Female Scientists and Engineers in the U.S.: A Story of Change and Revitalization

Grace Series Lecture

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This is Me

My position

- A senior executive in the federal government – 1 of 7,500
- National Science Foundation (NSF)
- Division of Graduate Education (DGE)

My job

- Support innovation and transformation in STEM graduate education
  - Institutional change
  - Direct support of graduate students in STEM
  - ***SFS at UT-Dallas since 2010; Graduate Research Fellows (7)***

My background

- Trained in civil engineering and science policy
- Career in statistics, survey methodology and science policy analysis

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Barrier, Catalyst, Opportunity

Barrier:

a circumstance or obstacle that keeps people or things apart or prevents communication or progress

Catalyst:

a person or thing that precipitates an event

a substance that modifies and increases the rate of reaction without being consumed in the process

Opportunity:

A set of circumstances that makes it possible to do something

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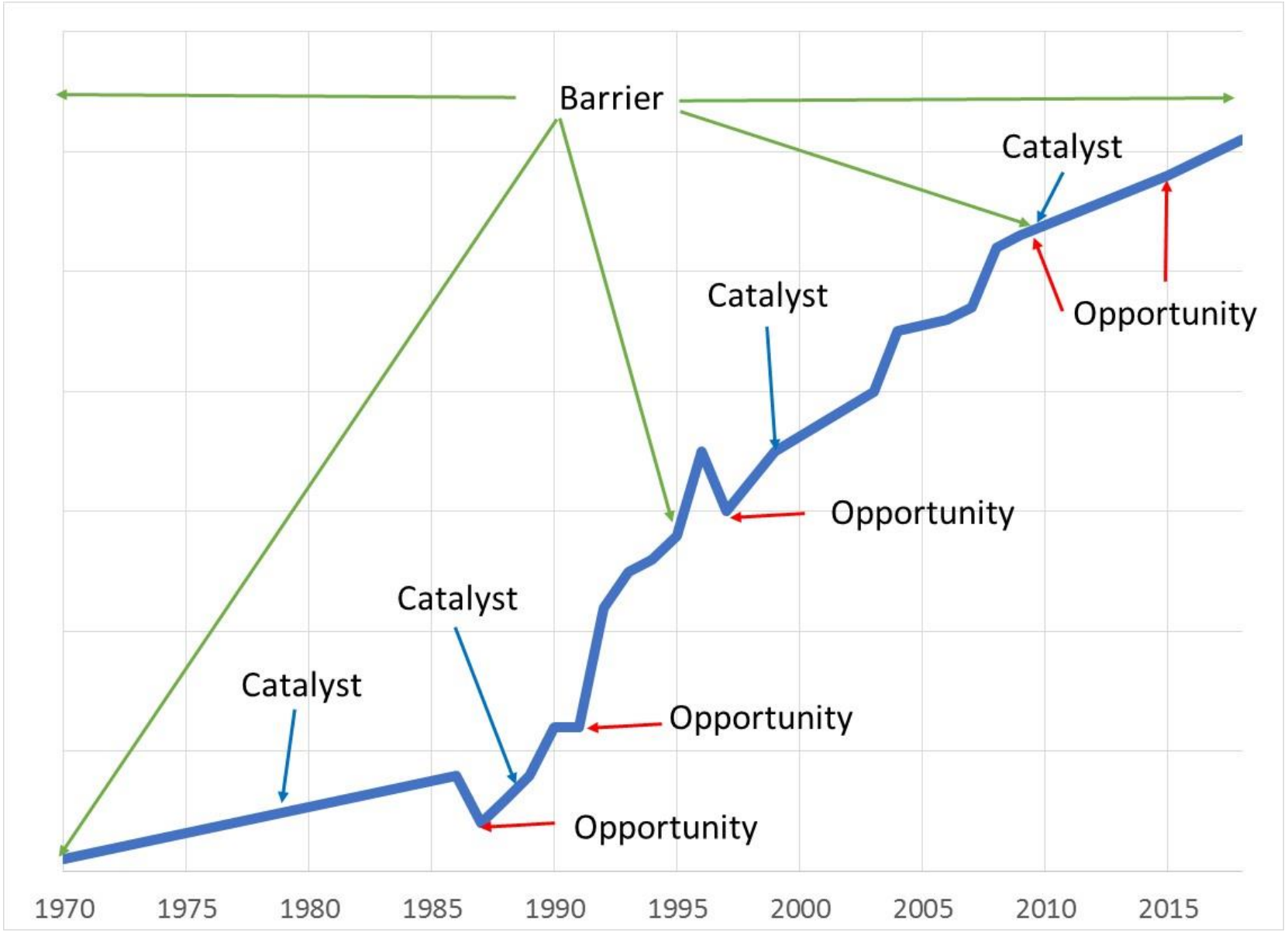
My Life in a Chart



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Changes in the Scientific Workforce

1970s

- Disciplinary focus, work as an individual
- U.S. a world leader in higher education and attracting talent
- Predominantly U.S. citizen students and postdocs
- Public and private non-profit campus-based degree programs
- Mobility is limited (across disciplines, sectors, economies)
- Students predominantly white and majority male

2000s

- Greater interdisciplinary and team focus
- Growth in higher education abroad and increasing competition from other nations
- Increase in foreign students and foreign postdocs
- Growth of for-profit institutions and online programs
- Students move across disciplines, countries and institutions
- Greater racial/ethnic diversity and higher proportion of female students

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The Big Picture

Women	1980/81	2015
Women as a percentage of the U.S. Population	**51%**	**51%**
% of Women with bachelor's degrees	**50%** (out of 935,000 degrees)	**57%** (out of 1,893,000 degrees)
% of Science and engineering bachelor's degrees	**45%** (out of 438,000 degrees)	**57%** (out of 859,000 degrees)
% of **Computer science bachelor's** degrees	**33%** (out of 15,000 degrees)	**18%** (out of 49,000 degrees)
% of **Computer science master's** degrees	**23%** (out of 4,200 degrees)	**30%** (out of 29,000 degrees)
% of **Computer science doctoral** degrees	**10%** (out of 250 degrees)	**22%** (out of 1,900 degrees)

