239		737	

2016 Taulbee Survey, Bachelors

Table B2. Bachelor's Degrees Awarded by Gender

	CS		CE	
Male	14,259	82.1%	2,103	87.4%
Female	3,107	17.9%	304	12.6%
Total Known Gender	17,366		2,407	
Gender Unknown	1,588		204	
Grand Total	18,954		2,611	

Why the Low Numbers in CS?

- In general
  - Perceptions about the job market
  - Lack of self confidence
  - Imposter syndrome
  - Bias in the classroom, advising
  - Lack of women faculty, mentors, heroines

Some Good News from Taulbee!

The proportion of women among bachelor's graduates in CS rose once again, from 15.7 percent in 2014-15 to 17.9 percent in 2015-16. This is the highest percentage of female CS graduates among Taulbee Survey respondents since 2002-03.

What Works

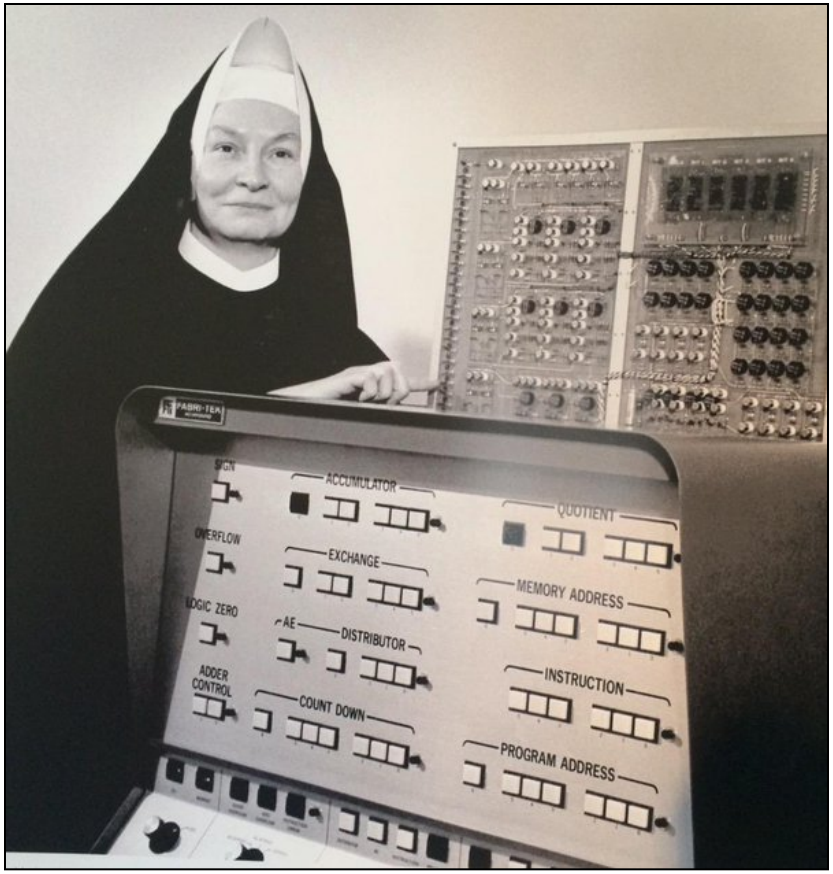
- At colleges
  - More interesting first year classes in CS
  - Fewer “weed out” classes
- At work
  - Better job advertisements
    - More accurate list of requirements
    - Less silliness about free beer and ninja software warriors
    - More info about benefits, teamwork, job training
  - Better on-the-job experience
    - More mentoring, training
    - Less sexual harassment, discrimination, macho behavior
    - More accurate job performance reviews

