Title IX as a Change Strategy for Academic Science—Isn't a Millennium of Affirmative Action for White Men Sufficient?

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** The views about to be expressed are those of the author and are not necessarily those of the U.S. Naval Research Laboratory or the U.S. Department of Defense **

Today? … we have certainly accumulated women in S&E—the "statistics of small populations" no longer apply

BACHELOR'S	1970–71	2001–02
Engineering	0.8	18.9%
Physics	6.7	22.6%
Geology	11.0	44.7%
Computer Science	13.6	27.6%
Chemistry	18.4	48.4%
Biological Sciences	29.1	60.8%
Mathematics	37.8	46.7%
Health Sciences	77.1	85.5%

MASTER'S	1970–71	2001–02
Engineering	1.1	21.4%
Physics	6.9	20.9%
Geology	9.7	39.7%
Computer Science	10.3	33.2%
Chemistry	21.4	45.6%
Biological Sciences	33.6	57.8%
Mathematics	27.1	42.4%
Health Sciences	55.4	77.5%

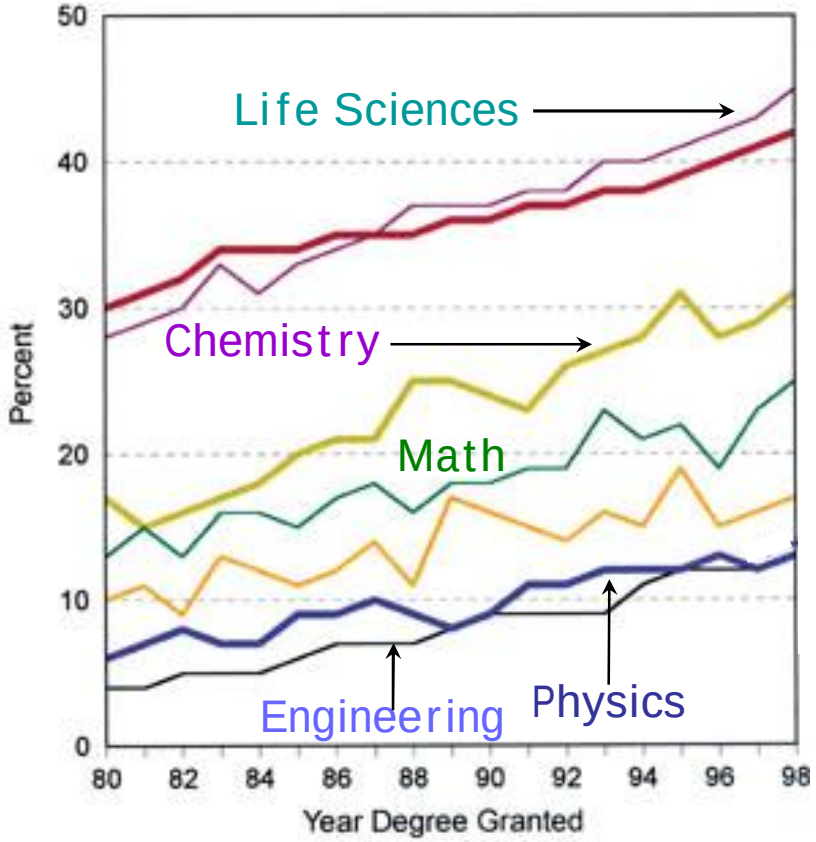
DOCTORATES	1970-71	2001-02
Engineering	0.6	17.3%
Physics	2.9	15.5%
Geology	3.4	28.5%
Computer Science	2.3	22.8%
Chemistry	8.0	33.9%
Biological Sciences	16.3	44.3%
Mathematics	7.6	29.0%
Health Sciences	16.5	63.3%

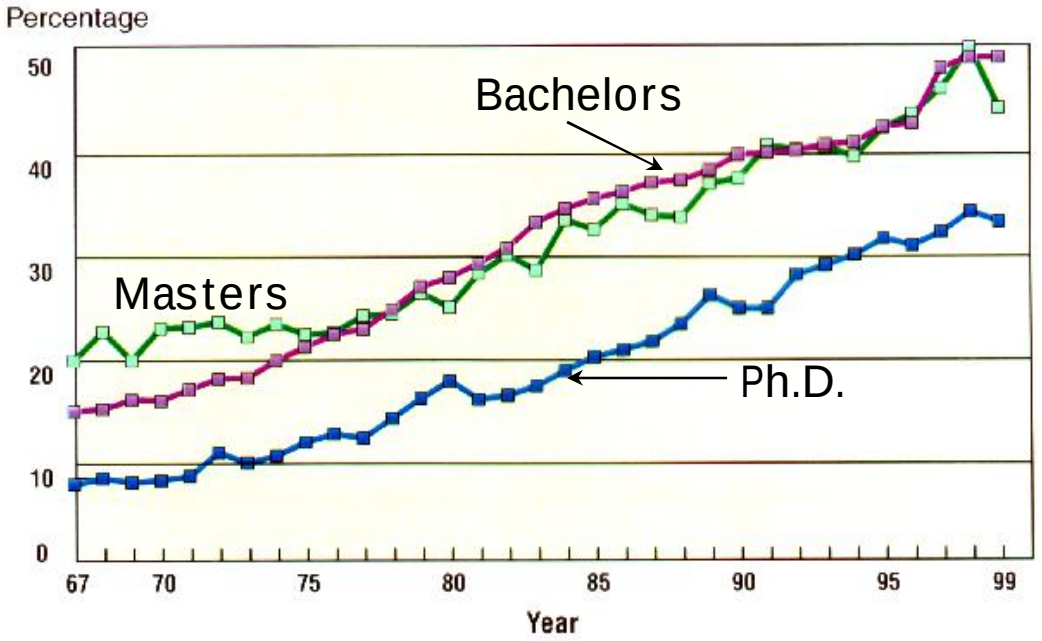
Scientists Are Made, Not Born, W. Michael Cox and Richard Alm, *New York Times,* Monday 28 February 2005 (Op-Ed)

