

Title IX as a Change Strategy for Science & Engineering — The Path Forward



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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 ****

The Face of American STEM



How good can S&E
be when it's missing
two-thirds of its
talent?

**Is Not the Face
of America**

from a lecture by Henry Blount (NSF) at
the CAMD Outreach and Education Day,
Louisiana State University, 28 July 2005



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

Our universities (our bridge to the future!) and laboratories have got to get out of our predominantly white male universe if we want to stay at the forefront of science

an institution's leaders—as opposed to (store-minding) 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

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.

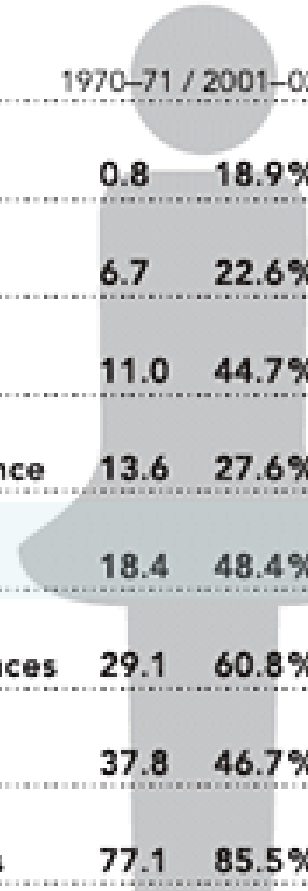
Section 1681. Sex (b) Preferential or disparate treatment

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...”

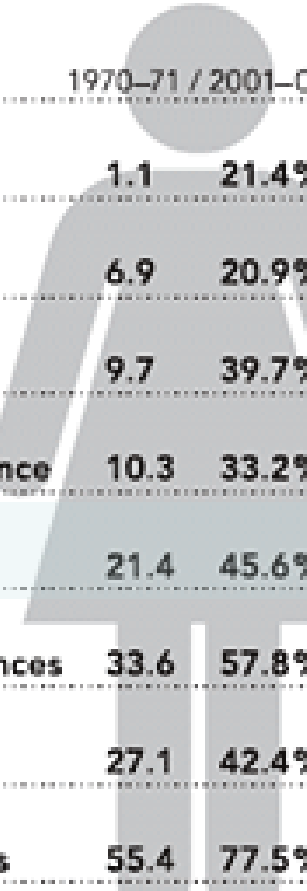
<http://www2.dol.gov/dol/oasam/public/regs/statutes/titleix.htm>

Why Title IX? Because it works! Today the “statistics of small populations” no longer apply for women in (most) STEM disciplines

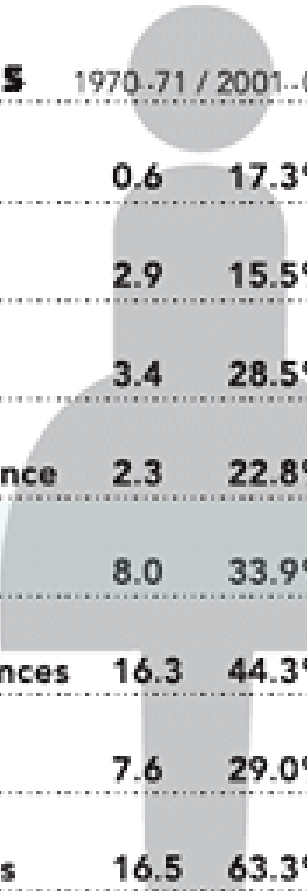
Percentage of degrees in STEM granted to women before (1970–1971) and 30 years after enactment of Title IX



