Undergraduate Women in Computer Science at Carnegie Mellon

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Outline

- Research and Action at Carnegie Mellon
  - Program
  - Findings
  - Intervention
- Outreach
- The Challenge

The Carnegie Mellon Study

- 4 year longitudinal study at CMU (Sloan Fdn).
- Understand processes of attachment and detachment.
- Conceive of interventions for higher education.
- Computer Science/Women's Studies collaboration (Jane Margolis)
- Core data: 200+ intensive interviews with students.

Findings

- Gaps in experience (informal > formal)
- Differences in motivation/interest
- Differences in social/psychological factors
  - insider vs. outsider
  - attribution
  - stereotypes
- Interest vs. confidence
  - the “appropriate switcher”

Changes

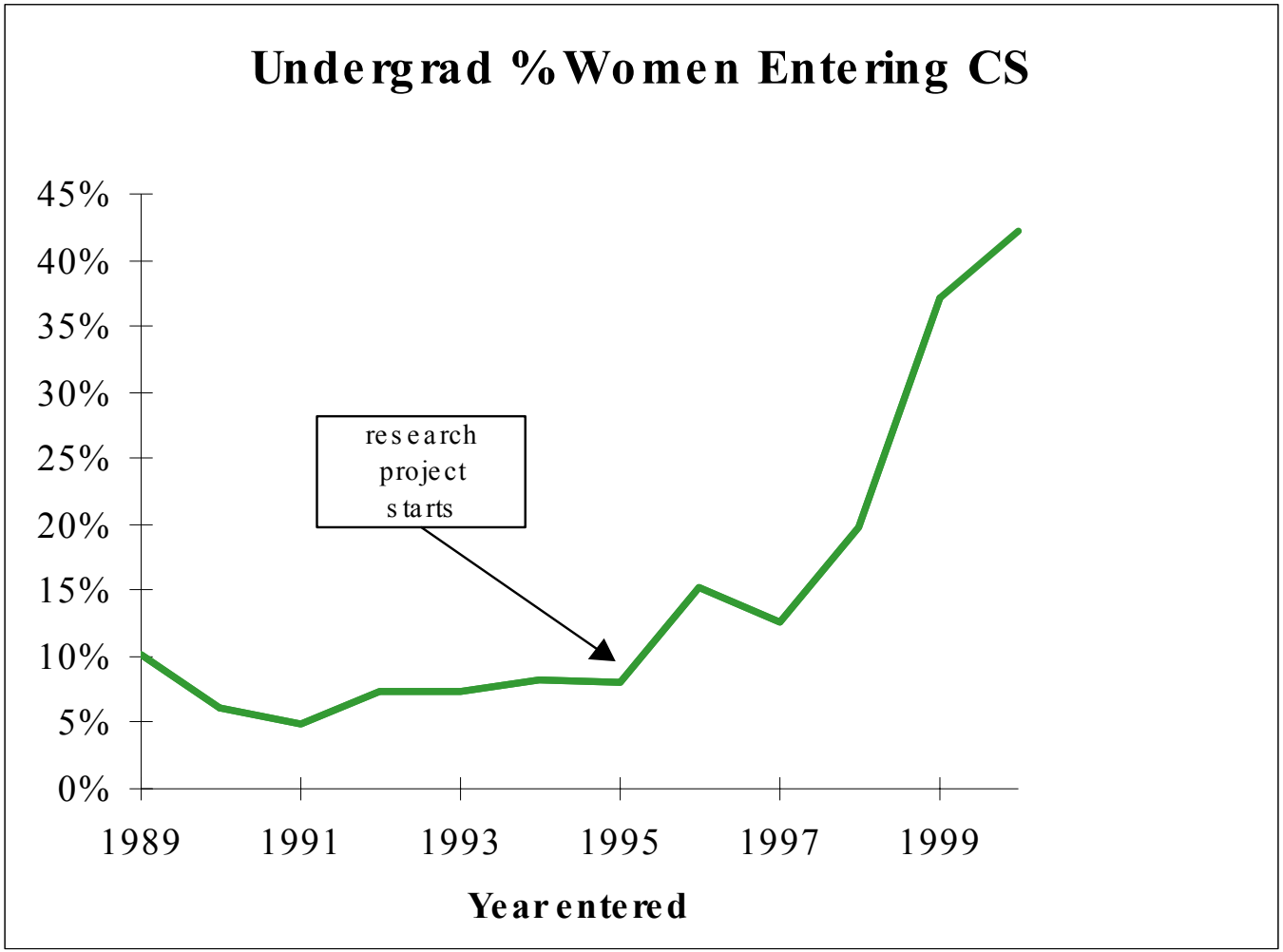
- Experience gap -- *what if I'm not a hacker?*
  - experience not a key admissions preference. yes
  - multi-track entrance to curriculum. yes
- Attraction gap -- *why do CS?*
  - immigration course -- what is CS? yes
    - career information, etc.
  - computing with a purpose: some
    minor, projects, integrated courses.
- Confidence gap -- *am I doing OK?*
  - improve teaching some
  - improve human contact/mentorship now
  - teach students about cognition and attribution ?
- Let prospective students know. yes