Accumulated progress over time — the "statistics of small populations" no longer apply

Percent of Ph.D.s Earned by Women in Selected S&T Fields

APS News, The Back Page, January 2000



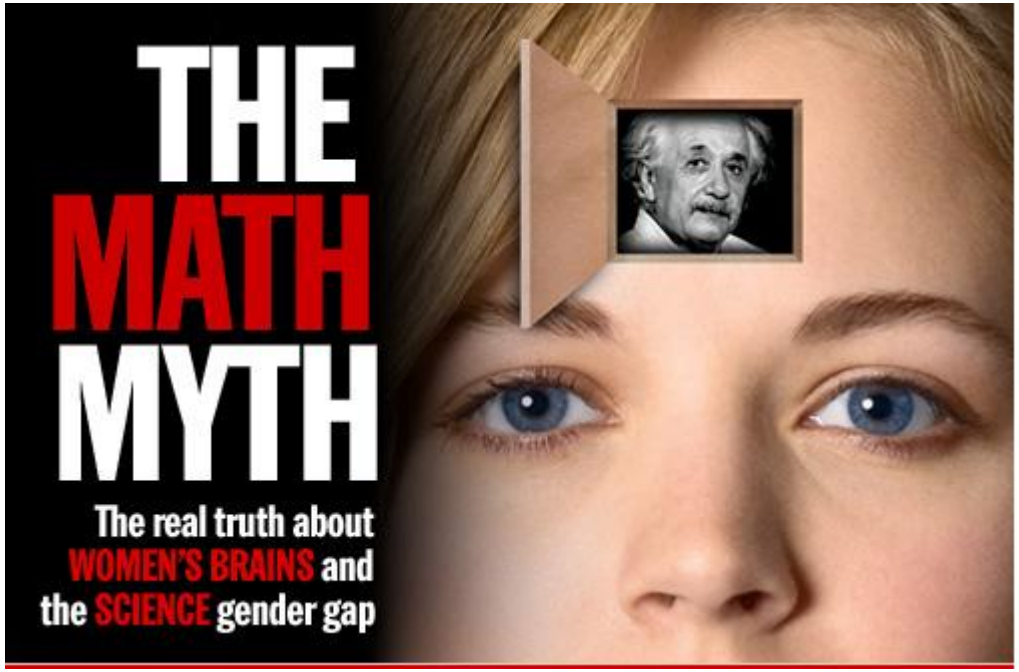


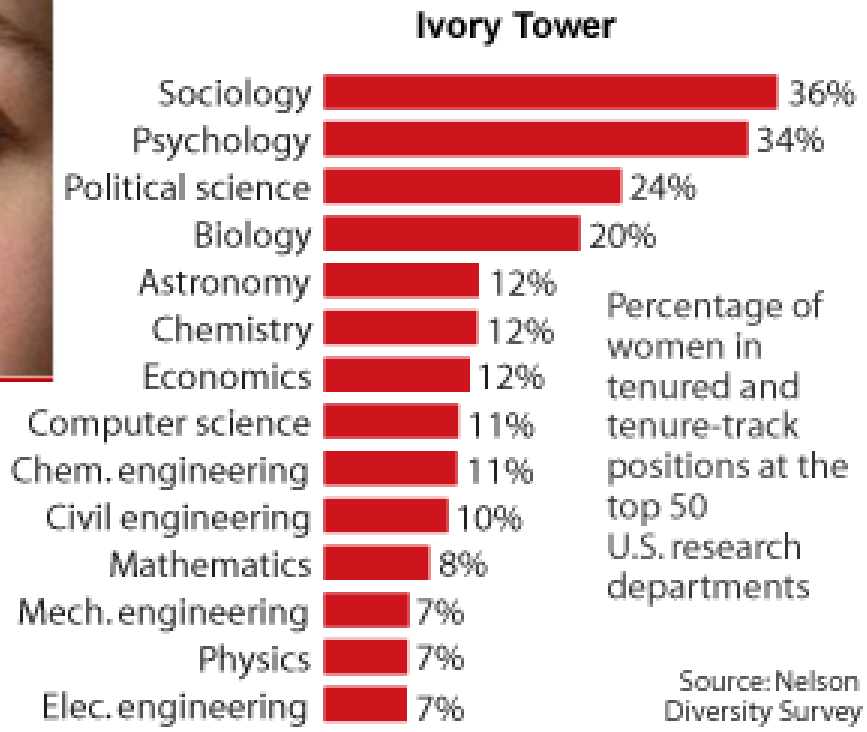
Percentage of Chemistry Degrees Earned by Women from 1967 to 1999