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%

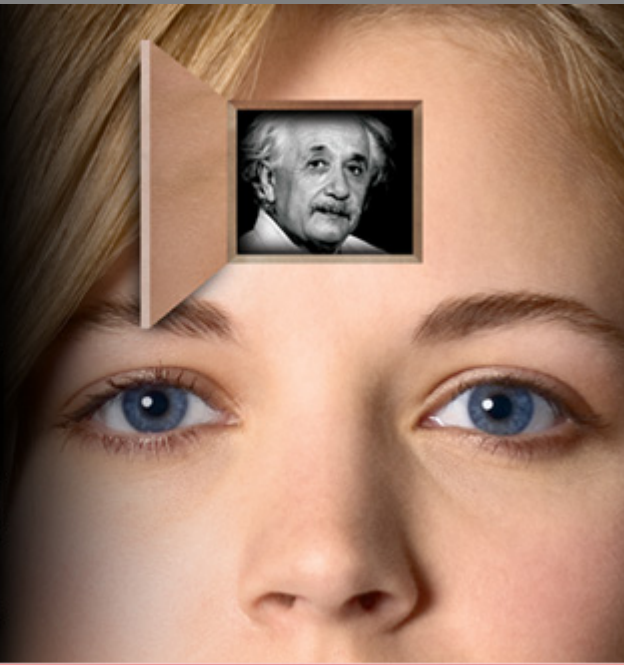
Scientists Are Made, Not Born, W. Michael Cox and Richard Alm, *New York Times*, Monday 28 February 2005 (Op-Ed)

... but ... “Science is Still a Man’s World”

Time Magazine (27 February 2005)

THE MATH MYTH

The real truth about
WOMEN’S BRAINS and
the **SCIENCE** gender gap

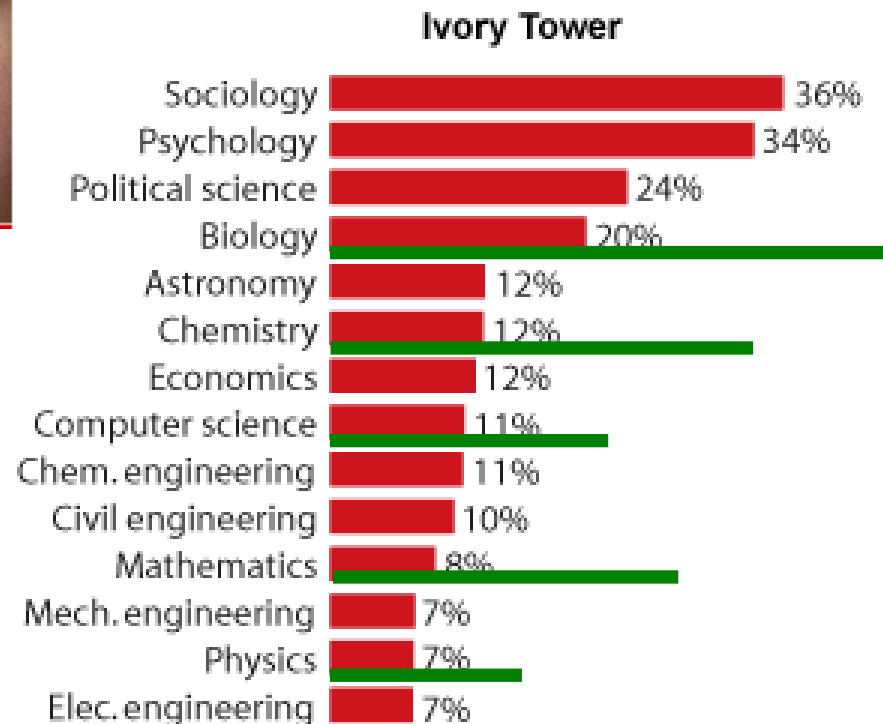


Percentage of
women in
tenured and
tenure-track
positions at the
top 50
U.S. research
departments