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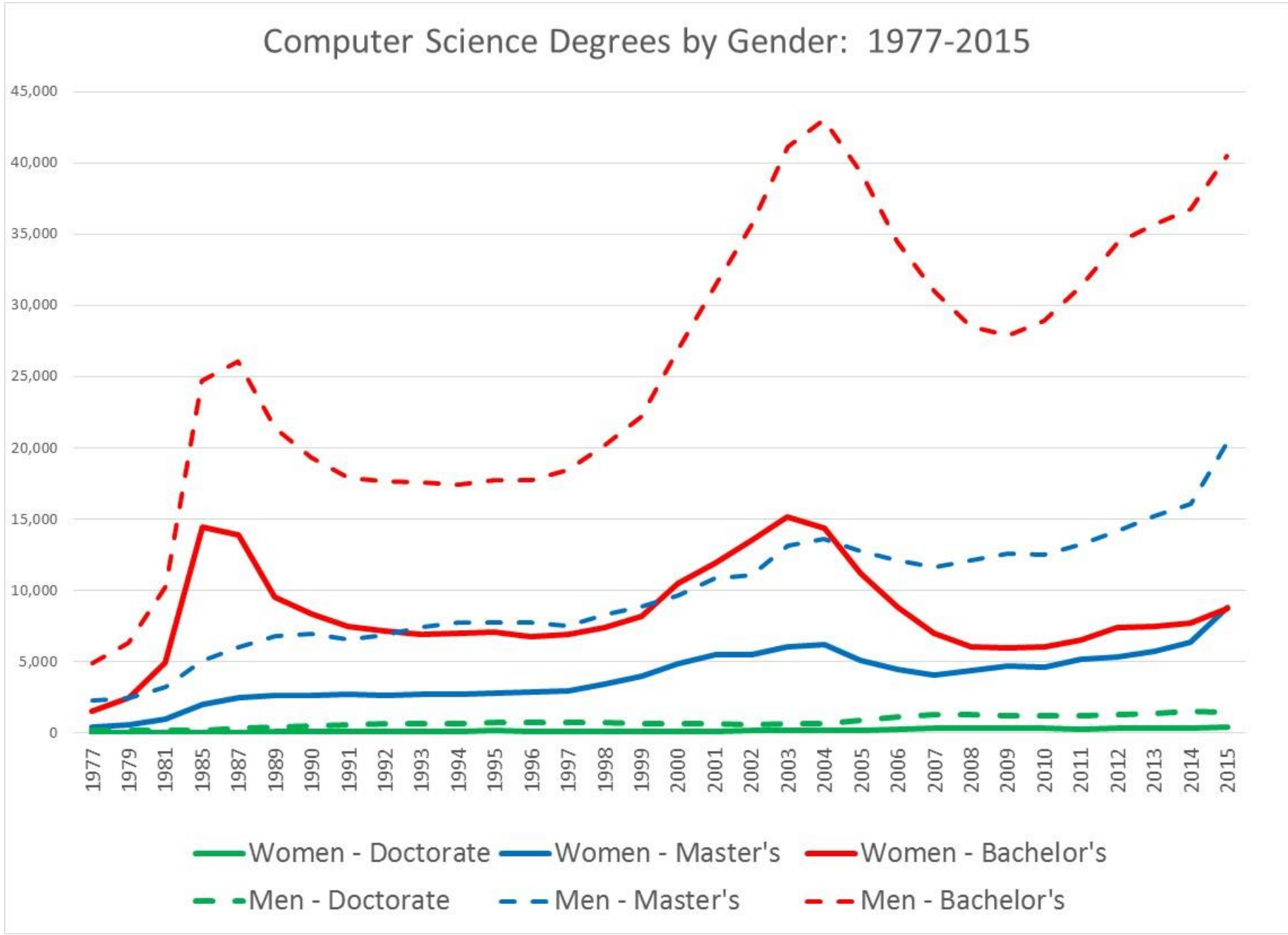

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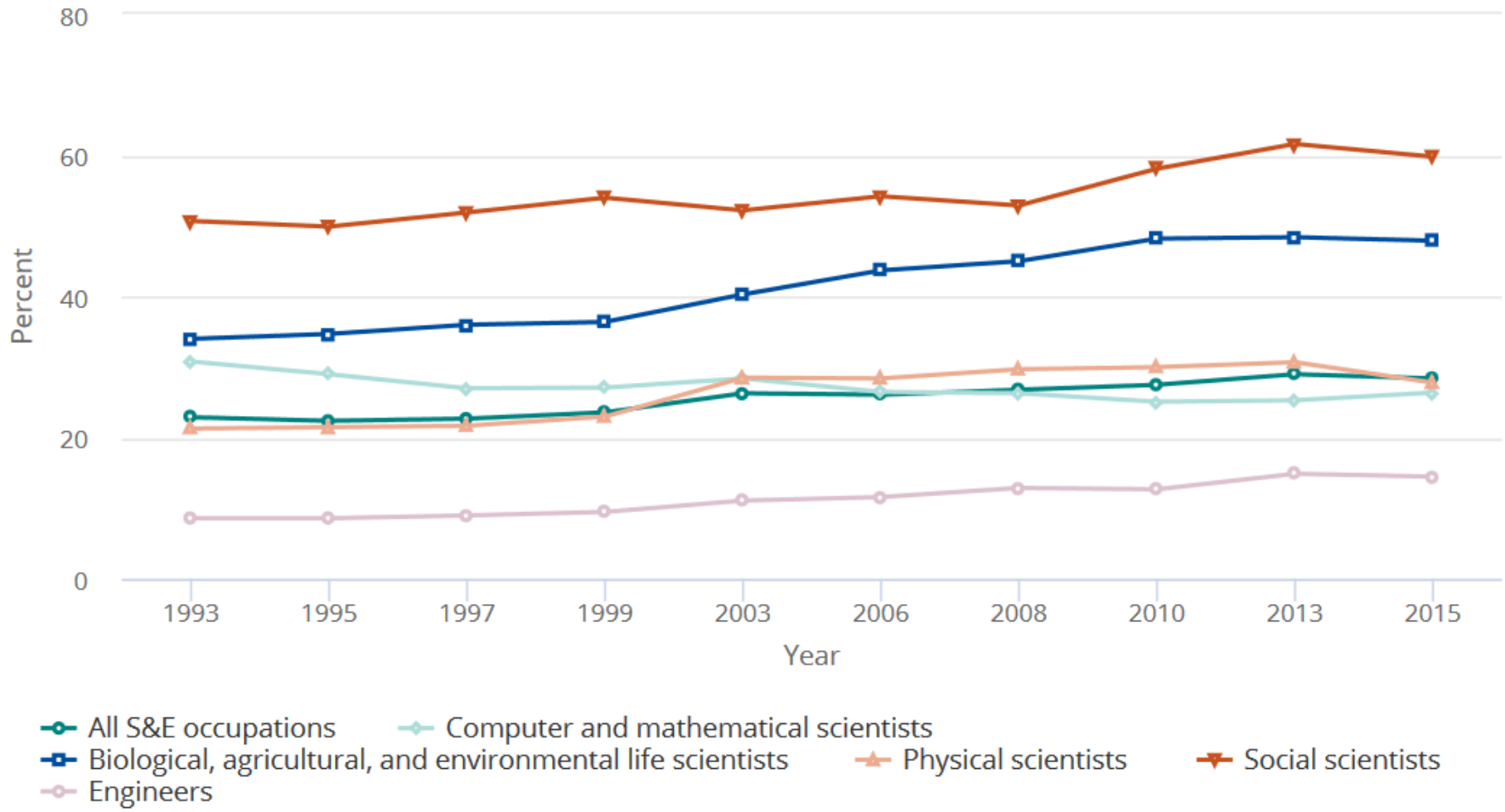
FIGURE 3-27