ACS Starting Salary Survey, 1999, American Chemical Society

Update: In 2002, 31% of the Ph.D.s in chemistry went to women (total number of U.S. Ph.D.s in S&E are down)

...27 February 2005: Time Magazine: Science is Still a Man's World





... for example: Number (%) of tenure-track female faculty at top Research I departments* in Chemistry

	2000 (10%)	2001 (11%)	2002 (12%)	'03 (12%)	'04 (12%)
UC-Berkeley	5 (10%)	5 (10%)	5 (10%) ↑		
Caltech	3 (11%)	3 (11%)	3 (12%) ↑		
Harvard	1 (5%)	2 (10%)	3 (13%)		
Stanford	1 (4%)	1 (4%)	1 (5%) ↑		
MIT	4 (14%)	4 (13%)	5 (17%) ↑		
Cornell	2 (6%)	2 (6%)	2 (6%)		
Columbia	2 (10%)	2 (9%)	2 (9%) x		
U of Illinois	4 (10%)	4 (10%)	4 (11%)		
Wisconsin	3 (8%)	3 (7%)	4 (9%)		
Chicago	3 (12%)	2 (8%)	2 (8%) x		
Arizona	5 (15%)	4 (12%)	6 (16%) ↓↑		
Rutgers	10 (26%)	10 (26%)	10 (26%)		
Florida State	6 (17%)	6 (17%)	6 (17%)		
Kansas	6 (25%)	6 (25%)	7 (29%)		
Penn State	4 (13%)	6 (20%)	7 (22%)		
Purdue	6 (13%)	7 (15%)	9 (18%) ↓↑↑		
Colorado	7 (18%)	7 (18%)	7 (18%) ↓↓↑↑		
Akron	3 (18%)	2 (13%)	2 (12%)		
Ohio State	4 (9%)	4 (10%)	4 (10%)	(12%)	(11%)
UCLA	9 (18%)	10 (19%)	11 (20%) ↓↓		

C&EN

25-Sep-2000, p. 56
172 out of 1641

1-Oct-2001, p. 98
181 out of 1640

23-Sep-2002, p. 110
188.5 out of 1630

27-Oct-2003, p. 58
188.5 out of 1630

27-Sep-2004, p. 32
197.5 out of 1594.5

NOTE: 28% of the universities in the top 50 in 2004 have only 1 or 2 female t-t faculty

*NSF ranking

Top 50 Physics / FY02: 1989 / 132 XX (6.6%)

Institution	Total	White	Black	Hispanic	Asian	% XX
Johns Hopkins	32.2	27.0	0	0	5	6.2
MIT	76.8	66.6	0	0	10.2	10.5
UC–Berkeley	54.3	41.2	0	1	12.1	5.6
Caltech	46.2	43.1	0	0	3.1	4.3
UT–Austin	49.1	41	0	2.1	6	2.0
Cornell	44.3	40.2	0	1	3.1	6.8
Florida State	45.3	33.2	1	4.1	7	6.7
U MD – College Park	72.4	54.4	1	0	17	5.6
Michigan State	50	46	0	0	4	0
UCLA	63.5	55.4	0	2.1	6	7.9
Illinois–UC	58.4	51.4	1	1	5	6.9
UW-Madison	48.5	43.4	0	0	5.1	10.4
Indiana	38.2	36.2	0	0	2	5.2

Ranking based on research expenditures in FY99 as determined by NSF (91–99: ab.c% XX Ph.D.)

The Nelson Diversity Studies http://cheminfo.chem.ou.edu/%7Edjn/diversity/physdiv.html

...and at NRL?... Number (%) of full-time female technical staff in the Chemistry Division (Code 6100)

(FY04)

94 FT Staff: 85 XY

9 XX 9.6%

- Jean Bailey (6183)
- Dawn Dominguez (6127)
- Joanne Jones-Meehan (6113)
- Azar Nazeri (6132)
- Jane Rice (6171)
- Debra Rolison (6171)
- Susan Rose-Pehrsson (6112)
- Karen Swider-Lyons (6171)
- Kathy Wahl (6176)

oh... all right... I cheated... Susan is PT (30 h/wk part-time...)

Technical FT in 6100 is really 8.6% XX

... right "up" there with Columbia ...

and without 6171 (60% XX), 6100 would be 5.7% XX ...

Should scientists accept the (white) male-dominant status quo of the modern university and laboratory?

Our universities and laboratories have got to get out of this lily-white male universe if we want to stay at the forefront of science

an institution's leaders (as opposed to (run-of-the-mill) managers) would not stand still for less

American universities have established (and advertise and recruit for) a diverse student body ... why has that success not been reflected into creation of a diverse faculty and ultimately a diverse S&T profession??

"Who teaches matters"

C.A. Trower, R. Chait, *Harvard Magazine*, 104 (2002) 33

A stacked deck?? (or how level is that playing field?)