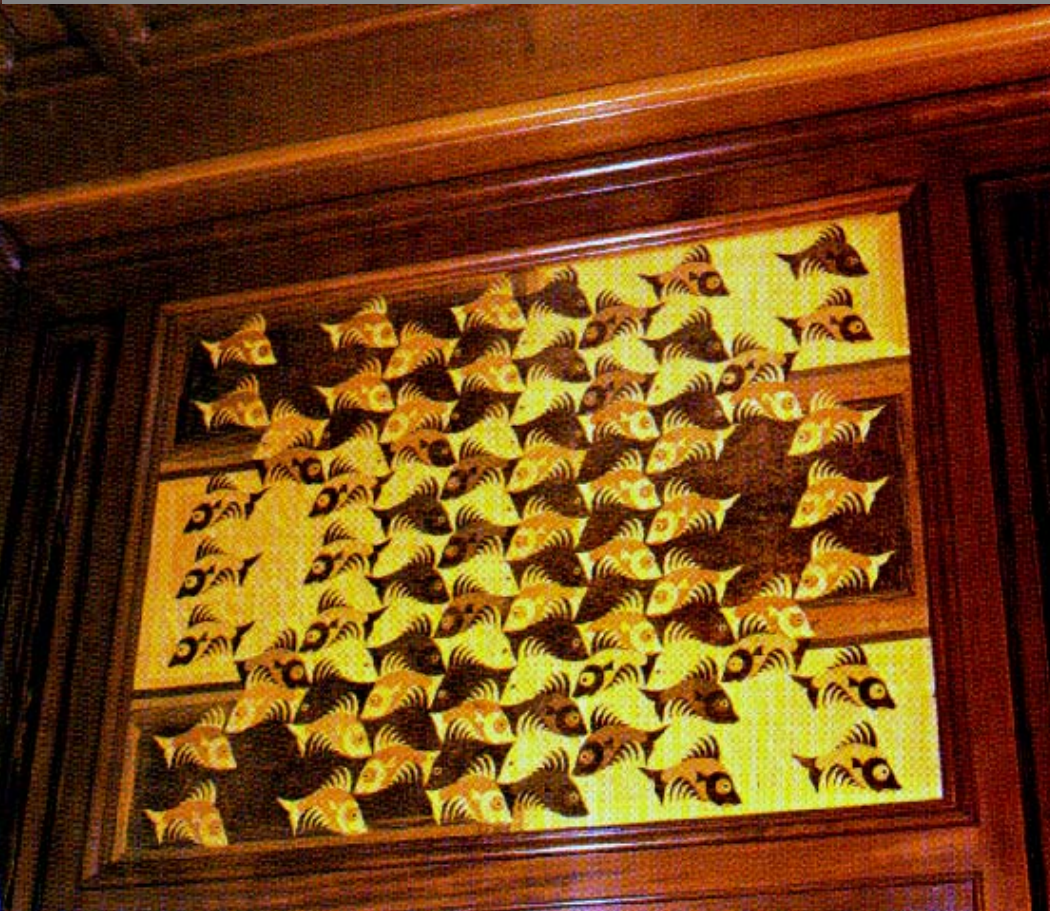
Source: Nelson
Diversity Survey

The Nelson Diversity Studies
Top 50 ranking based on research
expenditures as determined by NSF

[http://cheminfo.chem.ou.edu/faculty/
djn/diversity/chemEdiv.html](http://cheminfo.chem.ou.edu/faculty/djn/diversity/chemEdiv.html)



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

...

The U.S. 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

Leading ... not store managing ... **search committees must stop being envelope-opening committees**

✓ **STEM departments need to recruit what they need... and they need women** (don't just stand around opening manila envelopes!)

U-Dub Faculty Recruitment Toolkit

http://www.washington.edu/admin/eoo/forms/ftk_01.html

✓ **STEM units 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

... things all scientists need to learn ...

- ✓ recognize that there is bias in evaluating "others" (see Valian)
- ✚ STEM professionals just need to get over the fantasy that they are objective ...
 - they ain't —
- ✓ We 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 kids 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 ...

David Sadker, "Gender Games," *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, 1999

... the crux of the problem ... departmental/laboratory 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 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?

The U.S. Congress acts on its concerns

<<http://commerce.senate.gov>>

3 October 2002 — Hearing on Title IX and Science
Subcommittee on Science, Technology, and Space
from the Statement of Senator Ron Wyden (D-Oregon), Chair:

... if Title IX can do that on the playing field it should certainly do so in the classroom, where its help was originally directed... I want the National Academy of Sciences to report on how universities support their math, science and engineering *faculty* with respect to Title IX. This can cover hiring, promotion, tenure, even allocation of lab space.