Women in S&E occupations: 1993–2015



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US S&E Workforce: 25 M (degree or job in an S&E field)

25M – 6.4M – where are the rest of the S&E trained people?

Table 3-4

Educational background of college graduates employed in S&E occupations, by broad S&E occupational category: 201

(Percent)

Educational background	All S&E occupations	Bio/agri/enviro life scientists	Computer and mathematical scientists	Physical scientists	Social scientists	Engineers
Total (number)	6,407,000	631,000	3,156,000	331,000	570,000	1,719,000
At least one S&E degree	82.8	88.6	75.0	97.6	86.5	91.1
At least one S&E degree in field	62.4	76.1	44.8	75.5	80.9	81.0
Highest degree in field	75.8	66.9	40.6	70.1	70.2	74.5
All degrees in S&E	71.0	71.5	65.0	90.3	58.6	82.4
No S&E degrees but at least one S&E-related degree	4.3	5.7	4.4	1.5	2.5	4.6
No S&E or S&E-related degree but at least one non-S&E degree	12.9	5.7	20.6	0.9	11.1	4.3

Science and Engineering Indicators 2018

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All STEM Majors | Men | Women | White | Black | Asian | Hispanic

All STEM Majors

College Majors

Computers, mathematics, and statistics

Engineering

Physical sciences

Biological, environmental, and agricultural sciences

Psychology

Social sciences

Multidisciplinary studies

Occupation Groups

Computer workers

Mathematicians and statisticians

Engineers

Life scientists

Physical scientists

Social scientists

Architects

STEM

Health care

Managers (Non-STEM)

Business and financial

Social services

Legal

Education

Arts and entertainment

Service

Sales

Office support

Agriculture

Construction

Production

STEM workers

Non-STEM workers

https://www.census.gov/dataviz/visualizations/stem/stem-html/

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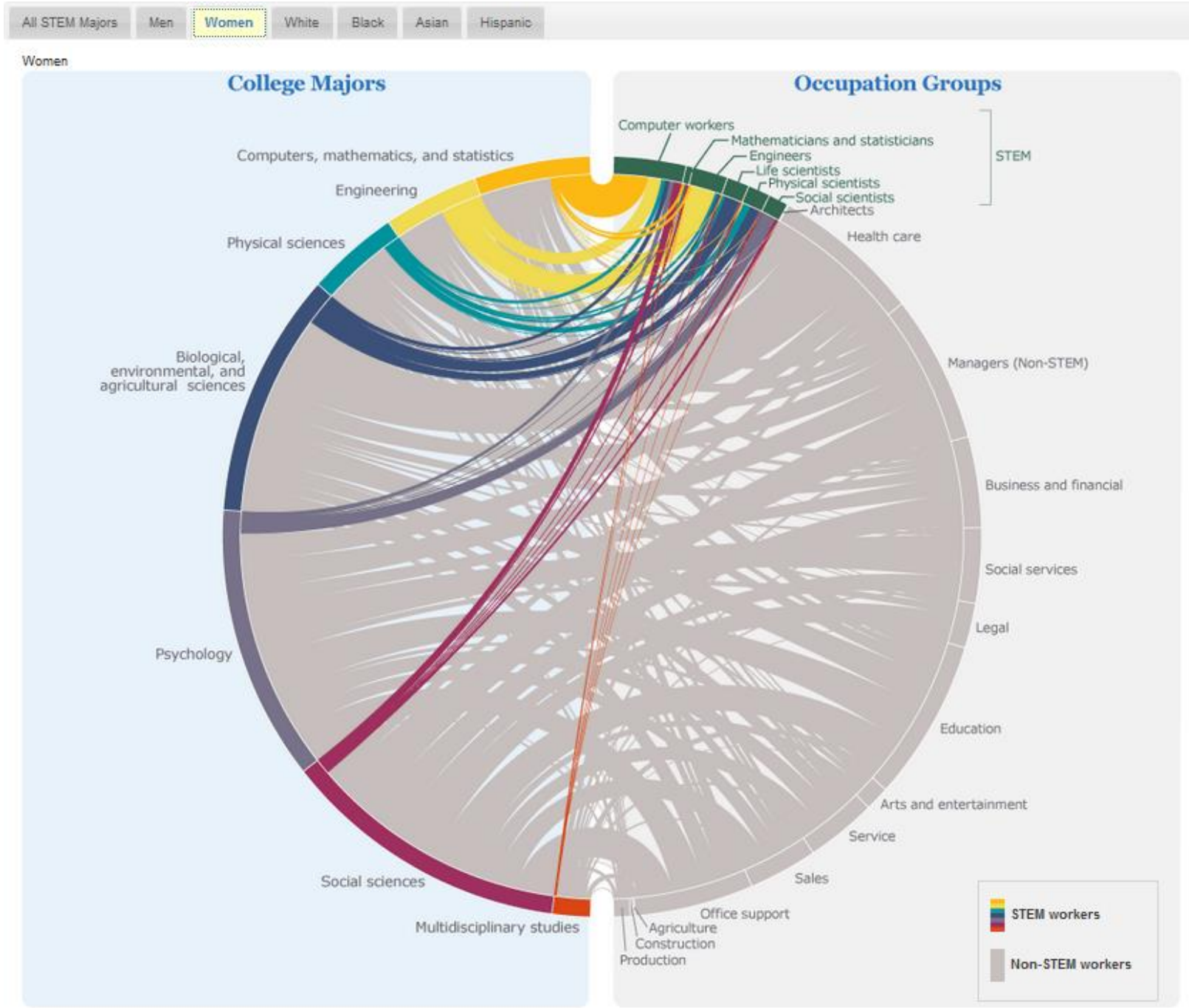