The 1999 MIT Report on the College of Science

The full MIT report documented a pattern of gender discrimination in:

- hiring
- promotion
- awards
- committee responsibility
- allocation of laboratory space
- research money

... MIT also found that, despite increasing numbers of women scientists, there had been no change in faculty ratios for 10–20 years

The imbalance of men and women in the School of Science at Massachusetts Institute of Technology

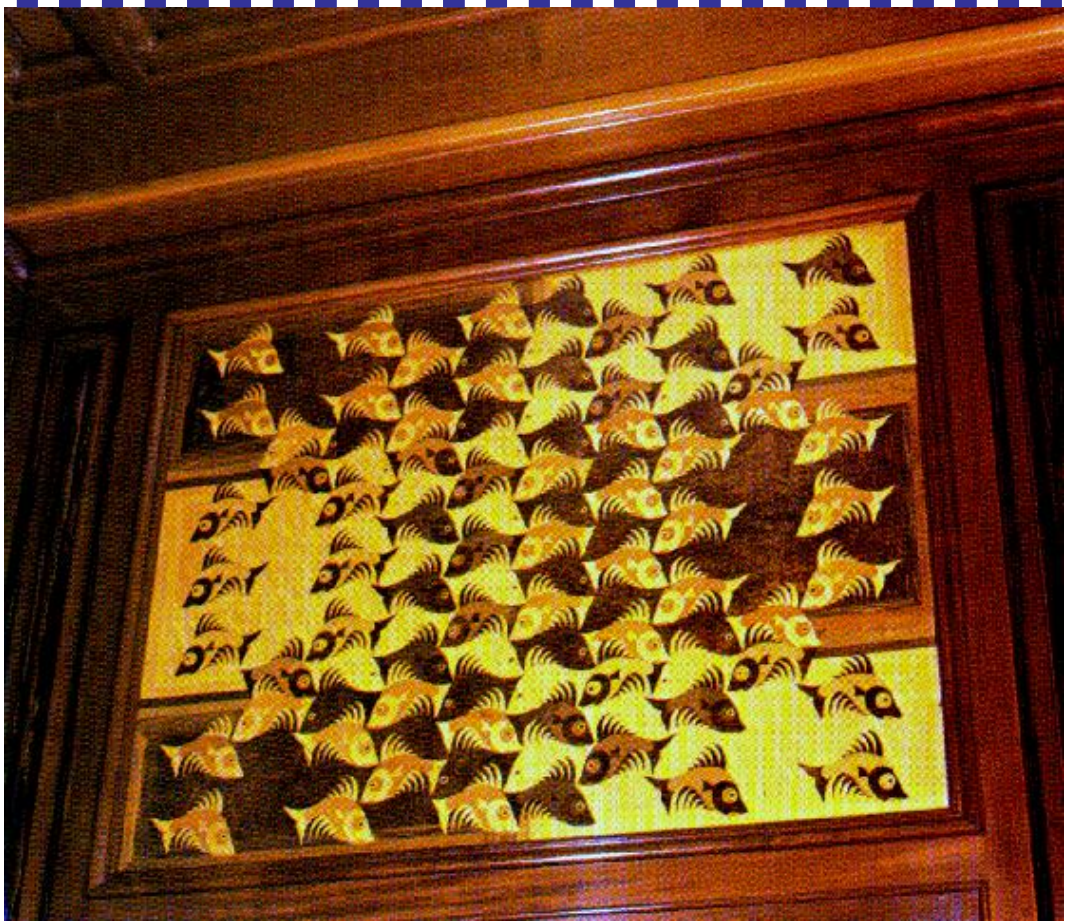
Loder, *Nature* 405 (2000) 713

How level is that playing field? ... It's not just MIT...

- Women who teach in medical schools are less likely to be promoted at every step along the path *New Eng. J. Med.* 342 (2000) 399
- "Historic" admission by the University of Rhode Island that its engineering school was hostile to women
- University of Pennsylvania conducted a similar investigation [to MIT's] in 1970. Helen Davies (a microbiologist at Penn's Medical Center) says "... we went out and did a preliminary study on three-year-old data. We did not look appreciably better than MIT, though we started 29 years ago. This was a shock."

  Nature 405 (2000) 713
- The biology division at Caltech saw its first woman faculty member receive an endowed chair in late 2000, after some 70% of male biology faculty already had endowments — but the woman biologist's endowment came only after strong lobbying... *Nature* 412 (2001) 844
- 100% of the 9 NIH Director's Pioneer Awards ($500k/year for 5 years) went to men: 94% of the evaluators were XY [Note: ±1% Δ in XX or XY success rate for RO1 grants] *Science* 306 (2004) 595

Historic opportunity? To be seized or squandered??



