

# Attraction, Repulsion, and Other Forces that Affect Women in Physics

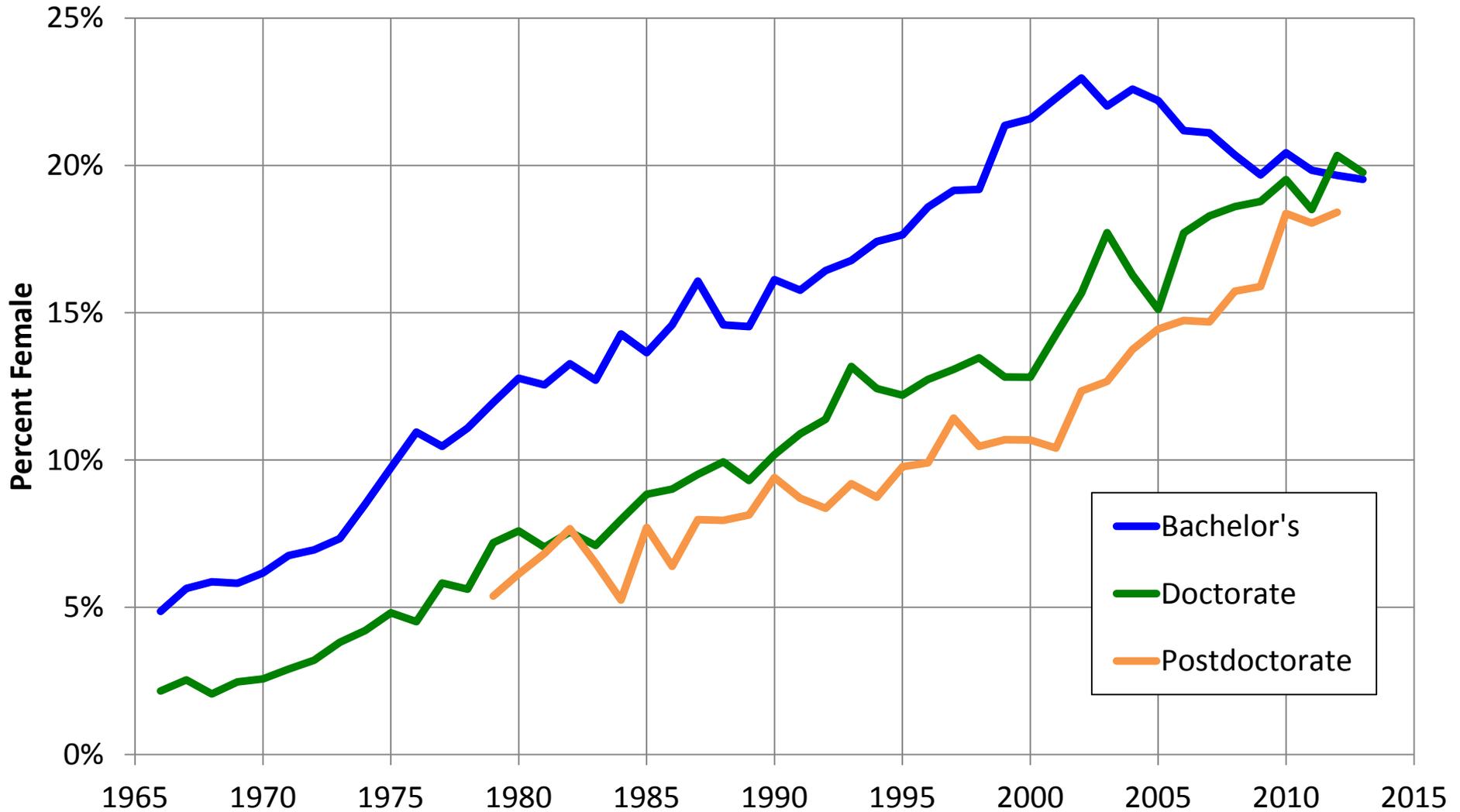
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Professor of Psychology

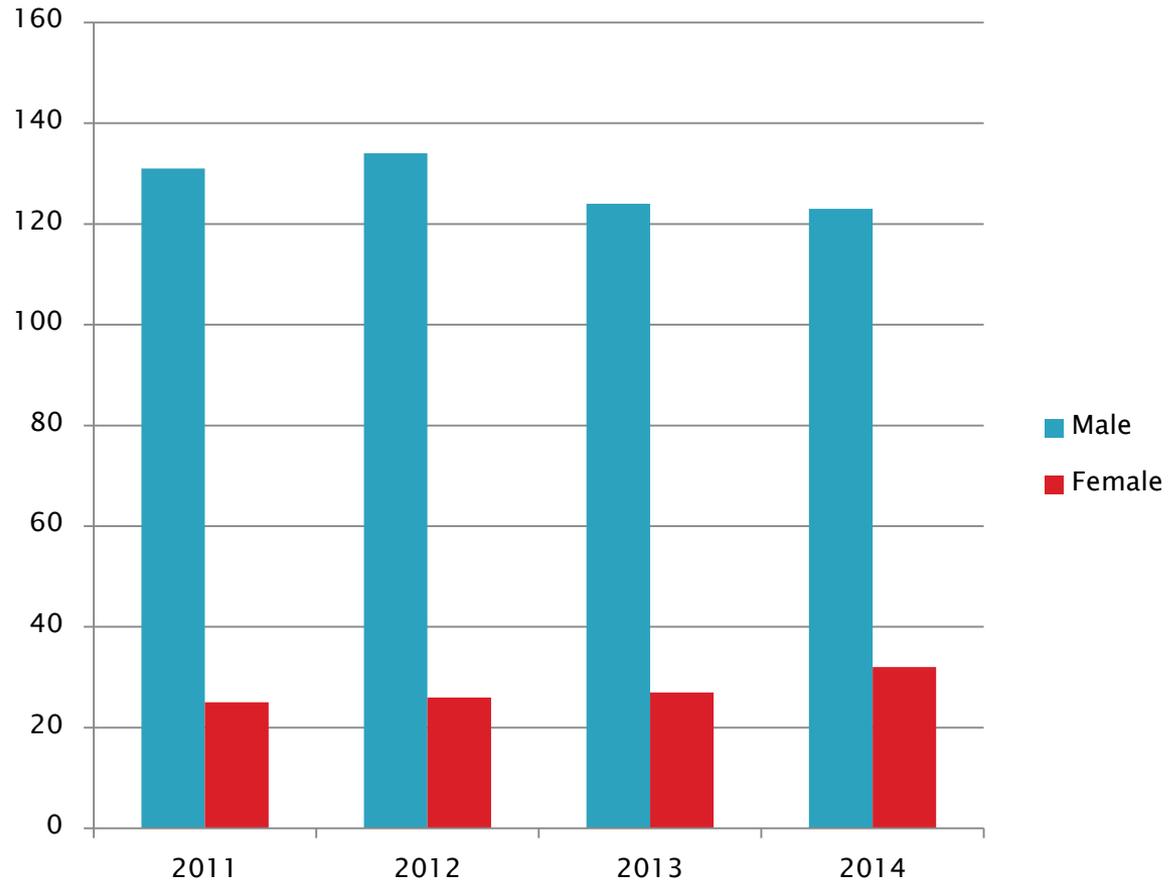
Director, Doctoral Program in Social and Health  
Psychology