Appendix

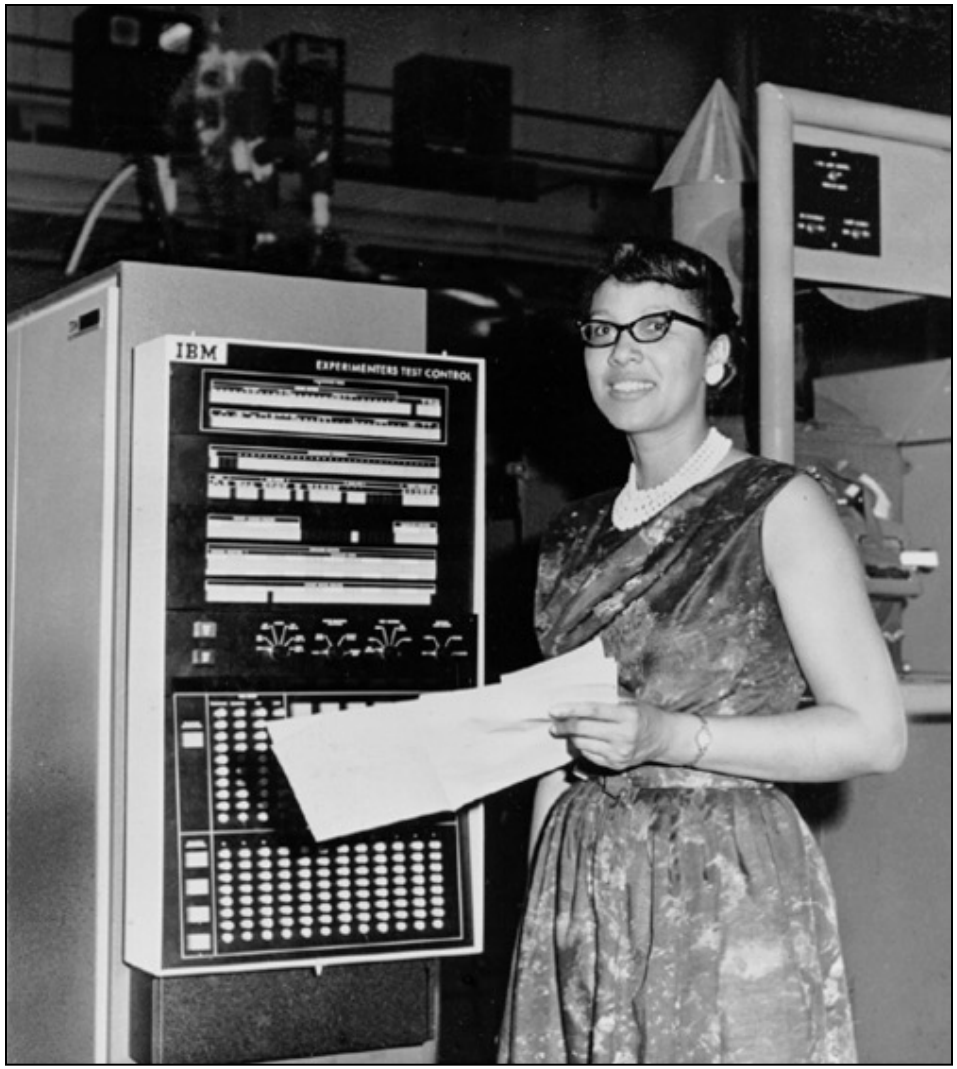
- We’ve always been here! You just weren’t looking…

Sister Mary Keller

- The first two people to earn a PhD in CS in the US were Sister Mary Keller and Irving Tang, June 7th, 1965