— real room in the academic pool —

Intarsia panel in the City Hall of Leiden

[from *The Magic Mirror of M.C. Escher*, B. Ernst, Taschen, 1994]

unless women fill their share of the positions opening up as the STEM faculty and staff hired in the 1960s retire

…

our profession will have squandered its premier opportunity to increase the fraction of female S&E faculty and staff

…

thereby locking in another generation of faculties with women-poor demographics

Women are the “canaries in the mine”

The disproportionate absence of women from the academic applicant pool is the signature that an unhealthy environment exists in U.S. STEM departments

Montferrant, *Les douze dames de rhétorique*, French, 15th century, Bibliothèque Nationale, Paris

... we need to admit that the current state of U.S. STEM departments does not serve a modern society

but, creates, instead, an unhealthy environment for:

(1) those men and women who want children — and to play a continuing, rather than merely genetic role in their lives

(2) those women who, once they demonstrate productivity, scholarship, and mentorship still reap less respect — and the ancillary rewards of space, salary, funding, and awards — than their male colleagues [see the MIT Faculty Report of 1999]

(3) those men and women who want to create collaborative, cooperative, team-based research programs

(4) those men and women who place the educational and mentoring aspects of their job first

(5) those undergraduate students (>50% of whom are now women), graduate students, and postdoctoral associates who are trying to envision their lives in science

... an unhealthy environment for ... people?

The crux of the problem … departmental and scientific (and societal) culture

Why has the "problem" of women in science not been solved??

"I sincerely doubt that any open-minded person really believes in the faulty notion that women have no intellectual capacity for science and technology. Nor do I believe that social and economic factors are the actual obstacles that prevent women's participation in the scientific and technical field."

"The main stumbling block in the way of any progress is and always has been unimpeachable tradition."

Wolf-laureate Chien-Shiung Wu

Revisiting arguments that were boring the first time around …

Lawrence H. Summers, the president of Harvard, suggested on 14 January 2005 that he believed that women's lagging progress in science and mathematics arises from differences in "intrinsic aptitude" between the sexes …

(http://www.president.harvard.edu/speeches/2005/womensci.html—Summers' two-page apology of 19 January)

Elizabeth Spelke, Professor of Psychology at Harvard, who studies basic spatial, quantitative and numerical abilities in children ranging from 5 months through 7 years:

"… when we measure their capacities, they're remarkably alike … while we always test for gender differences in our studies, we never find them. It's hard for me to get excited about small differences in biology when the evidence shows that women in science are still discriminated against every stage of the way."

Angier & Chang, *New York Times*, Monday, 24 January 2005

… and the tradition of Western science has been one of a "world without women"

Albrecht Dürer's "Adam and Eve", retouched by Kathy Grove to remove Eve

D.F. Noble, *A World without Women*, Knopf, 1992

- academic culture traces it origins to the monastery and the ecclesiastical schools
- vestiges of that tradition still cling to the "ideal" of dedicated academic life
- this "ideal" requires either a monastery or some other support infrastructure: ***i.e.***, a wife
- such is simply no longer life in today's world … it certainly is not an option open to most women

?? Is an academic career off-limits to talented, dedicated women and men just because they recognize the need for family in their lives (and the time investment required therein)??

The crux of the problem ... the departmental culture ... as exemplified by its reward structure

What they say

(1) The first duty of faculty is to the young people whom they have chosen to teach, mentor, and guide in the joys and rigors of fill-in-your S&E discipline

(2) The second duty is to produce quality scholarship

What they do

(1) Reward those who bring in the most overhead-bearing monies (in part to recoup the start-up package)

(2) Reward those who excel at promoting their science (which brings a high level of external recognition)

(3) Reward the single-minded and aggressive

Search committees? … or envelope-opening committees??

- STEM departments need to recruit what they need… and they need women (not just open manila envelopes)
- STEM departments certainly recruit the men that they want to join their ranks
- universities certainly understand that to build a competitive, functional team, recruitment is a necessity…

they would fire their basketball coach if he didn't do it

Jacob Jordaens, *The Four Evangelists*, Antwerp, ca. 1625, oil on canvas, Musée de Louvre, Paris

… and if search committees finally search and women apply, evaluators and evaluation committees need to …

- ü recognize that there is bias in evaluating "others"
- ~ Men just need to get over this fantasy they have that they are objective …

  — they ain't —

- ü Men also need to recognize that it is human to identify (and therefore) pick the person who most reminds one of oneself

Ex. 1: "Blind" auditions can explain 30 to 55% of the increase in women winning orchestral jobs

Washington Post, 13 July 1997

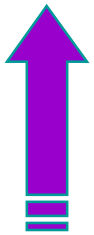
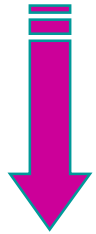
Ex. 2: University psychology professors prefer, 2:1, to hire "Brian" over "Karen", even when the application packages are identical

Washington Post, 2 April 2000

R.E. Steinpreis, K.A. Anders, D. Ritzke
Sex Roles 41 (1999) 509

Ex. 3: Women applying for a Swedish Medical Research Council postdoctoral fellowship had to be 2.5 times more productive to receive the same competence score as the average male applicant

C. Wennerås, A. Wold, *Nature* 387 (1997) 341

In general: level of prestige  # women 

A telling statistic — even elementary school kidlets know the score

More than 1,000 Michigan elementary school students were asked to describe [in 2000, not 1975 or 1950] what life would be like if they were born a member of the opposite sex ... Op Ed column in the *Washington Post*, 31 July 2000

>40% of the girls saw positive advantages to being a boy: better jobs, more money, and definitely more respect

95% of the boys saw no advantage to being female

WHY?? gender schemas—unconscious mechanisms by which men and women assign higher "value" to men and lesser "value" to women

Virginia Valian: *Why So Slow—The Advancement of Women*; MIT Press (Cambridge, MA) 1999

The crux of the problem ... the academic and departmental culture as exemplified by its reward structure

Point

The university system for all its warts does, in fact, serve society very well in many ways and produces people who do great science

Counterpoint

So (the expletive deleted) what! We've not done the control experiment (and that's bad science)

... does that mean the university system won't serve society — and science — better when it changes and integrally includes female and minority scholars??