The Federal government should share some of the spotlight... It's time Congress quantified and qualified the realities facing women in the sciences. Only then can we find fully effective solutions.

See also: News Focus by J. Mervis, *Science* (2002) 11 October, p 356

Upping the ante ... the U.S. Congress acts on its concerns ...
<<http://thomas.loc.gov/home/c107/query.html>>

H.R. 4664 “An act to authorize appropriations for fiscal years 2003, 2004, 2005, 2006, and 2007 for the National Science Foundation and other purposes”

— signed into law by President Bush on 19 December 2002 —

SEC. 18. REPORTS—(b) FACULTY. ... the Director shall enter into an arrangement with the National Academy of Sciences to assess gender differences in the careers of science and engineering faculty. This study shall ... examine issues such as faculty hiring, promotion, tenure, and allocation of resources including laboratory space ...

(c) GRANT FUNDING. ... the Director shall enter into an agreement with an appropriate party to assess gender differences in the distribution of external Federal research and development funding ...

Status of the congressionally mandated studies

- **NRC Committee on Gender Differences in Careers of Science, Engineering, and Mathematics Faculty**
<http://www7.nationalacademies.org/cwse/gender_differences.html>
~ Report originally anticipated by mid-2005 (still pending)
- **RAND Corp. Study on Gender Differences in Federal External R&D Investment**
✓ Report originally anticipated by late-2004 (issued September 2005)
<http://www.rand.org/pubs/technical_reports/2005/RAND_TR307.sum.pdf>
NSF passed ... NIH flunked ... DOE & DOD *really* flunked
- **GAO task force: Title IX Compliance in Math, Science and Engineering**
✓ Audit commissioned January 2004, report issued July 2004
study requested by Senators Barbara Boxer (D-CA)
and Ron Wyden (D-OR)

GAO to STEM: Title IX? **IT'S THE LAW!!!!**

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>



GAO notes: "Our review of federal science agencies' oversight for Title IX suggests that much of the leverage afforded by this law lies underutilized in the science arena, even as several billion dollars are spent each year on federal science grants."

GAO to Funding Agencies: Title IX? **IT'S THE LAW!!!!**

The primary GAO recommendation to the Secretaries of Energy and Education, the Administrator of NASA, and the Director of the NSF:

“... take actions to ensure compliance reviews of grantees are conducted as required by Title IX”... i.e., proactive not reactive reviews

In response to the GAO report

► NSF, the Dept of Education, DOE, and NASA formed an interagency committee to jump-start Title IX enforcement