Outreach

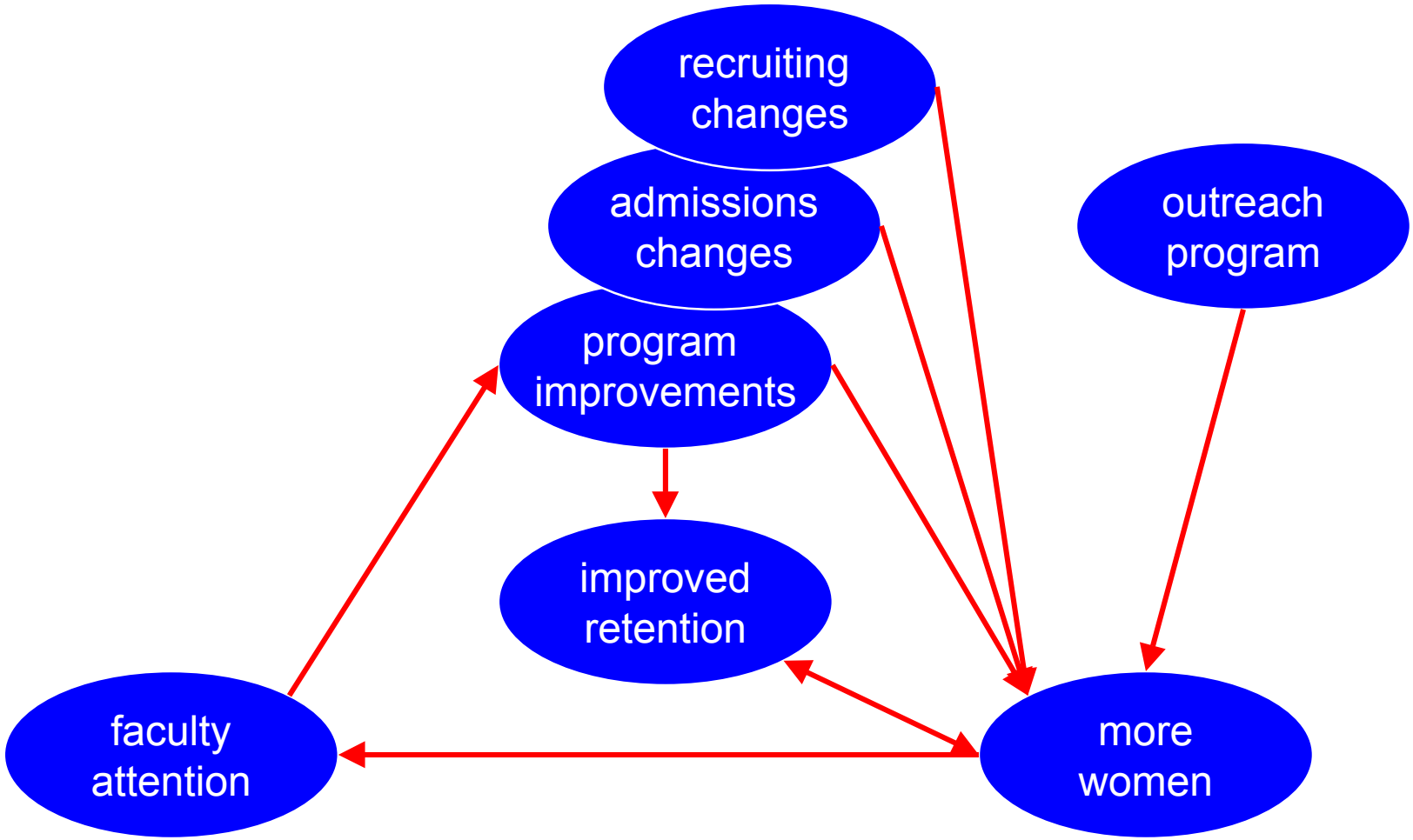
Summer Institute for Computer Science Advanced Placement Teachers (6APT)

