

Women in Computer Science

Presented by

Priscilla Oppenheimer

www.priscilla.com

www.themakersofthings.com

twitter.com/priscillaoppy

www.priscilla.com/womeninics.pdf

Topics

- Summary of the problem
- Some heroines
- Some statistics
- Possible explanations for statistics
- Some good news!

Lack of Diversity at Major Tech Companies

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

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

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%

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 **2011**, it was **11.7%**.
 - 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.



Diversity Research

- [Forbes](#) study identified workforce diversity and inclusion as a key driver of internal innovation and business growth.
- [Lu Hong and Scott Page](#) showed that groups of diverse problem solvers can outperform groups of high-ability problem solvers.
- According to [McKinsey](#), companies with diverse executive boards enjoy significantly higher earnings and returns on equity.
- According to [Harvard Business School](#) multicultural social networks promote creativity.

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

Heroines

Well-known Women in CS

- Ada Lovelace
- Hedy Lamarr
- Top-secret Rosies
- 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

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

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, faculty hiring, etc.
- Information is gathered during the Fall from PhD-granting institutions.

2013 Taulbee Survey

- 179 departments completed the survey
- The number of CS degrees is rising.
- Diversity problem persists, but there are signs of hope!
- Fraction of women among CS graduates:
 - PhDs down from 18.4% in 2011 to **17.2% in 2013.**
 - Masters down from 24.6% in 2011 to **21.2% in 2013.**
 - BS degrees up from 11.7% in 2011 to **14.2% in 2013.**

2013 Taulbee Survey

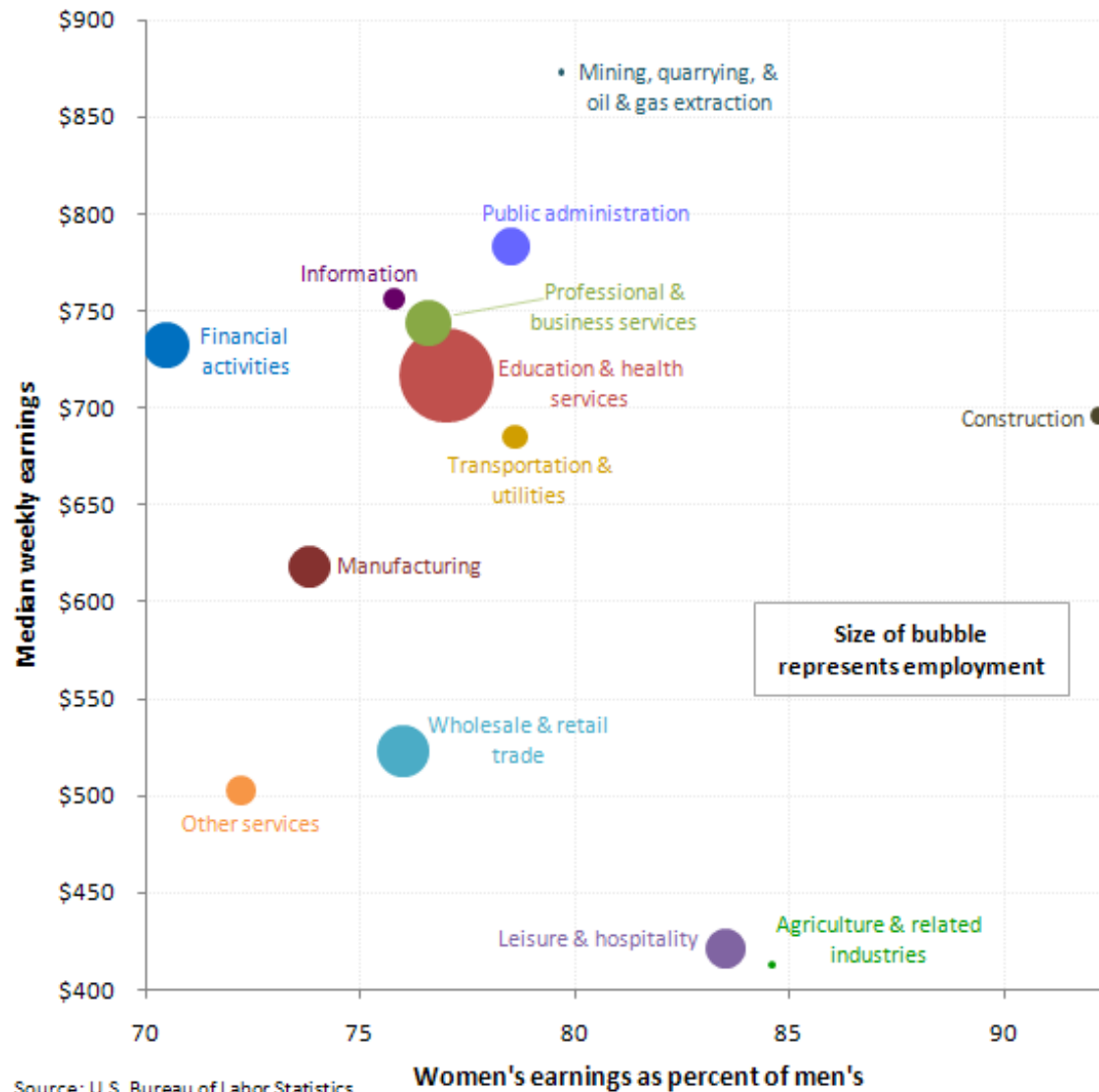
- Gender of newly hired faculty
 - Tenure-track
 - 22.5% women
 - Research
 - 7.8% women
 - Post-doc
 - 16.5% women
 - Teaching faculty
 - 33.3% women

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

On the Job

Employment and median usual weekly earnings of women, by industry, 2009



Source: U.S. Bureau of Labor Statistics

Source: [US Bureau of Labor Statistics](#)

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

Some Good News!

- “[Dude](#), I think that girl sitting in front of us is a CS major.”
- Record numbers of women declaring CS major at [Harvard](#), [Harvey Mudd](#), etc., due to concerted faculty efforts!
- Numerous federal, business, college organizations working to increase women in STEM.



We're coming BACK!

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

Resources

- [Women in Computing Wikipedia page](#)
- [US Bureau of Labor Statistics Population Survey](#)
- Computer Research Association's
 - [Committee on the Status of Women in Computing Research](#)
- AAUW
 - [Why So Few? \(STEM research\)](#)
- [Anita Borg Institute for Women and Technology](#)
- [National Center for Women & Information Technology](#)
- [Ada Project](#)
- US Federal Office of Science and Technology Policy
 - <http://www.whitehouse.gov/administration/eop/ostp/women>

Bibliography

- Cohoon, Joanne and Aspray, William (editors). [Women and Information Technology: Research on Underrepresentation](#). The MIT Press, 2008.
- Ensmenger, Nathan. [The Computer Boys Take Over](#). The MIT Press, 2010.
- Margolis, Jane and Fisher, Allan. [Unlocking the Clubhouse](#). The MIT Press, 2003.
- Misa, Thomas J. [Gender Codes: Why Women Are Leaving Computing](#). Wiley, 2010.