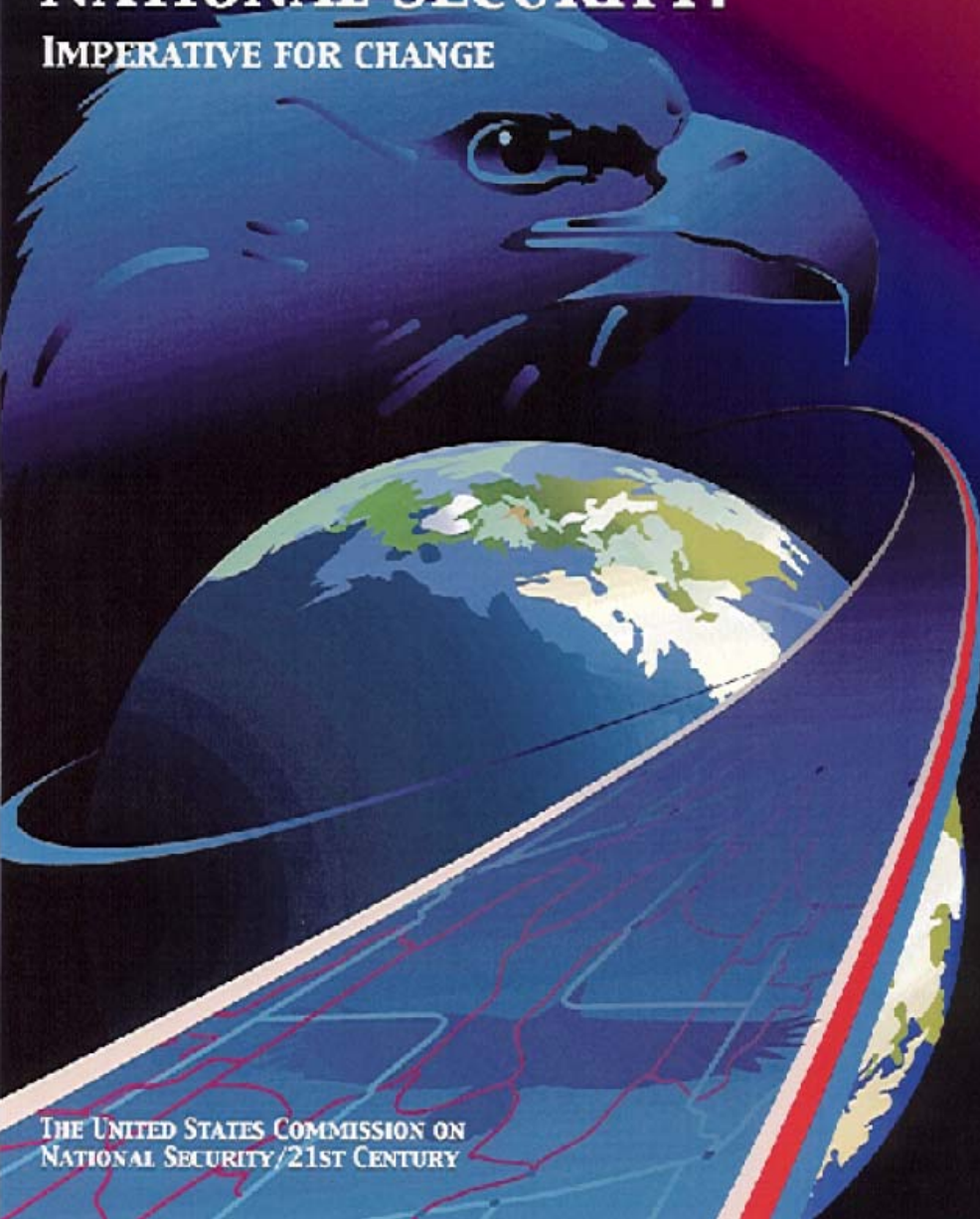
“NSF will be looking to see whether discrimination complaints have been filed, whether grievance procedures are in place at the schools and how many women are employed in math and science departments, according to Ronald Branch, director of NSF's Office of Equal Opportunity Programs.”
—reported in *CQ Researcher*, 20 May 2005

► NSF will perform Title IX assessments of engineering/computer science departments at 4 research-intensive universities over the next year

Announced by Ron Branch during the 25 Oct 2005 meeting of the Committee on Equal Opportunities in Science and Engineering (CEOSE) at NSF

ROAD MAP FOR NATIONAL SECURITY:

IMPERATIVE FOR CHANGE



THE UNITED STATES COMMISSION ON
NATIONAL SECURITY/21ST CENTURY

Why does Congress care?
“Hart-Rudman Report” (2001)

STEM 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.”

RISING ABOVE THE GATHERING STORM

*Energizing and
Employing America
for a Brighter
Economic Future*

NATIONAL ACADEMY OF SCIENCES,
NATIONAL ACADEMY OF ENGINEERING, AND
INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

Why do Congress and
the White House care?
“Augustine Report” (2005)

- (1) Science and Math Education; and
- (2) Investment in Basic Research ...