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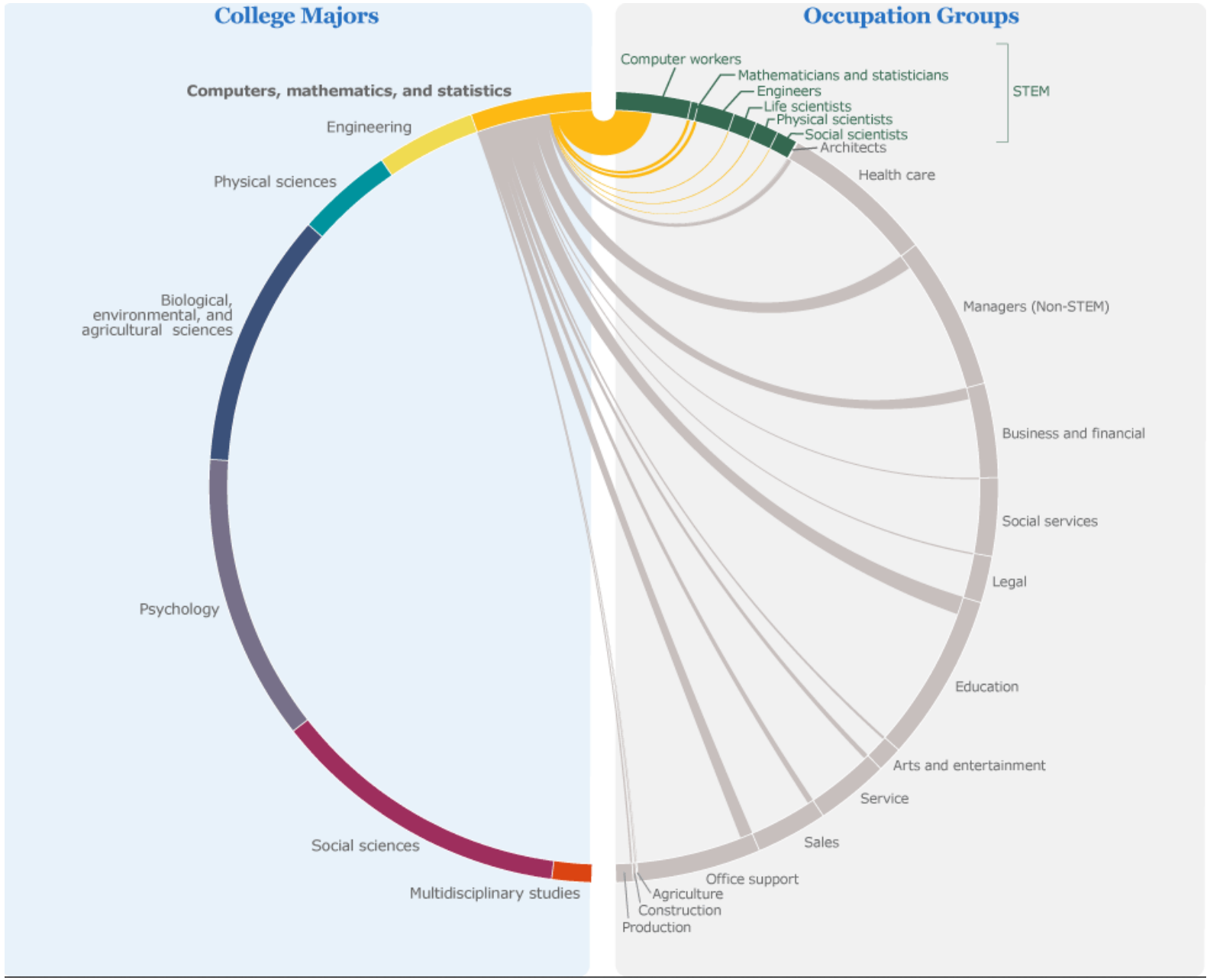

https://www.census.gov/dataviz/visualizations/stem/stem-html/

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Degree vs. Occupation

Population	Size
Employed scientists and engineers *(Working in an S&E occupation)*	25.0 M *(6.4 M)*
Job requires S&E technical expertise	19.4 M
Job requires S&E technical expertise in engineering, computer science, math or natural sciences	14.1 M