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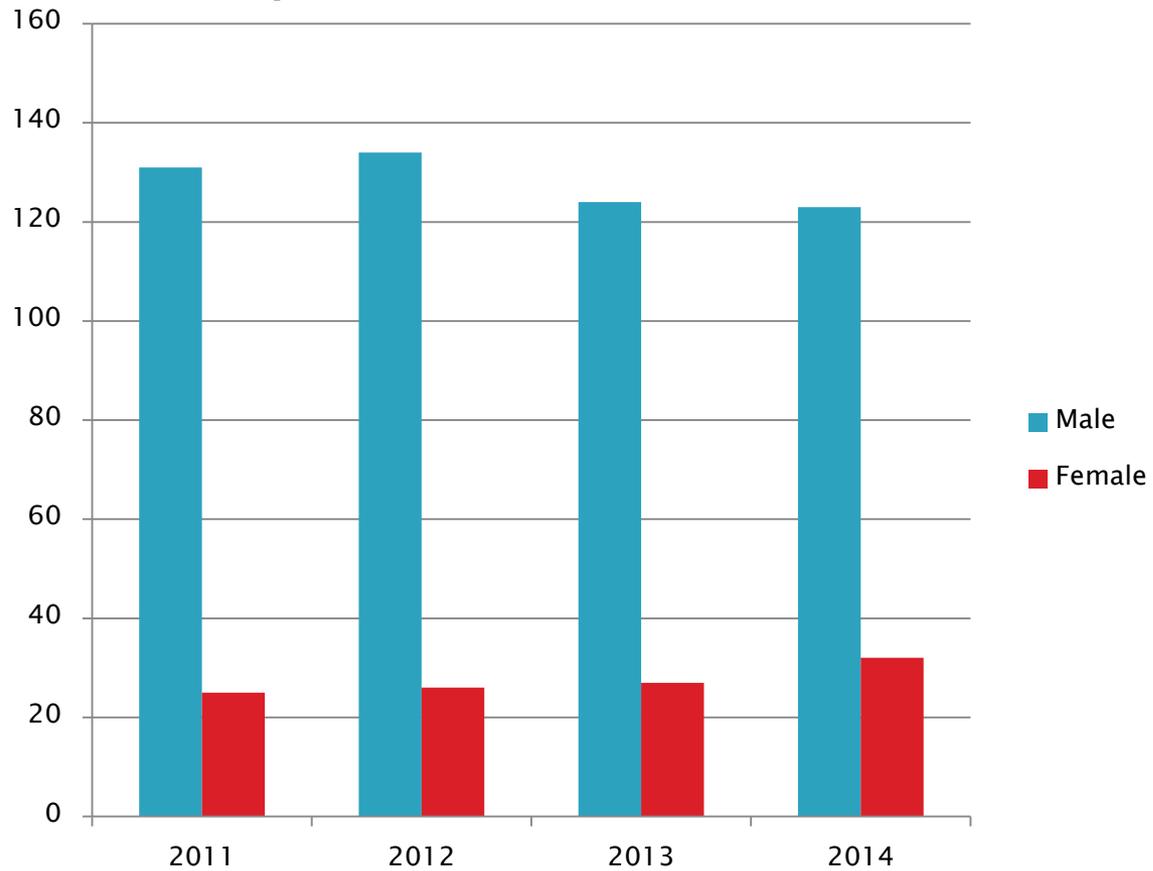
# Women in Physics



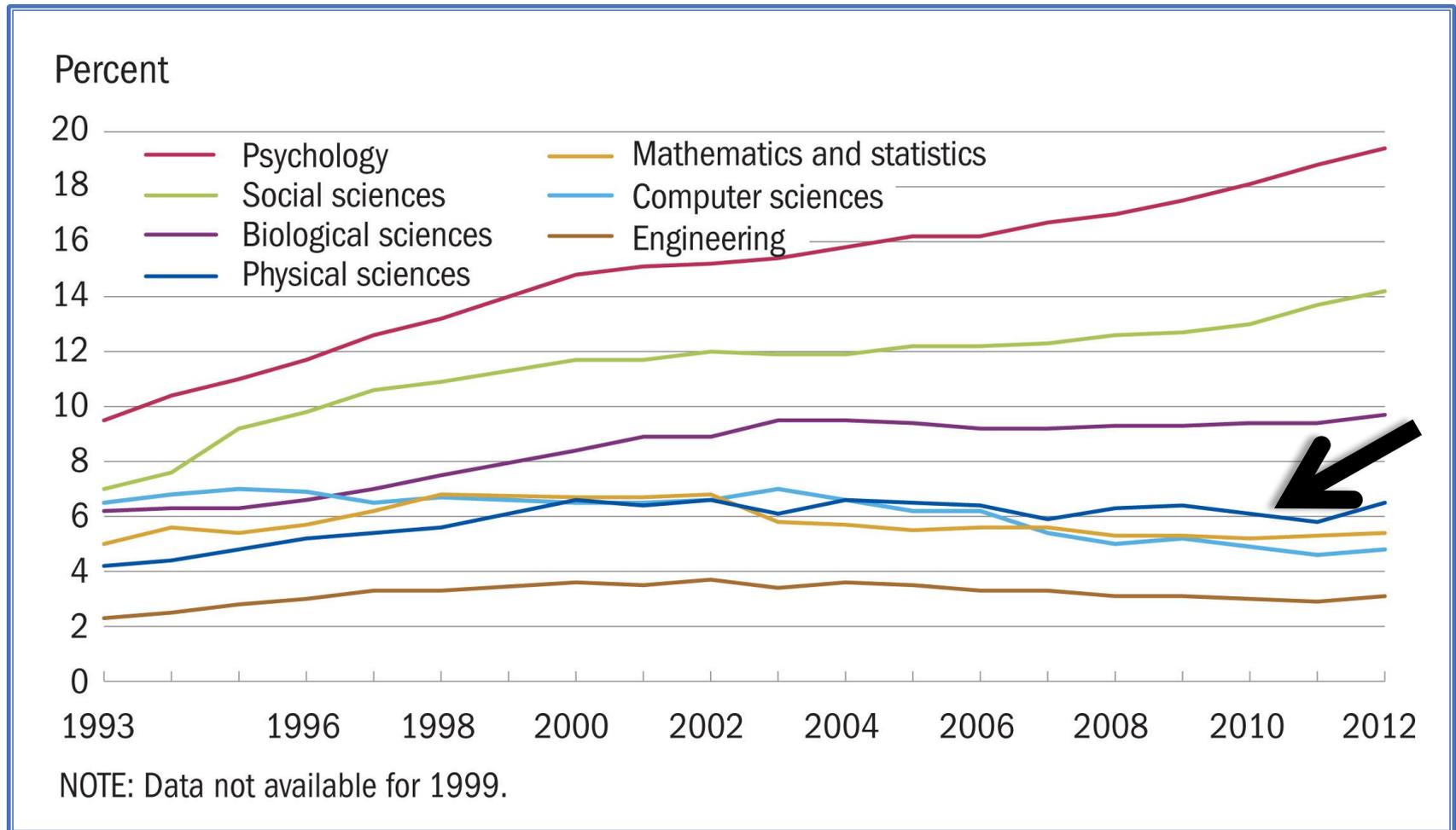
# Stony Brook University Physics Majors (Undergrad)