**are American
Competitiveness
Imperatives !!**

*“... the scientific
and technological building
blocks critical to our
economic leadership are
eroding at a time when
many other nations are
gathering strength.”*

2006 AAAS Meeting
St. Louis, MO
20 February 2006



Title IX (... it's not just for sports...) Assessments of Science & Engineering — Town Hall Discussion

Title IX—It's Not Just for Sports

Debra Rolison, Moderator, Naval Research Laboratory

Title IX—An Effective Change Strategy in Academia

Jocelyn Samuels, National Women's Law Center

The Slow State of Change in STEM Departments

Willie Pearson, Jr., Georgia Tech

Funding Agencies and Their Implementation of Title IX for STEM

Judith Sunley, MPS, National Science Foundation

Recruiting and Retaining Women Faculty

George Whitesides, Harvard University

My Thoughts on Applying Title IX

Richard Zare, Stanford University

Synopsis of AAAS symposium

- Every federal funding agency has the authority to do Title IX compliance reviews *and* the authority to withhold federal funds
- Overcaution is preventing universities from taking lawful affirmative steps



Initial NSF/DOE compliance review focus: on students
Admission/retention/access to resources and faculty

How should compliance reviews operate?

- Require disaggregated data at every stage (w/r/t students and (rank of) faculty—and not just XX vs. XY)
- Do climate surveys (along the spectrum)
- Note the # of complaints filed with/against the university
 - ... but remember that [as noted by the GAO report] XX in S&E eschew making complaints because of career implications

Suggestions (from the "uppity" list) for meaningful, relevant data for Title IX compliance reviews: Faculty focus

- start-up package (not just start-up funds)
- space, including square footage and renovation money
- total compensation (salaries+)
- allocation of discretionary funds AND research support (i.e., students/postdocs)
- teaching loads in credit hours per semester by undergraduate and graduate course load
- advising loads
- sabbaticals, other discretionary leave time
- matching funds for proposals
- representation on committees that decide on resource allocation (e.g., space, fellowships)
- Number of large projects headed by women vs. those by men

Even a trickle of press coverage ...



[24-Mar-2006] Title IX: Not just for athletes (Officials consider extending gender-equality law to science)—Neil Munro

"The NSF needs to challenge universities' definition of academic success because successful "university faculty tend to replicate themselves," Hogan declared. "We think academic institutions are at the heart of the problem."

INSIDE HIGHER ED
NEWS



[28-Mar-2006] Federal inquiry on women in science—Scott Jaschik

Stephanie Monroe, asst. education secretary for civil rights, said in an interview Monday that "about a half dozen" institutions would receive compliance reviews ... that could last from a few months to years in which actions would be monitored. "Compliance reviews frequently end ... with policy guidance that is broadened to apply to colleges that were not reviewed."



[7-Apr-2006] Bush wants women off the field, into the lab—Bonnie Erbe

"... the Bush administration did something uncharacteristic and unexpected. It announced it would explore the possibility of using Title IX as a tool to channel more women into the studies and fields of science and math. Helping women with Title IX instead of hurting them? Unheard of, at least by this administration."

... leads to push back (even though Title IX is THE LAW!!!!)



[9-Apr-2006] Title IX nonsense—Carrie Lucas

“... some officials at the National Science Foundation and Education Department share the feminists' immunity to cognitive dissonance. They are exploring Title IX's applications to specific areas of study, but only in disciplines where Title IX's application will benefit women.”



[17-Apr-2006] President's knees go weak when confronted with feminist agenda—Phyllis Schlafly

NSF “confirms that it is starting “a joint effort” with the Education Department “to do Title IX compliance reviews,” which spells the end of picking the best and the brightest.”...

“One agitator for compliance reviews, Debra Rolison of the Naval Research Laboratory, reveals that compliance reviews are focusing on the way women students are “experiencing a different climate” in engineering and computer science departments. Boohoo.”

... leads to push back (even though Title IX is THE LAW!!!!)



[24-Apr-2006] The math and science of quotas—Jessie Gavora

4 days after Monroe's announcement appeared in *National Journal*—the White House quietly forced a retraction. On Department of Education letterhead, a statement was released over Monroe's signature promising that "the Department of Education is not expanding Title IX enforcement beyond its regular activities to combat unlawful discrimination."



[17-May-2006] Title IX shouldn't be used as an academic weapon—Christina Hoff Sommers

"If the Education Department and National Science Foundation were strictly to impose Title IX compliance standards on academic science, we could see men's participation in math, physics, technology and engineering capped at the level of female interest. That would wreak havoc in fields that drive the economy and where the USA already lags other countries.."