Science and Engineering Indicators 2018

Opportunity

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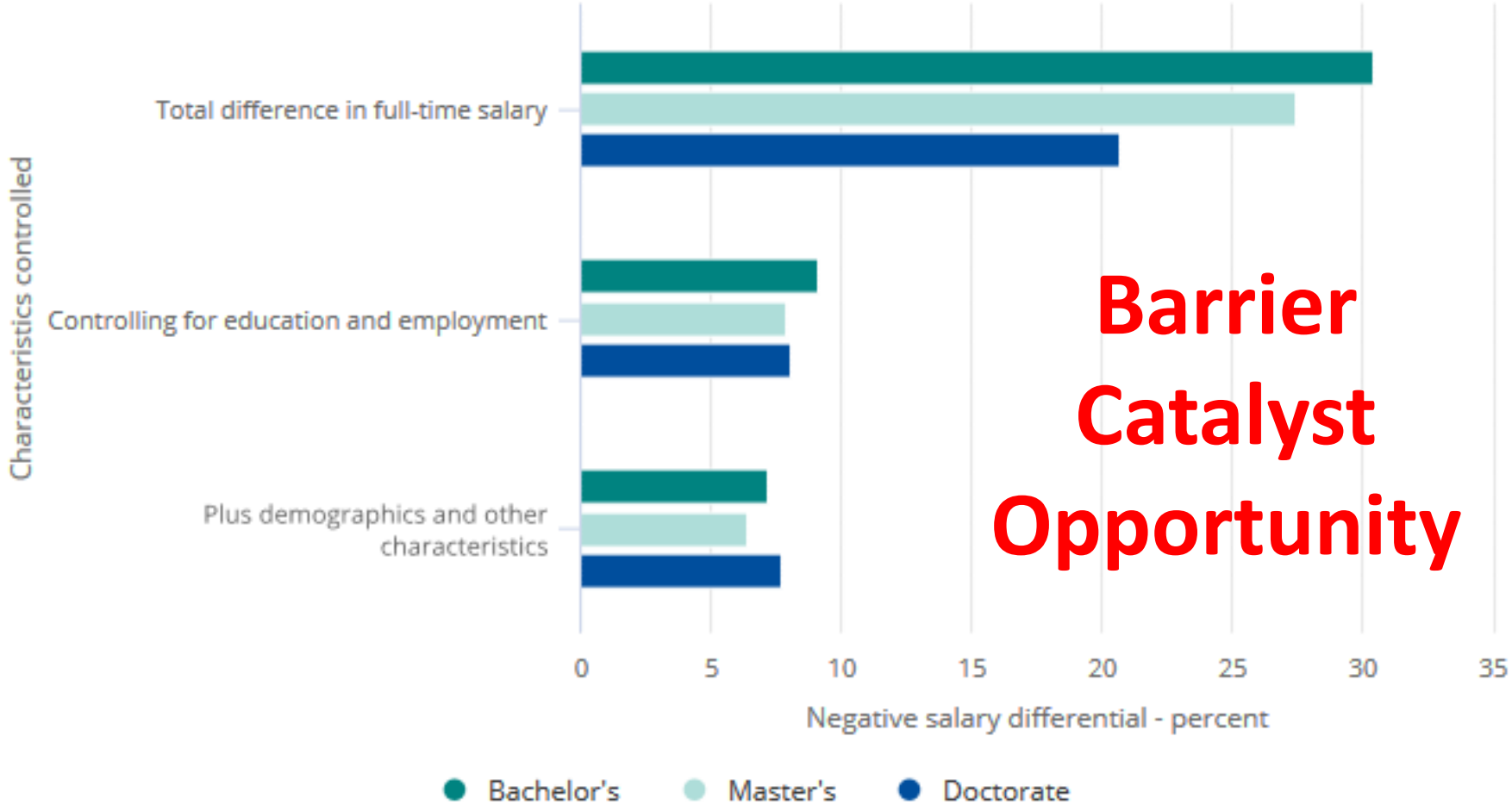
FIGURE 3-30

Estimated salary differences between women and men with highest degree in S&E employed full time, controlling for selected characteristics, by degree level: 2015



Barrier
Catalyst
Opportunity

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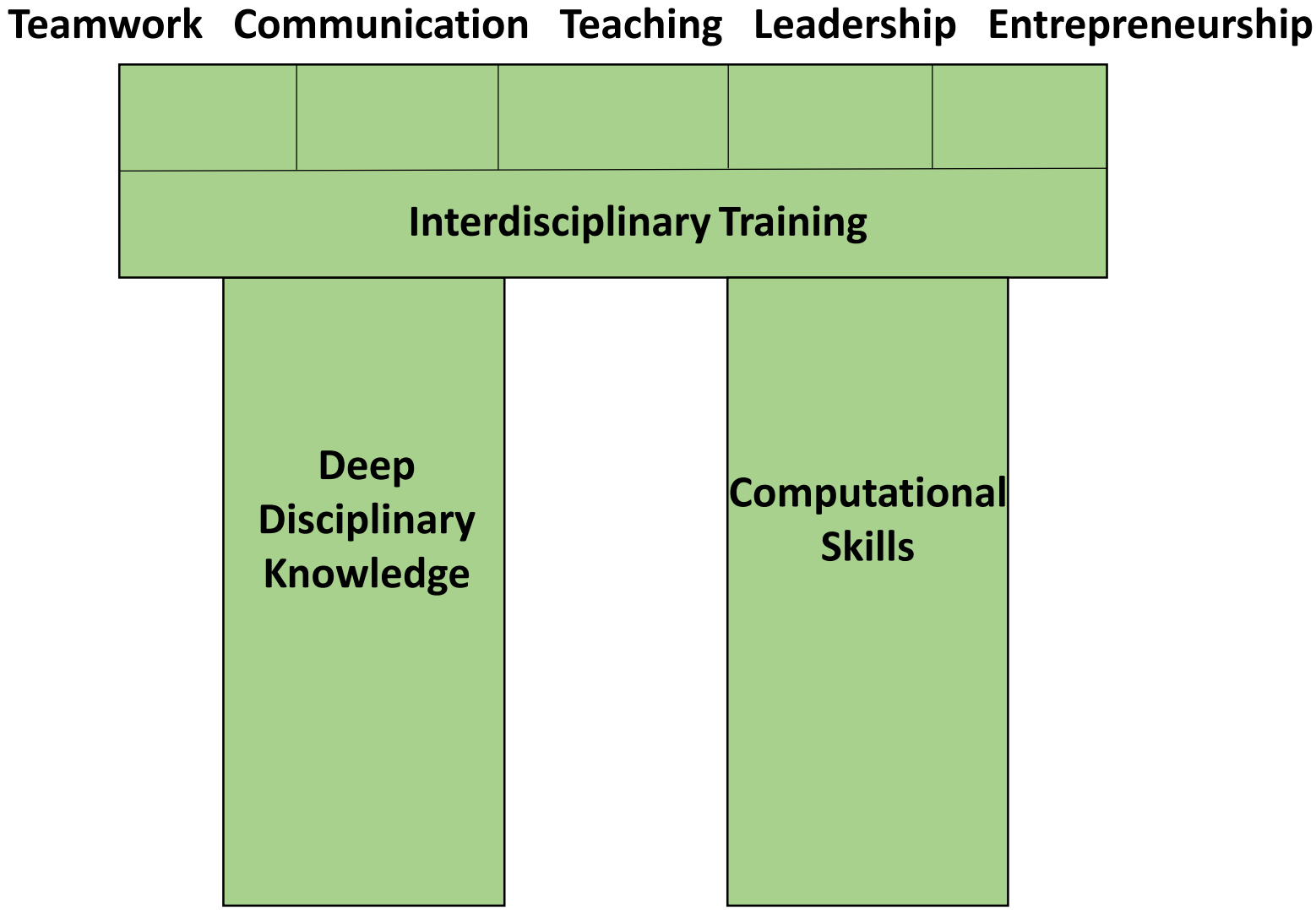
The π-shaped Scientist/Engineer