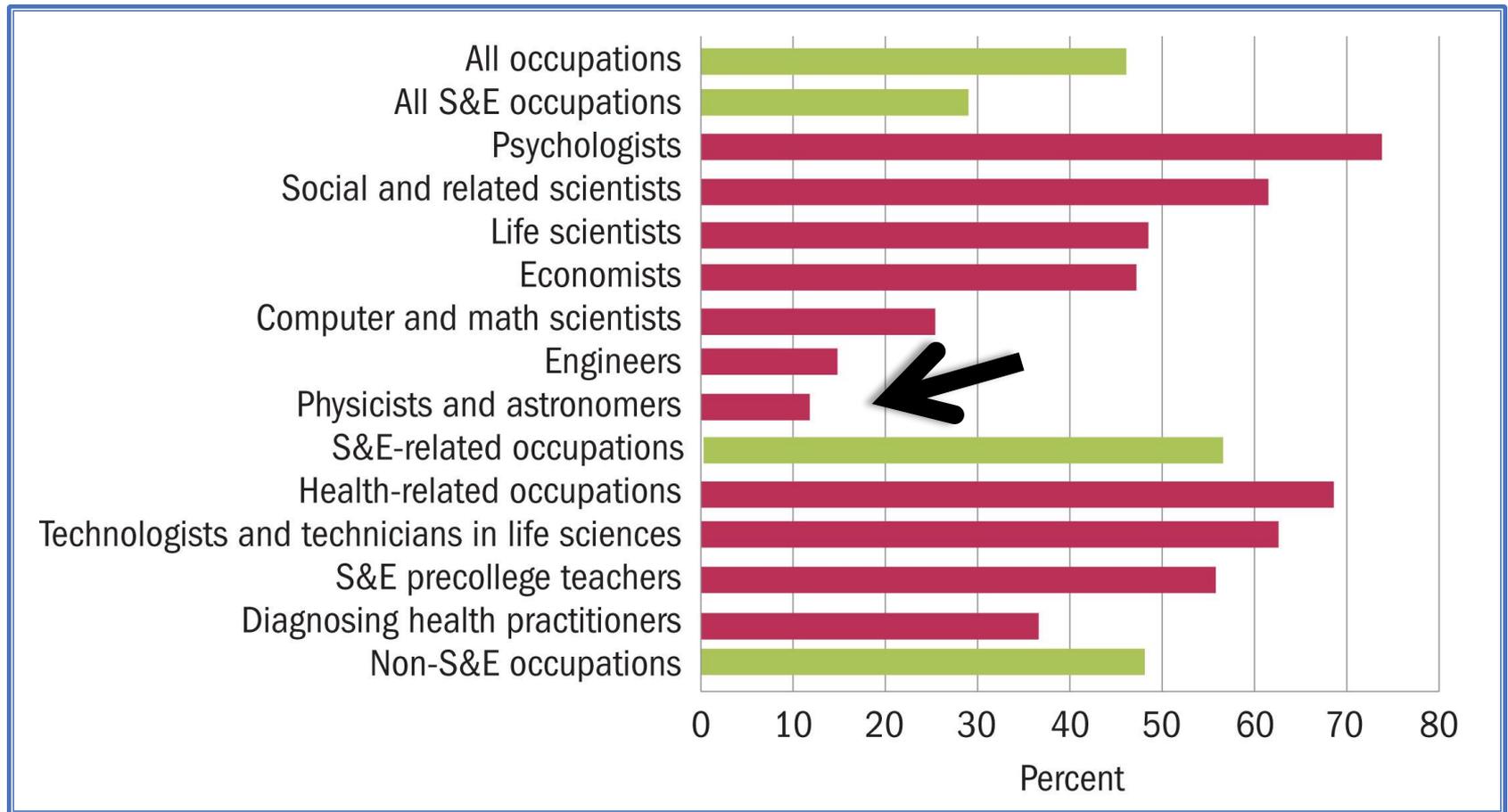
# Stony Brook University Physics PhD Candidates



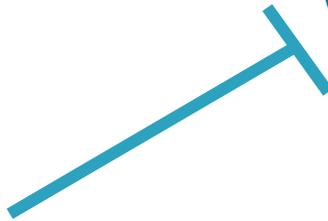
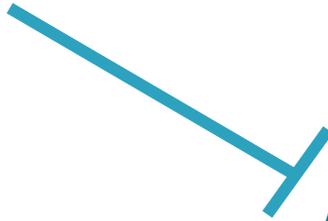
# Science and engineering bachelor's degrees earned by underrepresented minority women, by field: 1993–2012



# Employed women within the science and engineering workforce as a percentage of selected occupations: 2013



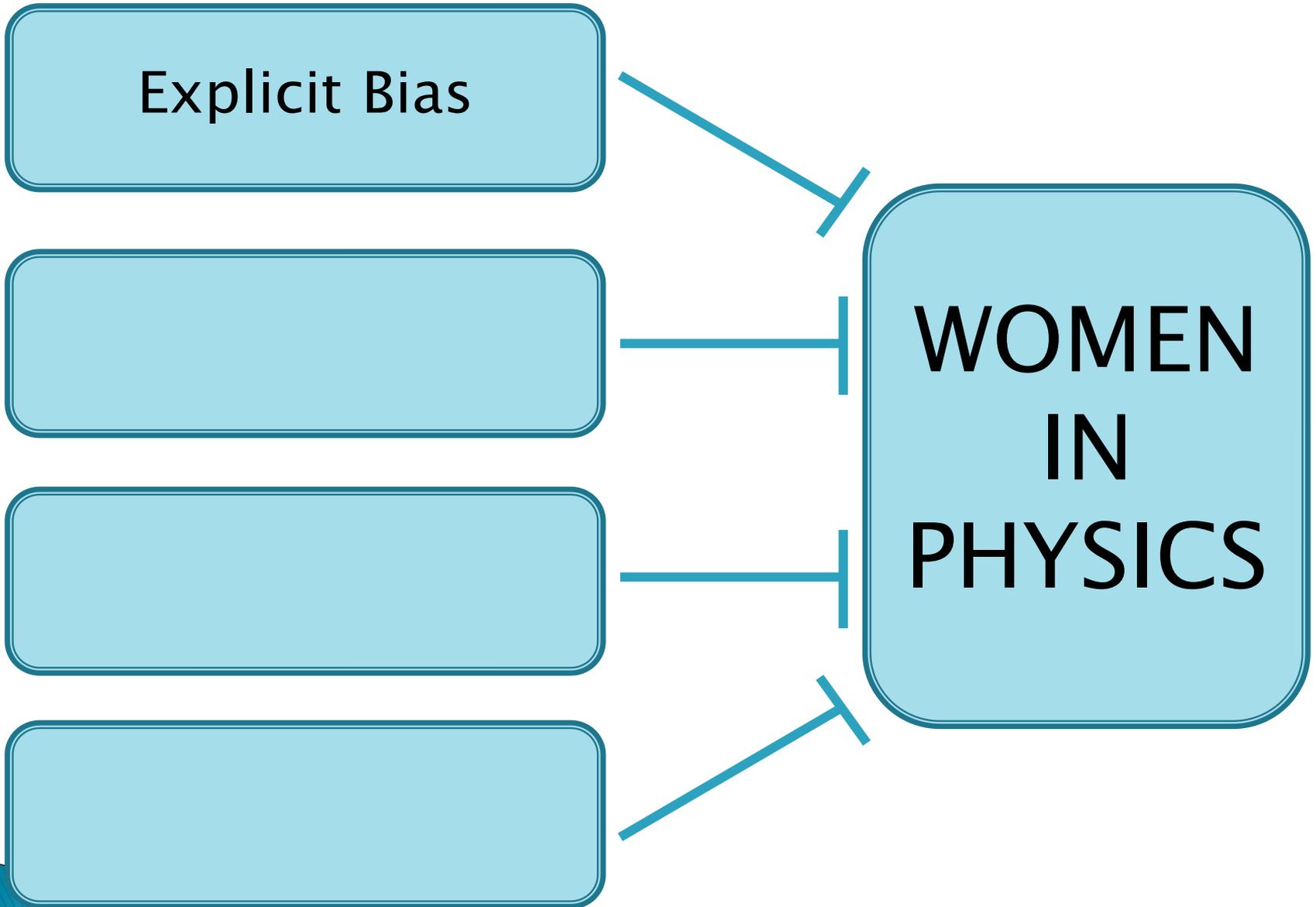
From: [www.nsf.gov/statistics/wmpd](http://www.nsf.gov/statistics/wmpd)