- Gender equity education for APCS teachers.
- Use need for C++ training (for 1999), along with Carnegie Mellon reputation, to attract a broad spectrum of teachers.
- Situate gender equity training within the CS classroom.
- 240 teachers over 3 years, 15-20% of active APCS teachers.

Enrollment Trends



What's Going On?



What Next?

- Historically, have graduated about as many women and men as entered:
  - 10-15% turnover among men
  - 20-30% turnover among women
  - influx largely from engineering, largely from ECE.
- If we lose 25% of a large number, they will be harder to replace.
- Early retention numbers promising.
  - 43%→35% →11% leaving by junior year.
- Lenore Blum's women@SCS effort.

For More Information

- www.cs.cmu.edu/~gendergap
  - CMU gender study page
- www.cs.cmu.edu/~women
  - CMU “Women@SCS” page

Backup slides

A Few Statistics

- Web-surfing about even, but…
- Small representation of women in Computer Science in general
  - 27% of 4-yr degrees in 1997, from 37% in 1985
  - 18% of 4-yr degrees in research depts in 1999
- Advanced Placement participation in particular (1996):
  - 17% of test takers
  - 12% of AB level test takers
- ☛ The key distinction: *using* vs. *making*

Why It Matters

- Workforce issues.
- Diversity breeds quality.
- Individual opportunity.