... and why should taxpayers support discriminatory institutions?

Is it time to "Title IX" U.S. S&E departments for their entrenched inability to increase the number of women represented on their faculties? Rolison, C&EN, 13 March 2000

Title IX, Education Amendments of 1972

Section 1681. Sex (a) Prohibition against discrimination

No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance.

Section 1681. Sex (b) Preferential or disparate treatment

Title IX may not be used to discriminate... but... "... this subsection shall not be construed to prevent the consideration in any hearing or proceeding under this chapter of statistical evidence tending to show that such an imbalance exists..."

http://www2.dol.gov/dol/oasam/public/regs/statutes/titleix.htm

How do dysfunctional, non-inclusive institutions change?

"Saw the editorial. I was shocked—shocked. After all these years, to find out that men were the problem. I never would have guessed." (… yes … his tongue was in his cheek …)

It's Not News!!!

Men, because they have been and predominantly still are the stewards and beneficiaries of the current system, have a moral responsibility to decide how to transform the institution

… a leader (as opposed to a (run-of-the-mill) manager) would not stand still for less for the health of the institution

- complete demolition … see the French Revolution
- coercion: e.g., no Federal dollars … a *very* large stick
- change the reward structure … as that is the only way to lead a standing structure by the nose
- denial of service … redirect resources—especially students—via market forces

Is being a faculty member at a university an "educational activity"?

Title IX? Doesn't Title VII Apply??

Why Not Seek Redress via Civil Rights — EEO Legislation?

... because a "one-STEM-department-at-a-time" lawsuit, even a class-action suit, is a war of attrition ...

... against the women ...

(the women aren't broken, the system is ...)

Should lawsuits be the primary approach for change?

The outcome of the class-action suit against the University of Minnesota

$7 million in legal fees and settlements, including

- $1.6 million to settle Shymala Rajender's lawsuit
  ... originally filed because the Dept of Chemistry would not transfer her to the tenure track
- $100,000 award to Ms Rajender (who is now a lawyer)
- $1.5 million in legal fees for her lawyers

—and that's in 1980 $$—

(1) Nijole Benokraitis and Joe R. Feagin, *Modern Sexism: Blatant, Subtle, and Covert Discrimination* (2nd Ed.), Englewood Cliffs, NJ: Prentice-Hall, 1995;
(2) http://www1.umn.edu/mnwomen/mwchistory.html

... and with 20(+) years to make changes??

Of the Assistant/Associate/Full Professors listed at http://www.chem.umn.edu/directory in 2000, 3 of 46 were women ... 6.5%
in 2003, 4 of 43 were women ... 10%

Upping the ante ... the U.S. Congress is fed up ...

GAO visited the following universities:

- Clemson University
- Columbia University
- Duke University
- Stanford University
- State University of New York at Stony Brook
- University of California, Berkeley
- University of South Carolina

and the following national laboratories:

- Brookhaven National Laboratory
- Environmental Measurements Laboratory
- Lawrence Berkeley National Laboratory
- Lawrence Livermore National Laboratory
- Savannah River Ecology Laboratory
- Savannah River National Laboratory

GAO report 04-639: *Gender Issues: Women's Participation in the Sciences Has Increased, but Agencies Need to Do More to Ensure Compliance with Title IX*

http://www.gao.gov/new.items/d04639.pdf

U.S. GAO to STEM:

Title IX?

It's the LAW!!!!

(the Feds are slow) so what's next? ... how to up the ante...

- Create a new guideline for professional society and institutional awards — if women are not among the nominees under consideration, the award simply is not bestowed AT ALL that year
  - ~ If the Awards committee is not presented with a comprehensive, unbiased slate, the honor and prestige of the award have been corrupted

- Educate faculty and students that as a society we (men and women) overvalue the competence, stature, and productivity of men and undervalue that of women

- Put to rest the myth that a scientist's best creativity and productivity occurs in early career: the tenure clock is an artifice and one that has been especially damaging to young women trying to integrate career and family

Start reform at the top: Doctorate schools of faculty members at the "Top 10" producers of chemistry faculty*

	Ph.D. School of Faculty at Top 10			Younger Faculty (Ph.D.: 1979-1999)	
	Women	Men	Total		
UC-Berkeley	9	33	42 (21.4%)	8 XX / 20	(40.0%)
Caltech	2	23	25	1 XX / 19	
Harvard	2	53	55 (3.6%)	1 XX / 18	(5.6%)
Stanford	2	15	17	2 XX / 14	
MIT	2	23	25	2 XX / 12	(16.7%)
Cornell	2	7	9 (22.2%)	2 XX / 6	(33.3%)
Columbia	2	16	18	2 XX / 10	(20.0%)
Yale	1	8	9	1 XX / 4	(25.0%)
Wisconsin	0	8	8	0 XX / 2	
Chicago	1	11	12	1 XX / 5	(20.0%)

8 it's a power law: the top 10 hires from the top 10 (preferably the top *5*), but the women educated at the top 10 *really* don't want an academic career in the top 10 (or top 25)...