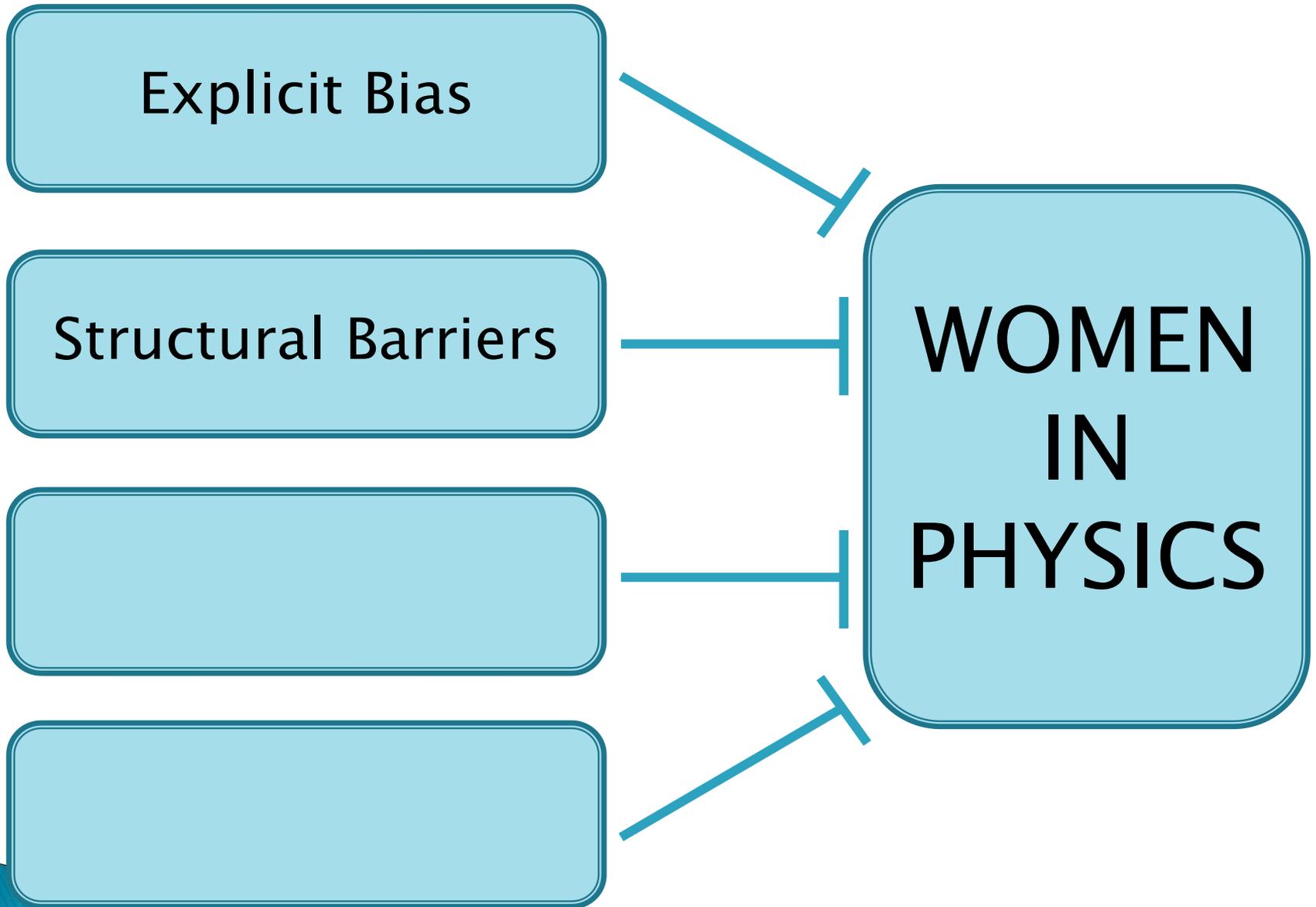


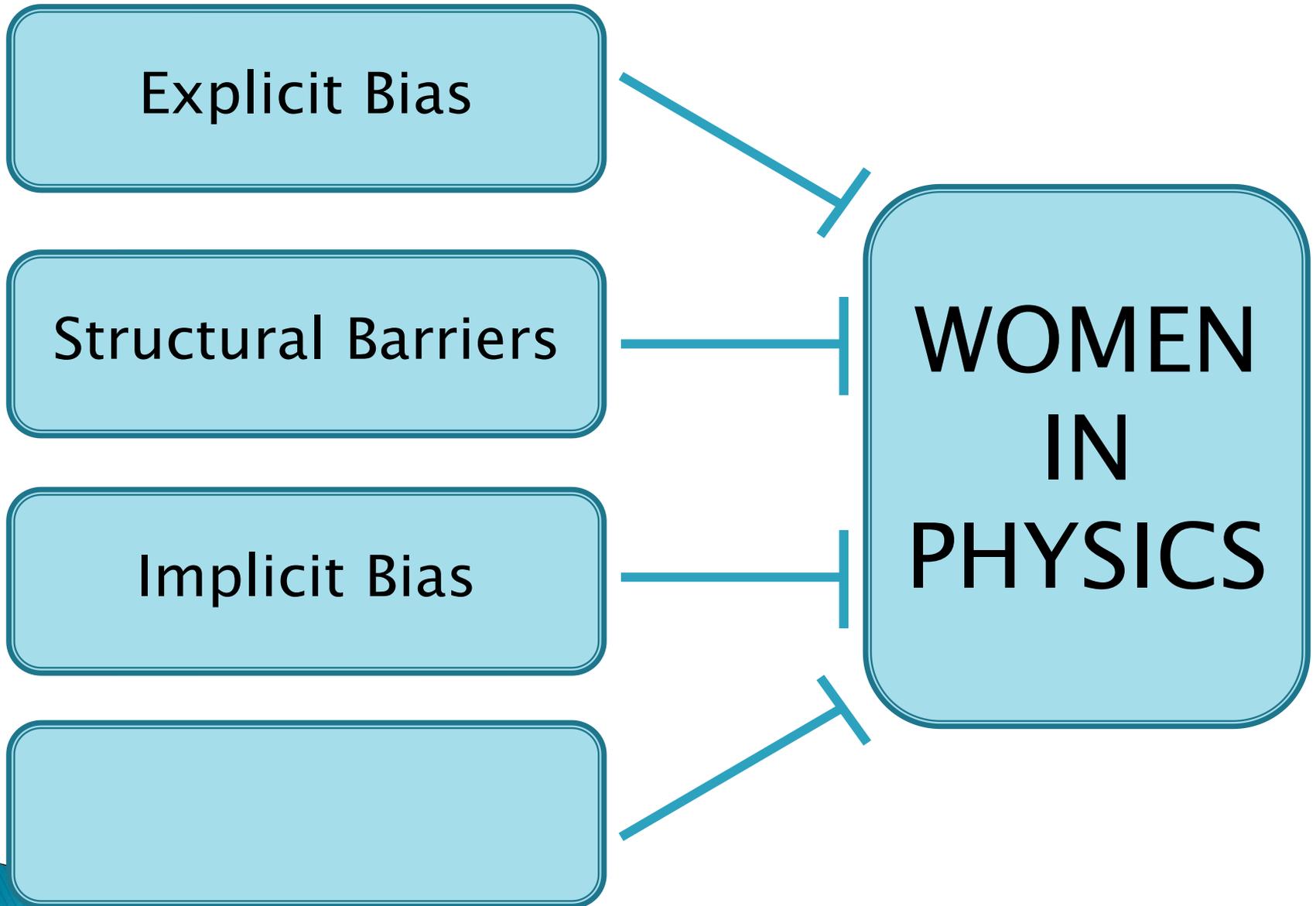
**WOMEN  
IN  
PHYSICS**

Explicit Bias

**WOMEN  
IN  
PHYSICS**





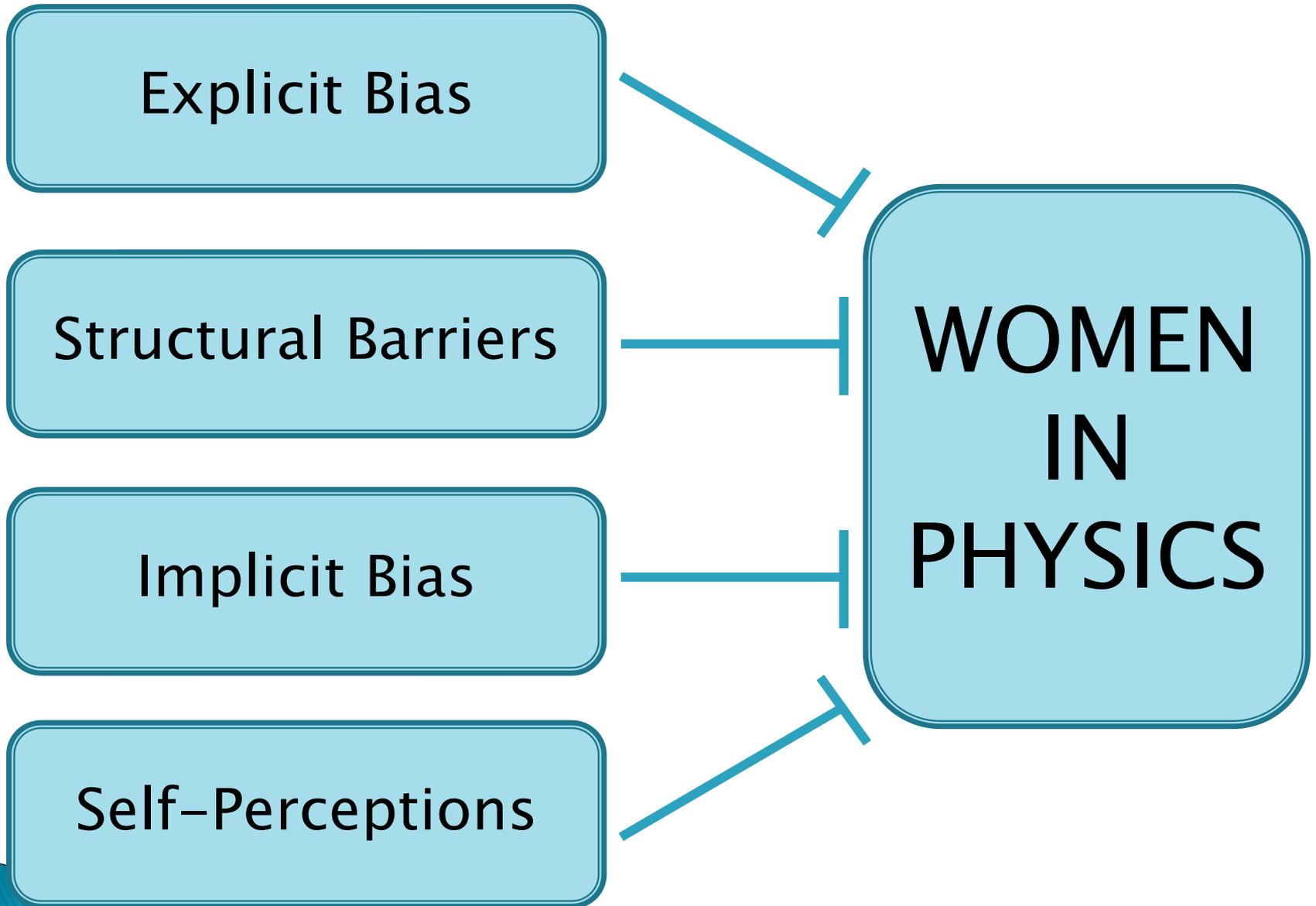