"Not everyone finds that prospect worrisome. Debra Rolison of the U.S. Naval Research Laboratory campaigns nationally for using Title IX to eliminate bias in academic science programs. She hails the campaign as a "not-yet-realized earthquake."

Sex, lies, and Title IX

Federal law banning sex discrimination in schools may do as much for academics as it has for athletics

“... THE GREATEST CHALLENGE is changing the perception of what constitutes a successful academic career in STEM ... Currently, the reward structure of the academic rat race in science, engineering, and mathematics presents a real barrier to women choosing a career in academics. We must dispel the notion that working day and night equates to productivity.

... I strongly favor the application of Title IX to the STEM enterprise ... Concentrate on the careful collection and wide circulation of ... Title IX measurables, quantitative measures that help us judge progress in achieving gender equity.

Finally! a leading XY
scientist steps up
Richard Zare—Stanford

Why is it that men are described as brilliant but women are described as talented and hard-working? Let a man be assertive and we admire his courage to speak out. Let a woman be assertive and we feel threatened by what she might next say.



The academic life is a grand profession, and it is not just for men. The smart application of Title IX can help demonstrate that.

(the Feds are slow) so what's next?

... how to up the ante ...

- 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 especially damaging to young women trying to integrate career and family ... time to re-think/abolish tenure?
- Put to rest the myth of 80-h weeks: Survey of UC tenured faculty show ~55-h/week gets the job done, even for faculty with children (Mason, Gouldin)
- Put to rest the myth of critical mass: 15%? No!! $\geq 35\%$
- ▶ Redirect resources: Encourage undergraduates to give diversified (human) institutions—and research groups—their first attention when looking at graduate school
- OUT THE TOXIC DEPARTMENTS !!!
... guerilla website??

We're scientists ... time to do an experiment

✦ Scientists just need to get over over the fantasy that they are objective ...



• Implicit Association Test

Mahzarin Benaji
Harvard University
Anthony Greenwald
University of Washington

<https://implicit.harvard.edu/implicit/demo/measureyourattitudes.html>



Measure Your Attitudes

I am aware of the possibility of encountering interpretations of my IAT test performance with which I may not agree. Knowing this,

I WISH TO PROCEED

The Bias Finders—A test of unconscious attitudes polarizes psychologists [169 (2006) 250 (22 April)]

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” [15%] of women on faculty ... but ...

► 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?

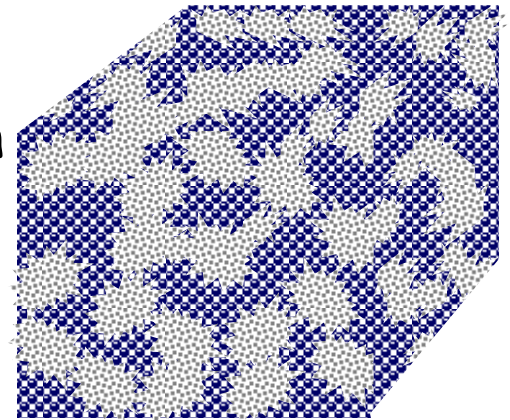
~ 15% is where one needs to be to reach a percolation threshold in a 3-D problem

Above the percolation threshold, the small amount of “other” in the sea of majority thinks it represents the whole and electron/ion/heat transfer 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