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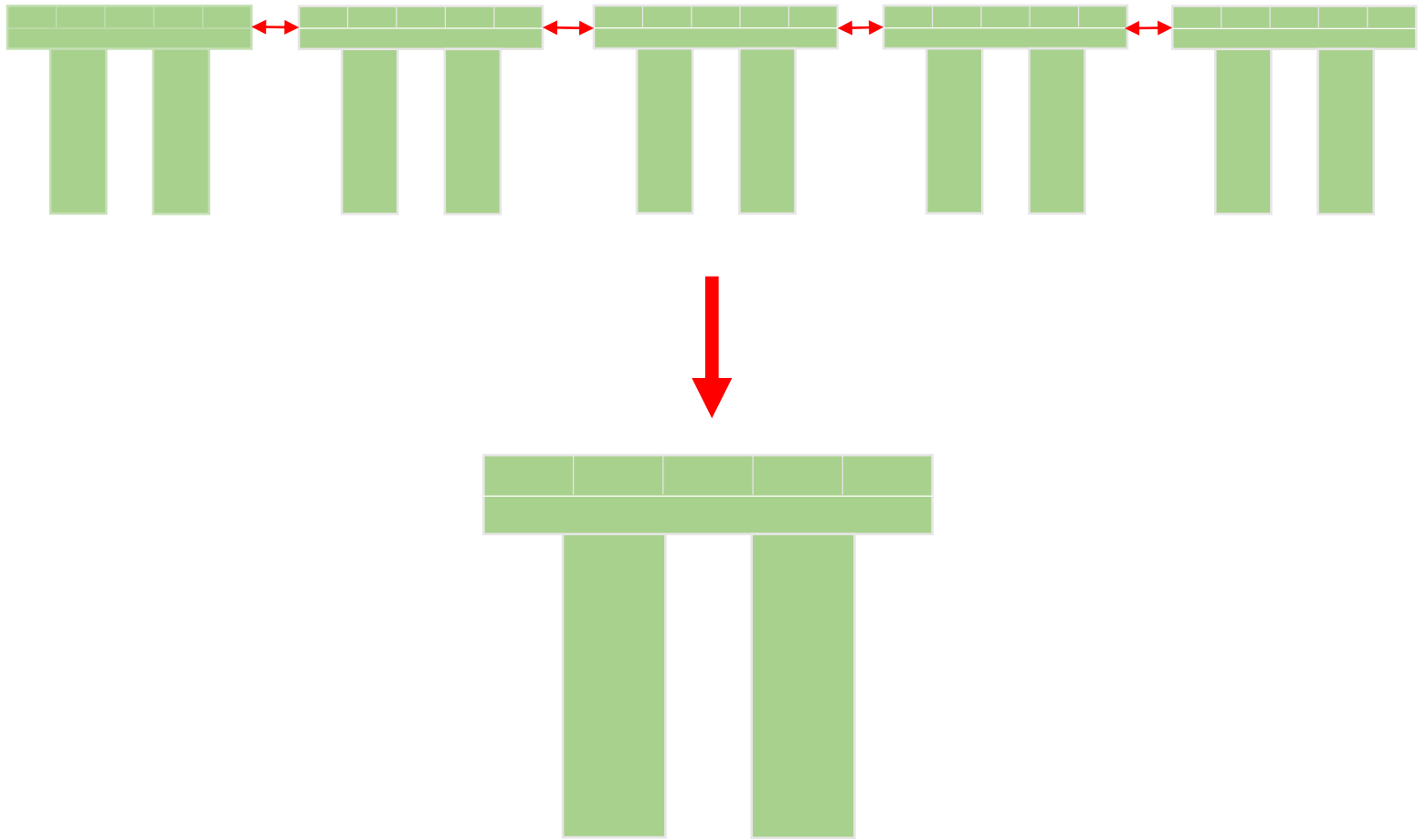
Integration Across Domains