Explicit Bias

Structural Barriers

Implicit Bias

**WOMEN  
IN  
PHYSICS**



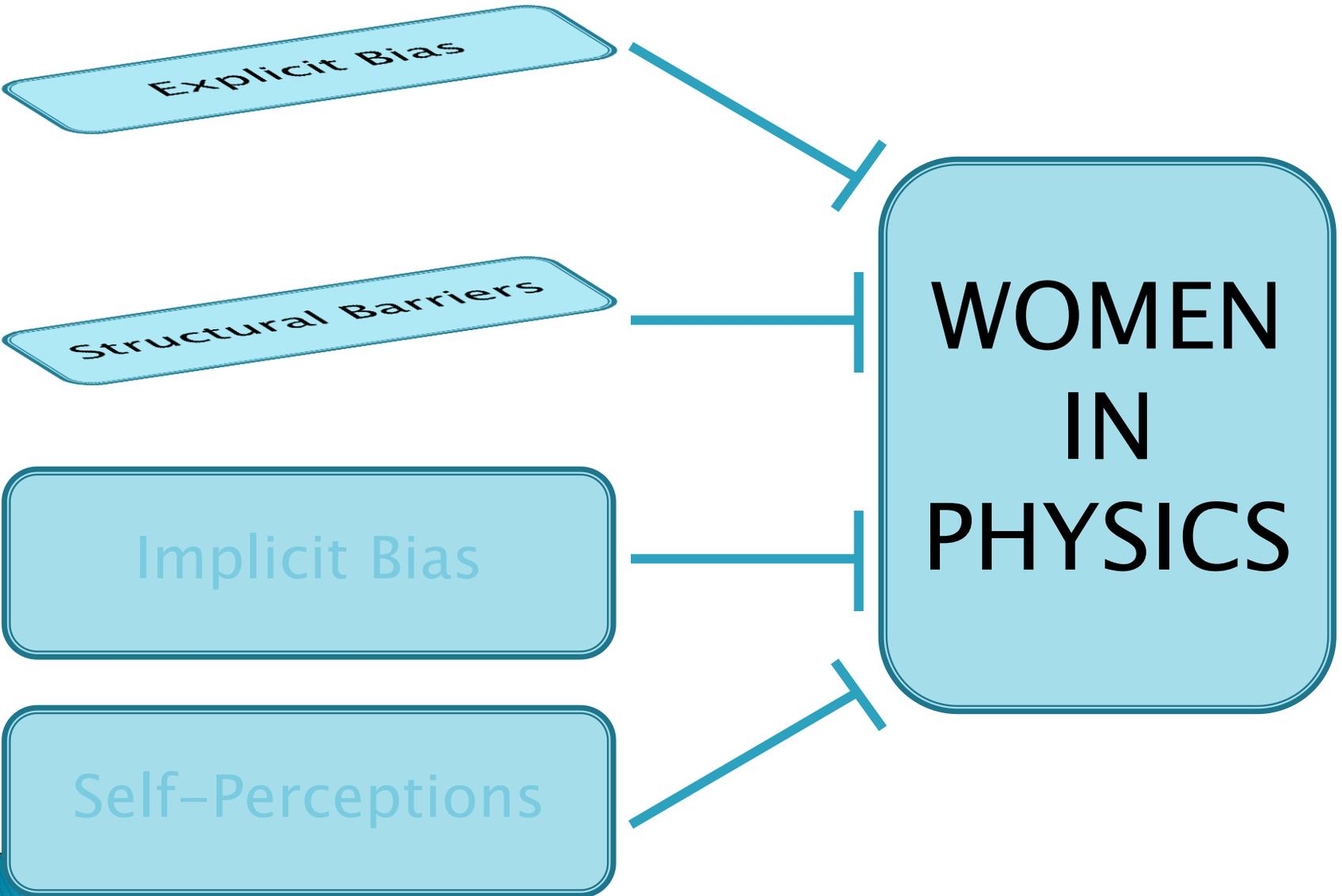
Explicit Bias

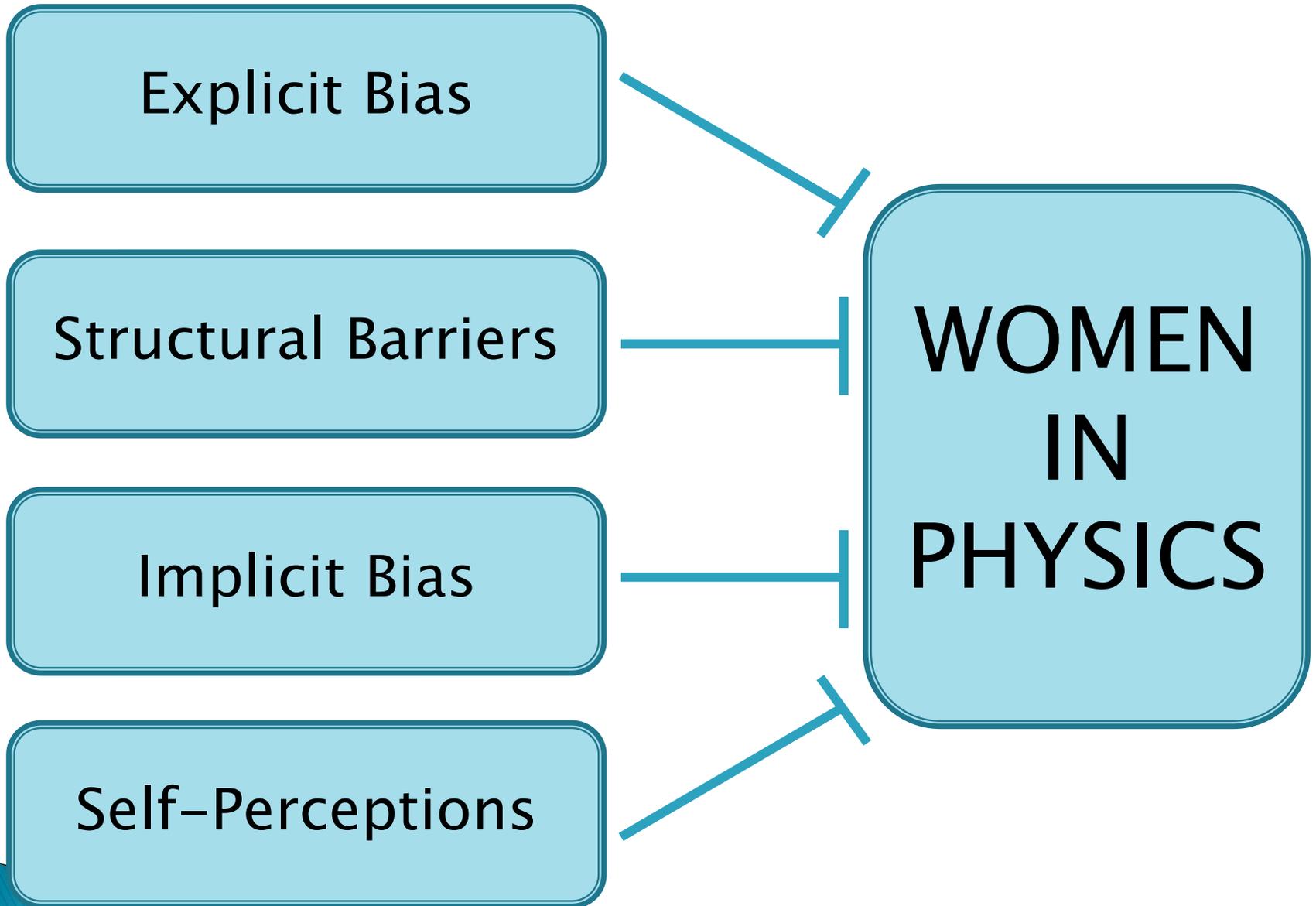
Structural Barriers

Implicit Bias

Self-Perceptions

**WOMEN  
IN  
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Claim: There are fewer women in Physics because women underperform men in mathematics.