Katherine Johnson, NASA



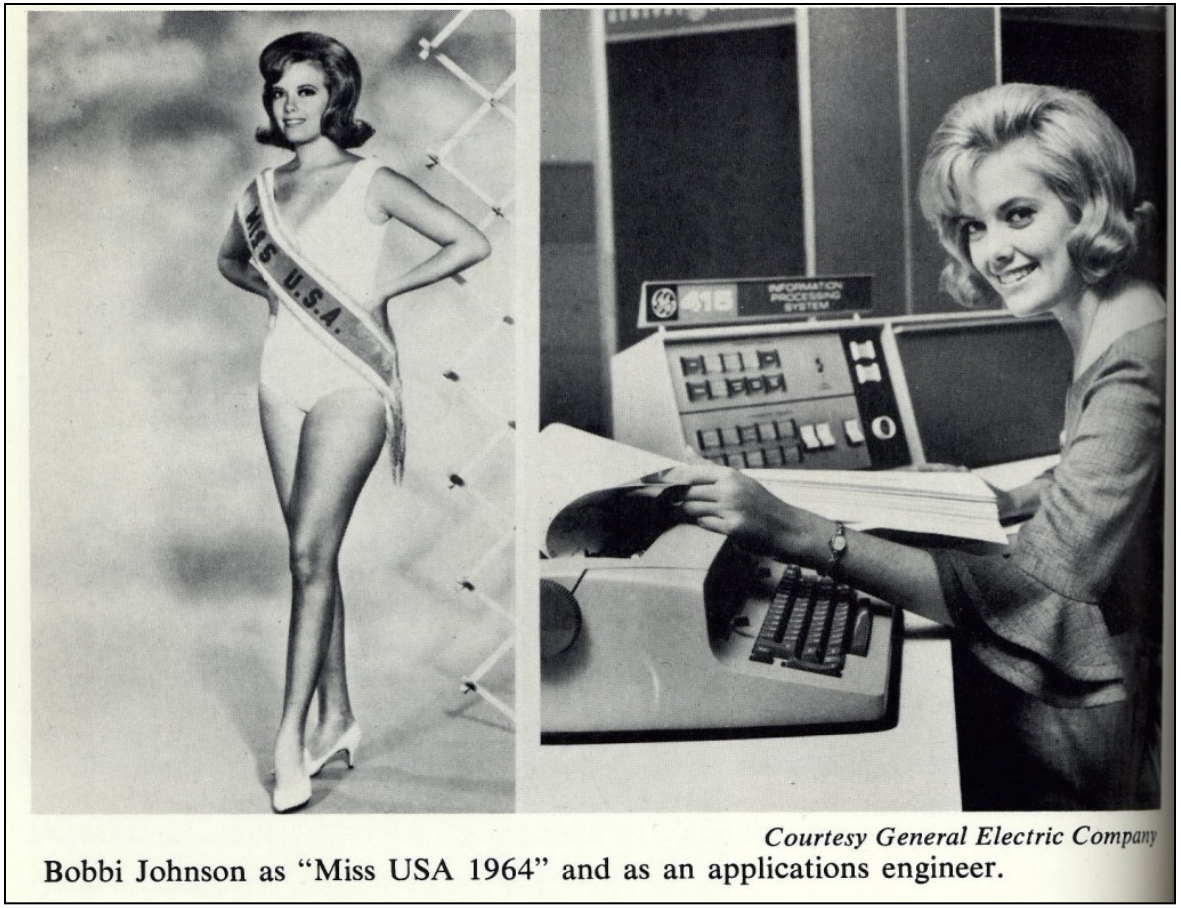
Unknown

Coffee and coding have always gone together.

Courtesy University of North Carolina

Payroll deadlines must be met. Print-out review and coffee drinking go hand-in-hand at this school's payroll and accounting department.

Bobbi Johnson



Courtesy General Electric Company

Bobbi Johnson as "Miss USA 1964" and as an applications engineer.

Margaret Hamilton, NASA

Control Data Advertisement

NSA Programmer

The First Computers WERE Women!

More Women Computers

Mamie Jackson

A computer at an aircraft firm in Buffalo, NY.

Genevieve Dixon

A computer at an aircraft firm in Buffalo, NY.

Appendix

- We’ve always been here. So get with the program.

Resources

- Women in Computing Wikipedia page: http://en.wikipedia.org/wiki/Women_in_computing
- US Bureau of Labor Statistics Population Survey: http://www.bls.gov/cps/cpsaat11.htm
- Computing Research Association's Committee on the Status of Women in Computing: http://cra-w.org/
- AAUW: Why So Few? http://www.aauw.org/research/why-so-few/
- AAUW: Solving the Equation: http://www.aauw.org/research/solving-the-equation/
- Anita Borg Institute: http://anitaborg.org/
- National Center for Women & Information Technology: http://www.ncwit.org/
- Ada Project: http://www.women.cs.cmu.edu/ada/

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- Misa, Thomas J. Gender Codes: Why Women Are Leaving Computing. Wiley, 2010.