* Compiled by data mining the 2001 Directory of Graduate Research

V.J. Kuck, C.H. Marzabadi, S.A. Nolan, J.P. Buckner, *J. Chem. Educ.* 81 (2004) 356

(the Feds are slow) so what's next? ... how to up the ante...

- Title IX is a mechanism: Create professional society, foundation, and university equivalents

  — *e.g.*, the American Chemical Society could award Petroleum Research Fund (PRF) grants to XX and URM faculty in all departments but otherwise only to faculty from departments with environments that have attracted women above the historical brick wall of 10%

- Do diversity audits of S&E departments (à la APS)

  — highlight and praise the departments that create environments appealing to women and minorities

- 8 Denial of Service: Encourage undergraduates to give diversified (i.e., human) institutions their first attention when looking at graduate school

- OUT THE TOXIC DEPARTMENTS !!!

  ... guerilla website??

Up the ante … Throw out the old "dictionary"

- "… you're only here because you're a woman…"
  - when far-too-many men are "here" because they're men
  - (thanks to gender schemas and accumulation of advantages)
- "preferential hiring"…
  - we've always had it: ~100% white men … now, *that's* a quota!!!
  - … or because we've had universities since the 11th C: "Isn't a millennium of affirmative action for white men sufficient??"
- "search committee"
  - manila-envelope-opening committee (disinterested in searching…)
- "I generally prefer carrots to sticks."
  - …We are dealing with carnivores. Carrots are for vegetarians.
- "We only want the *best* candidate…"
  - …fortuitous that in the old dictionary there's a picture of a white man by the definition of "best"…
- old: "diplomacy…" new: cast-iron-skillet diplomacy
  - … which may be required to get a point of logic across to the illogical by whapping them upside the head with cast-iron skillets…

How do STEM departments get more women as faculty?

- On-site day care
- Mentorship that illuminates the choices and opportunities
- Dial-back the demands …

men and women in academia now they work insanely hard

If faculty must become the equivalent of CEOs (and COOs and CTOs and CFOs and…) to thrive in academia—and it seems they must—the pay had better become commensurate (dream on)

Return the faculty to their primary function: training and challenging students in pursuit of scholarly research

- Reconfigure how students are supported to do research as part of their graduate degrees
- Change the reward structure — REALLY reward—and reward first and foremost—those professors who truly guide, mentor, and challenge in the classroom and the research lab

. . . and the system will turn on a dime

THE GOAL: WOMEN WHO DO MORE THAN JUST SURVIVE … THEY THRIVE

A complex, multivariate problem... yet why do the PTB push a one-answer mantra??

30 years ago the mantra was "keep women in the pipeline"

[Eqn] more women with Ph.D.s in S&E = problem solved

(*i.e.*, more women hired into academia, winning awards, *u.s.w.*)

WRONG!!!

(necessary, but not sufficient)

Today's mantra: achieve "critical mass" of women faculty in a department ... but ...

8 differentiation of female faculty produces isolation even when the numbers reach critical mass

Etzkowitz et al. (1) *Science* 266 (1994) 51; (2) *Athena Unbound—The Advancement of Women in Science and Technology*, Cambridge University Press, 2000

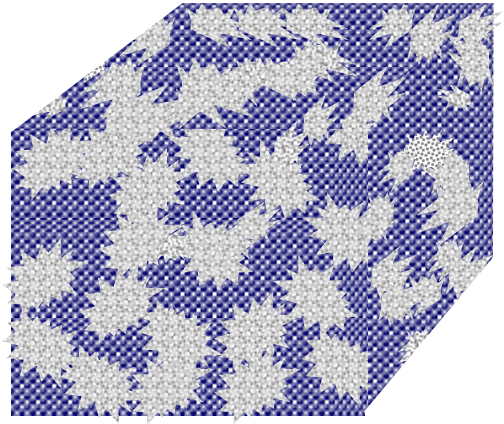
What if it isn't a critical mass that is needed, but a percolation threshold??

~ 15% ... that number is where one needs to be to reach a percolation threshold in a 3-D problem

Once ≥ the 3-D percolation threshold, the small amount of "other" in the sea of majority thinks it represents the whole and electron conductivity (if we are talking about one of my research interests) occurs with impunity, as does communication and a sense of community, if we are talking about women in a man's world.

- Is reaching >15% a happenstance outcome?
- Is reaching a contiguous network the better goal??

3-D percolation



... women *and* men can be members of such networks

… places to go…

… from the Declaration of Sentiments adopted at the Woman's Rights Convention in Seneca Falls in 1848:

"He closes against her all the avenues to wealth and distinction which he considers most honorable to himself."