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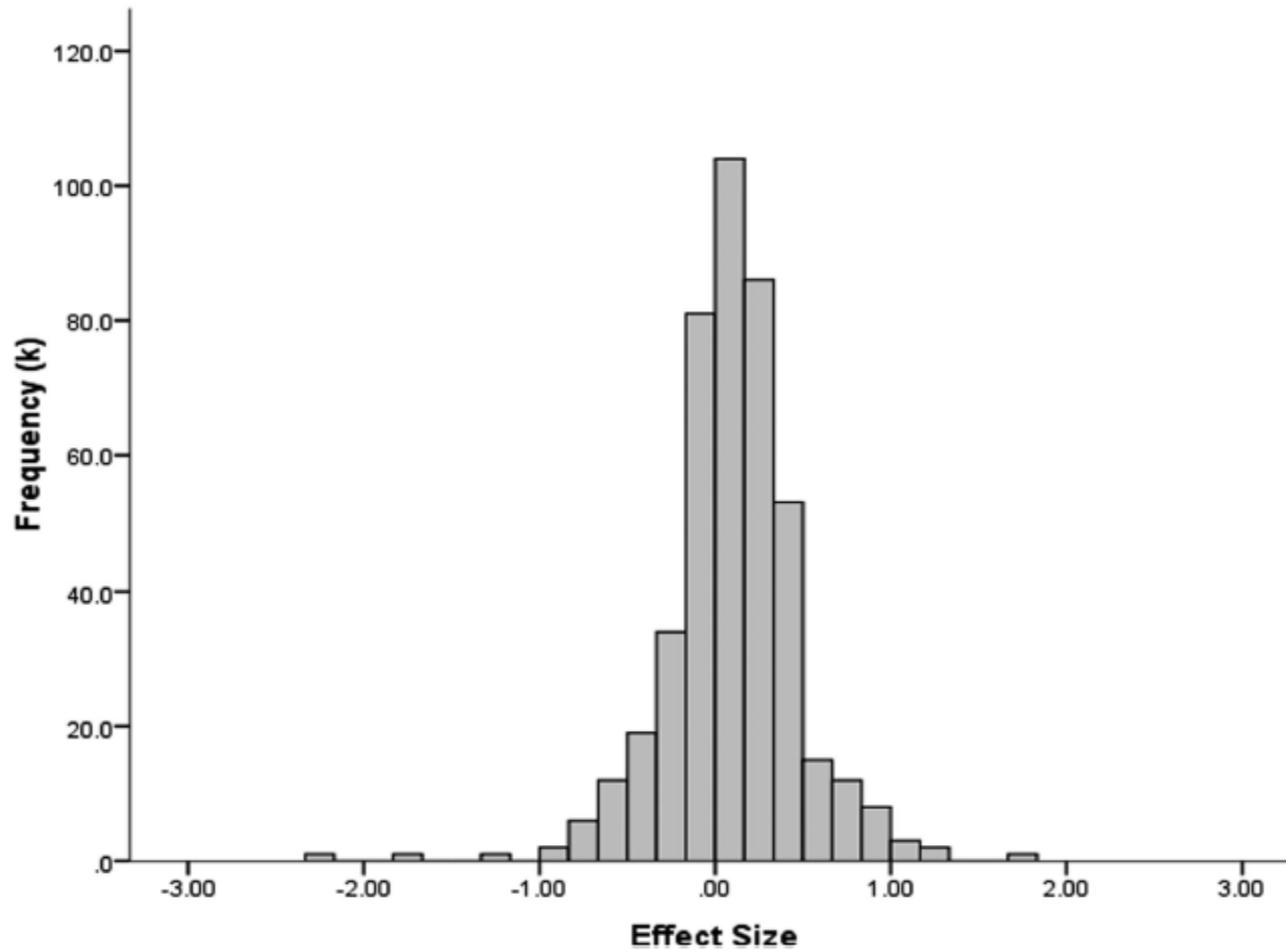
“It does appear that on many, many different human attributes – height, weight, propensity for criminality, overall IQ, mathematical ability, scientific ability – there is relatively clear evidence that whatever the difference in means – which can be debated – there is a difference in the standard deviation, and variability of a male and a female population.”

–Lawrence H. Summers, President of Harvard University, Jan 14, 2005



Truth: Women and men perform similarly  
in mathematics.





Based on 441 samples,  $N = 1,286,350$

Lindberg et al., 2010

Table 4  
*Descriptive Statistics for the NLSY-97*

Year	Age	$N_{\text{male}}$	$M_{\text{male}}$	$N_{\text{female}}$	$M_{\text{female}}$	$d$	VR
1997	13	3,184	96.57	2,860	96.53	0.00	1.07
1998	14	835	97.80	767	96.27	+0.08	1.06
1999	15	767	97.44	747	95.15	+0.12	0.99
2000	16	779	96.75	737	95.21	+0.09	1.09
2001	17	748	98.30	713	95.89	+0.14	1.04
2002	18	226	96.20	180	92.29	+0.22	1.05

*Note.* NLSY-97 = National Longitudinal Surveys of Youth;  $N_{\text{male}}$  = number of males in the sample;  $N_{\text{female}}$  = number of females in the sample;  $M_{\text{male}}$  = mean for males;  $M_{\text{female}}$  = mean for females;  $d$  = effect size; VR = variance ratio.

## Strongest predictors of math performance:

- Mother's education
- Quality of home learning environment
- Elementary school effectiveness

Melhuish et al., 2008



# Explicit Bias

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The 1999 report of the Women Faculty in the School of Science was a “wake-up call” to the faculty of MIT ... The report found an unequal distribution of resources between male and female faculty in every variable that was measured: lab space, salaries, proportion of funding from the Institute, and nominations for prizes.

Report of the School of Science  
March 2002  
Massachusetts Institute of Technology

## Explicit Bias

- Salary
- Lab/Office space
- Grad students & postdocs
- Teaching loads
- Start-up packages
- Travel funds
- Promotion & tenure
- Award nominations
- Service
- Leadership positions

## Explicit Bias

- Salary
- Lab/Office space
- Grad students & postdocs
- Teaching loads
- Start-up Packages
- Sexual Harassment
- Travel funds
- Promotion & tenure
- Award nominations
- Service
- Leadership positions