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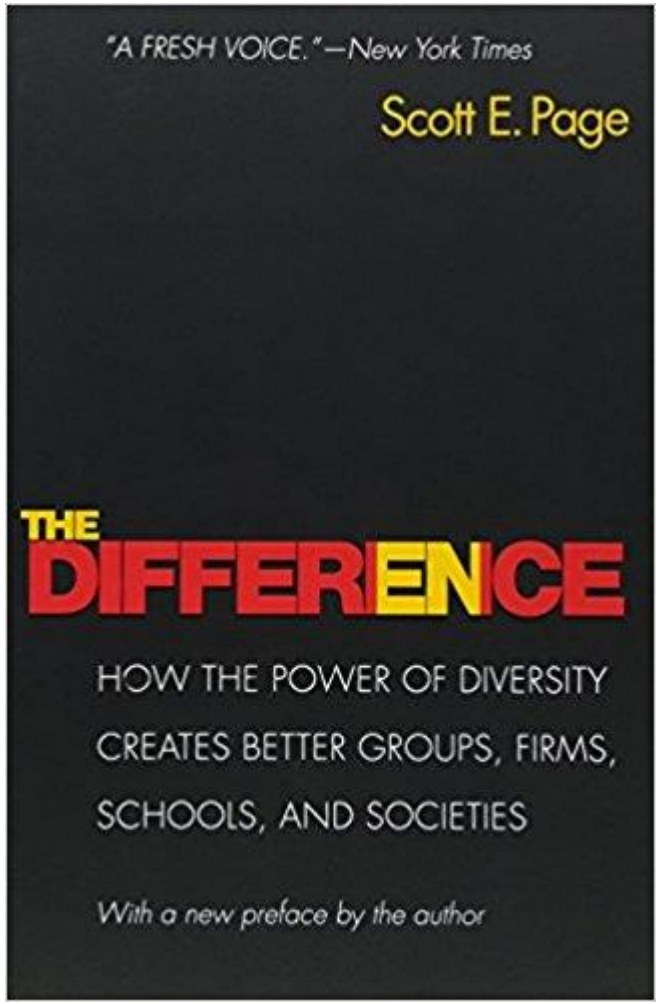

What characteristics define high-performing teams?

- **Demographics?**
  That's a part of it

- **Variety/Range**
  - **Perspectives**
  - **Skills**
  - **Abilities**

Opportunity

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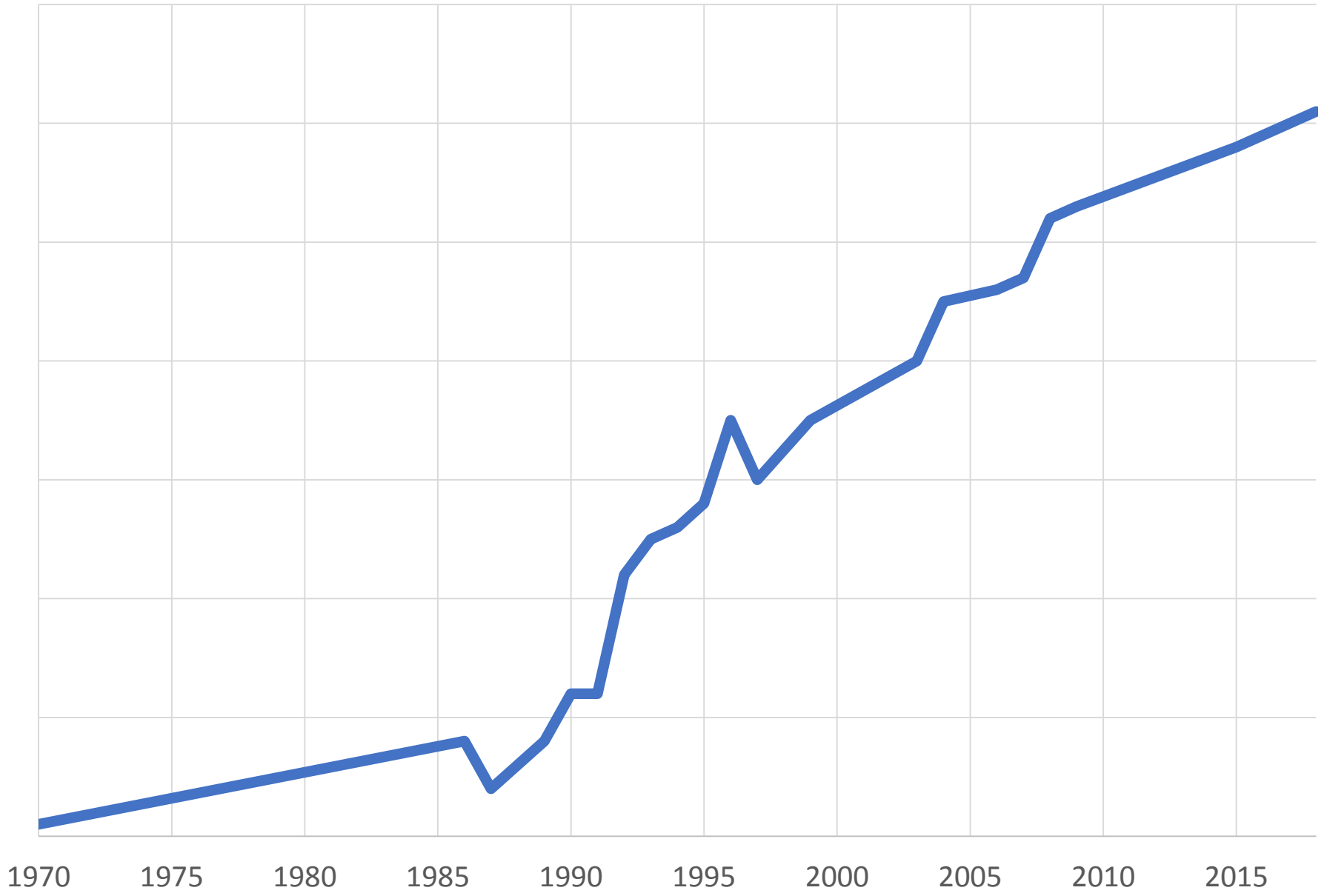
My Life in a Chart – Version 2