Attachment Begins at Home

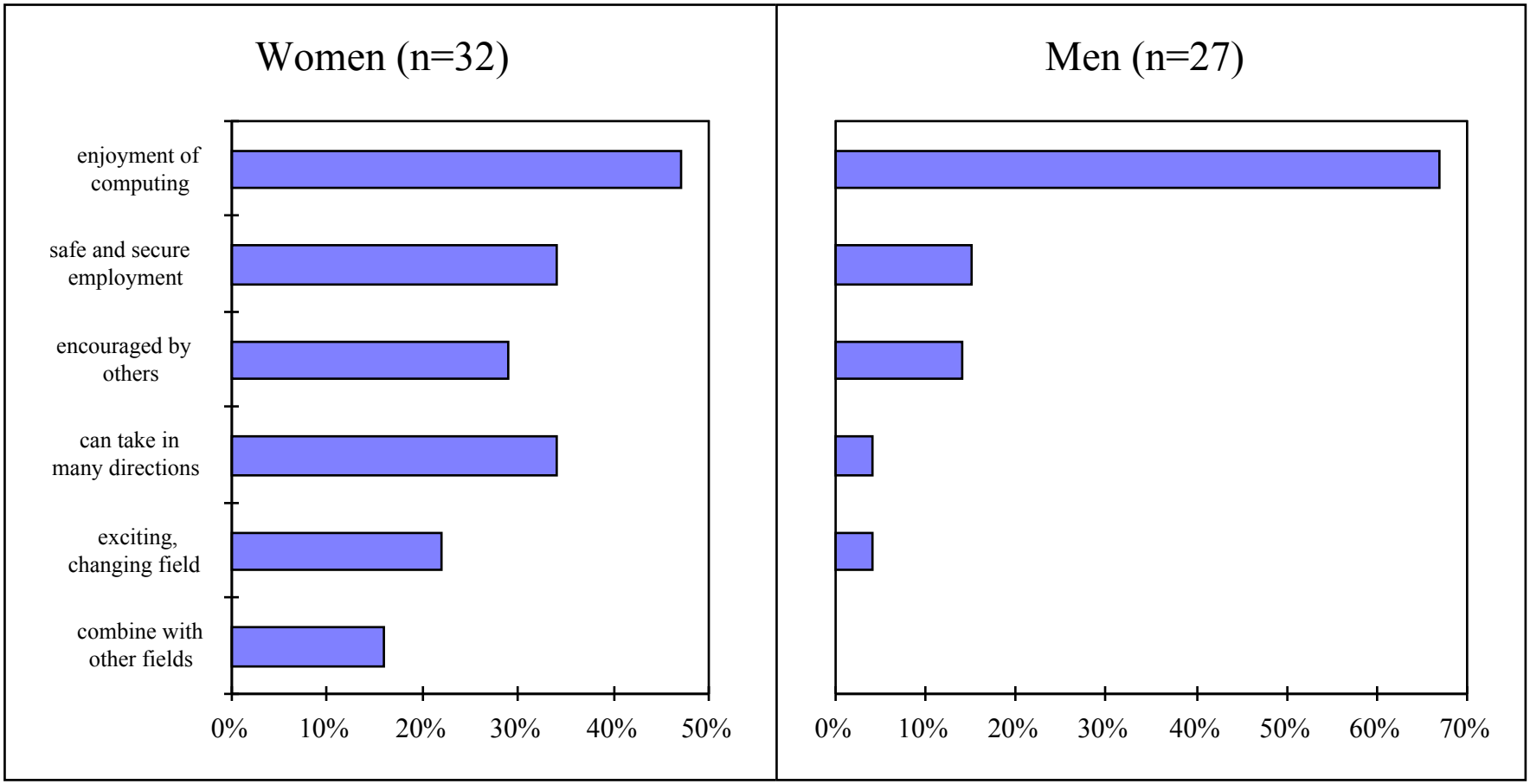
Women	Men
First introduced by a parent	First introduced by a parent
Unlikely to have own computer prior to CMU	Most had computers at an early age
Tell of *watching*, being *shown* how to use	Tell of *exploring*, self-mentoring
One interest among many	An object of fascination
An “acquired taste”	Object of an “epiphany”

Experience and Confidence

- Upon entry, female students have
  - less formal experience
  - far less informal experience
  - lower confidence in their CS abilities
- Gap in self-rating of confidence and ability narrows over time.

☛ What do we think incoming students need to know? What do *they* think they need to know?

Factors in Decision to Major



Geek Mythology

- Image of CS student as single-minded obsessive.
- Mix of prestige and derision.
- Common perception by CS students: “They’re geeks, but I’m not.”
  - 69% of female students.
  - 32% of men, but 50% of male switchers.
- Women report far greater concern with lack of fit.

Interest and Confidence

- The “appropriate” switcher: a student who changes major due to lack of interest.
- Longitudinal analysis shows: for many students, loss of interest is *preceded* by a loss of confidence.
- For female students, often exacerbated
  - by attributions of success and failure: sense of failure despite good performance.
  - by stereotype vulnerability: underlying perception that they differ from the norm.