# Structural Barriers

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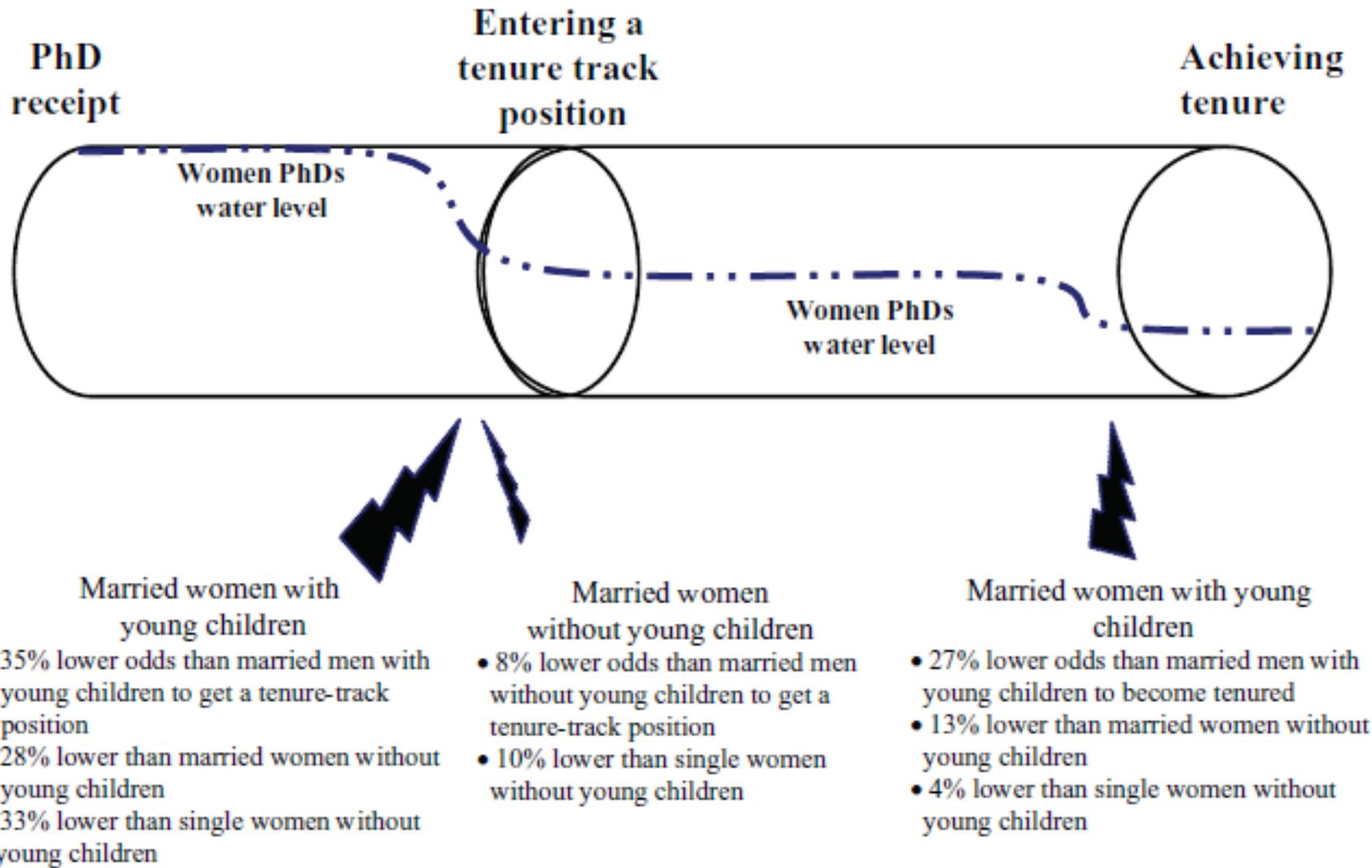
- Few role models

## Structural Barriers

- Few role models
- “Two-body problem”

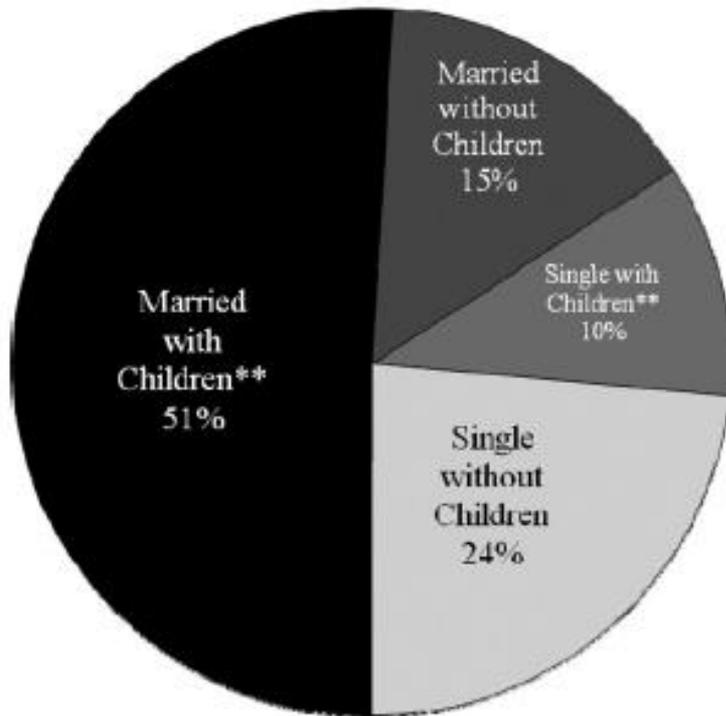
## Structural Barriers

- Few role models
- “Two-body problem”
- Lack of support for family roles
  - Parental – and caregiving – leave
  - Child care
  - Discordance of university schedules  
w/public schools



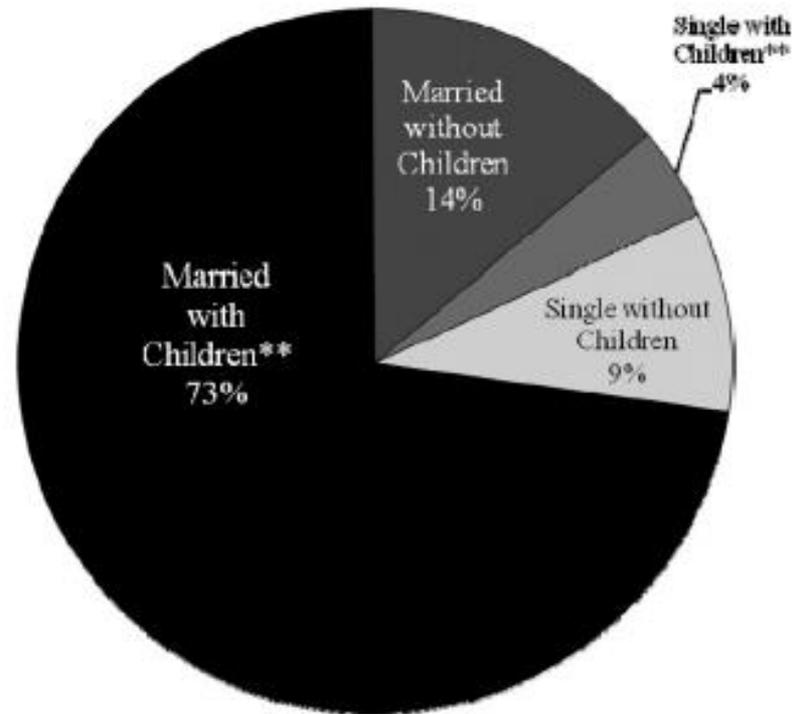
## Family Status of Tenured Faculty in the Sciences\*

### Women



N=4,157

### Men



N=19,767

# Implicit Bias

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	Women	Men
Men and Scientists	.88	.90
Women and Scientists	.82	.75

Carli et al., 2016

# Implicit Bias

Type of scientist	Women and scientists	Men and scientists
Psychologists	.92	.88*
Biologists	.79	.89***
Chemists	.74	.88***
Physicists	.76	.90***
Computer scientists	.66	.79*

Note. All intraclass correlations differ significantly from zero with  $p < .001$ . Intraclass correlations within rows that are marked with asterisks differ significantly; \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

# Self-Perceptions

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Perceived Identity  
Compatibility

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Social  
Support

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Perceived Identity  
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Social  
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SENSE OF BELONGING  
IN STEM MAJOR



# Self-Perceptions

Perceived Identity  
Compatibility

Social  
Support

STAYING IN  
STEM MAJOR



Monitor & Ensure  
Equity

Remove Structural  
Barriers

Promote Identity  
Compatibility

Provide Social  
Support

WOMEN  
IN  
PHYSICS



With thanks to:

Dr. Bonita London  
Dr. Sheri Levy  
Dr. Lisa Rosenthal

Funded in part by National Science Foundation Grant HRD-0733918  
“Advancing Women in Science: Building Engagement through  
Academic Transitions”