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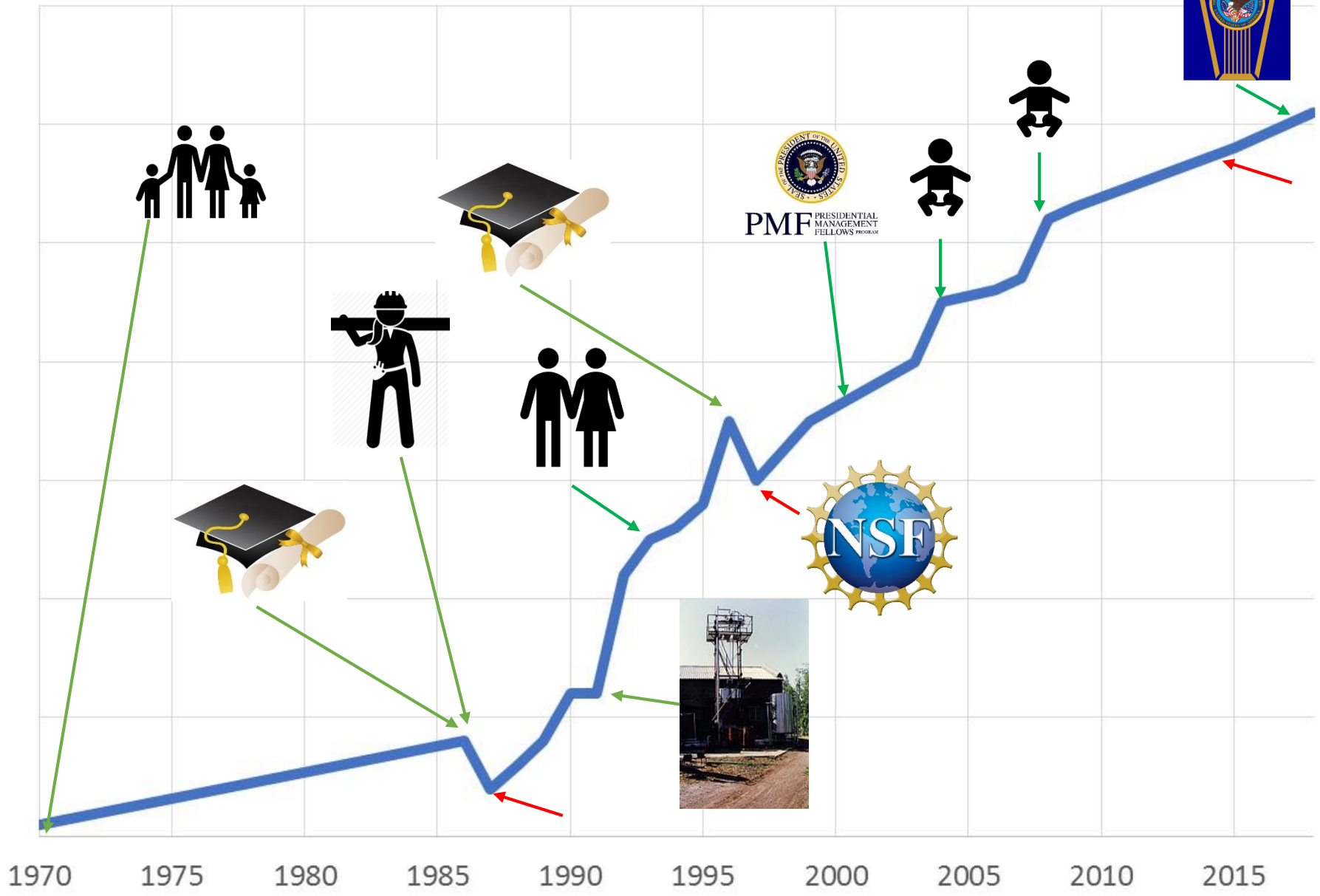
My Life in a Chart



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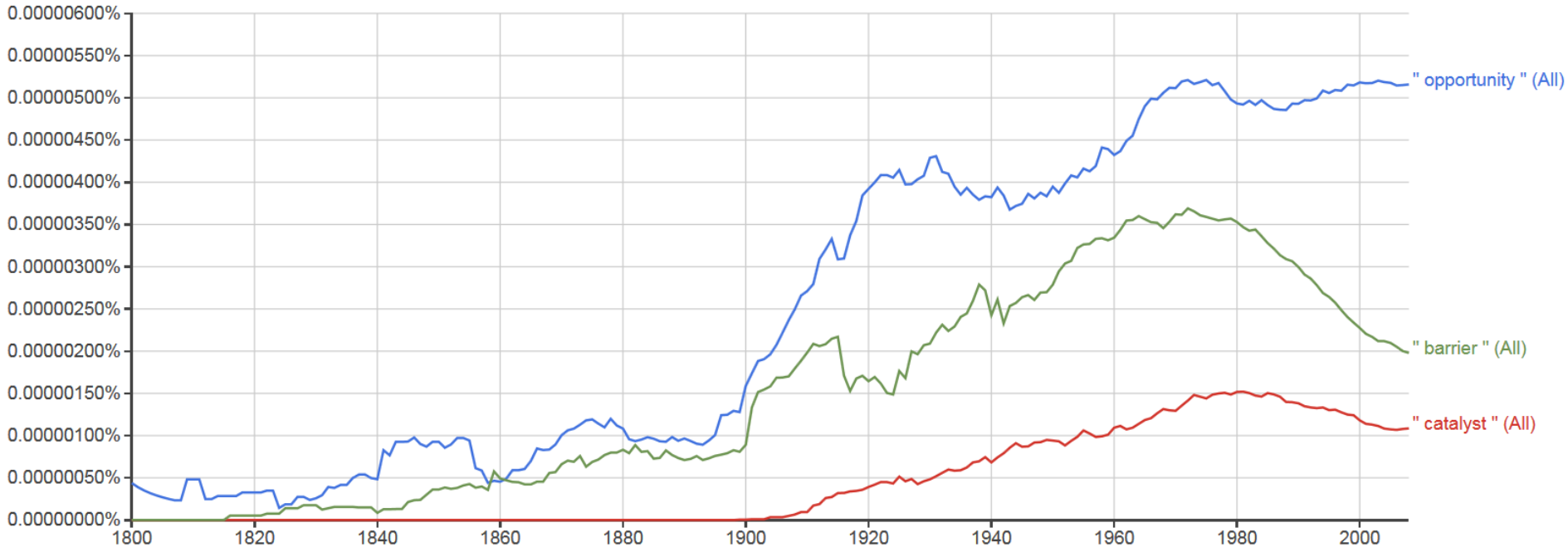
Barrier, Catalyst, Opportunity



SOURCE: Google Books Ngram Viewer; data accessed 3/25/2018.

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