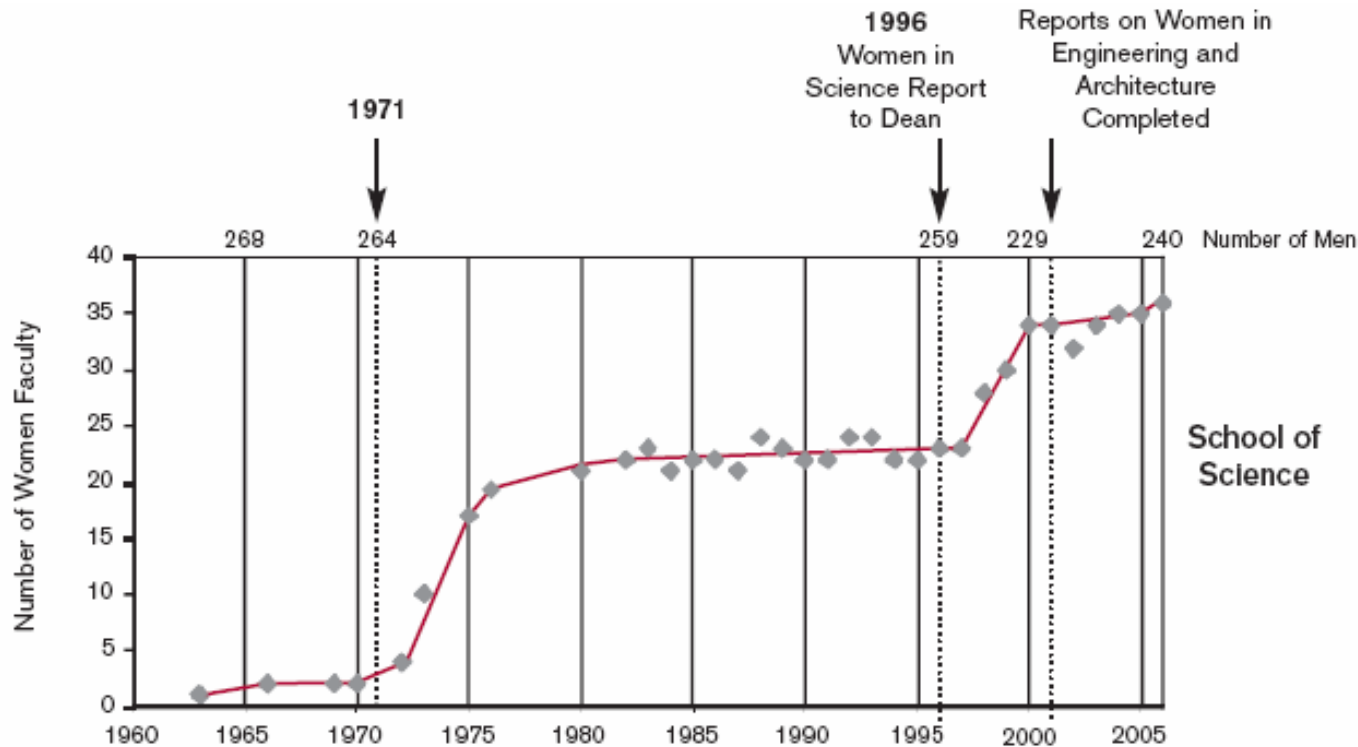
The good news about a percolation mechanism: women *and* men—whites *and* underrepresented minorities—can be members of such networks

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
(XY gender schemas = accumulation of advantage for men)
- ▶▶ “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...

Change without external pressure? ... not really ...

Number of Women
Faculty in MIT's School
of Science (1963–2006)



Diversification of a University
Faculty: Observations on Hiring
Women Faculty in the Schools of
Science and Engineering at MIT.

Hopkins, MIT Faculty Newsletter
18 (2006) March-April, p. 713

	# Out of 16 Women Faculty	# Out of All 208 Tenured Faculty in Science
Presidential Medal of Science	2 (13%)	8 (4%)
National Academy of Sciences	10 (63%)	60 (29%)
Institute of Medicine of the National Academy	2 (13%)	23 (11%)
American Academy of Arts and Sciences	11 (69%)	115 (55%)

People in academics can, and do, do it right — **we should stop rewarding the ones who do it wrong, even if they bring in dollars (and renown) galore**

The first and highest rewards should go to those who fulfill their duties to what **is** the product of the U.S. university:
the students

WHY? Brutal environments drain the joy out of doing science

... this country should want joyous scientists ...

✓ Reward via grant funds/renewals, awards, distinction, chocolate, etc. those who do do it right

... such men and women are indeed national treasures ...

REWARD THEM!!!

... 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]