"The most notable fact that culture imprints on woman is the sense of our limits. The most important thing one woman can do for another is to illuminate and expand her sense of actual possibilities."

Adrienne Rich in *Of Woman Born*, 1976

Seneca Falls, NY
National Park
Lucretia Coffin Mott introduces Susan B. Anthony to Elizabeth Cady Stanton
[photo: C. Korzeniewski]

... for future reference...

- Virginia Valian: *Why So Slow—The Advancement of Women;* MIT Press (Cambridge, MA) 1999
- Londa Schiebinger: *Has Feminism Changed Science?* Harvard University Press (Cambridge, MA) 1999
- Linda Jean Shepherd: *Lifting the Veil—The Feminine Face of Science*; Shambala Press (Boston) 1993
- David Noble: *A World without Women—The Christian Clerical Culture of Western Science*; Alfred A. Knopf (New York) 1992
- *Women, Science, and Technology*; Routledge (New York) 2001
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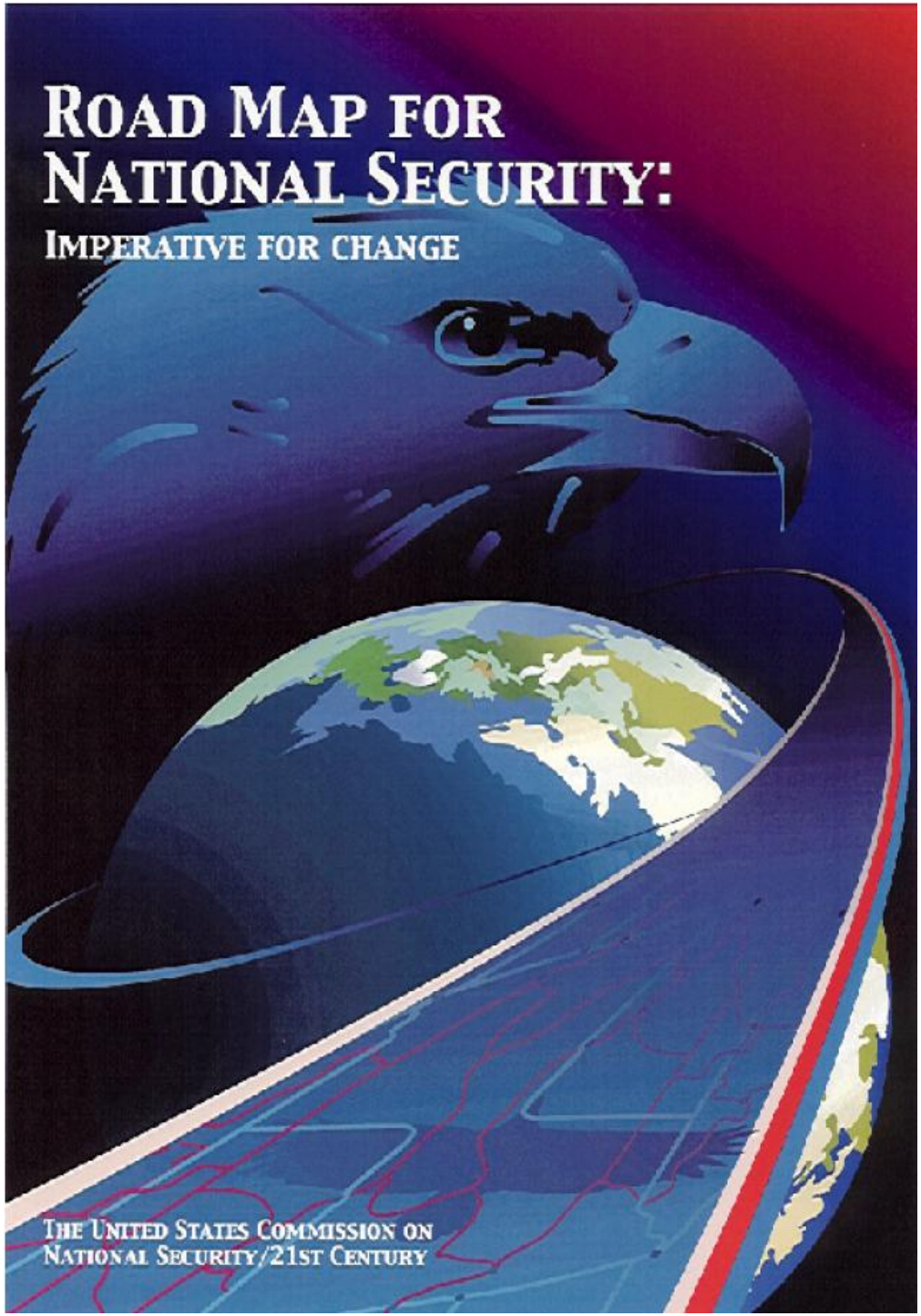

"Hart-Rudman Report" - 2001

Education as a National Security Imperative

"The harsh fact is that the US need for the highest quality human capital in science, mathematics, and engineering is not being met."

Recommendation

"… fund a comprehensive program to produce the needed numbers of science and engineering professionals as well as qualified teachers in science and math."