

**HIDDEN LOSSES: ALTERNATIVES TO FACULTY
CAREERS IN THE SCIENCES AMONG DOCTORALLY-
PREPARED WOMEN**

Preliminary Observations from a Career Pathways Study at the
University of Colorado at Boulder

Research-with-Evaluation Component of LEAP
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Additional observations and findings from other studies underway
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Two LEAP Research Questions with Bearing for the Loss from Faculty Careers of Women with Ph.D.s in the Sciences

1. In what types of positions are women (as compared with men) who have Ph.Ds. in the sciences employed at this University?
2. What can explain why women (and men) with Ph.D.s in the sciences are to be found in particular academic positions.

Research Methods

1. Construction of an Institutional Map using existing institutional and departmental data.
2. Intensive, semi-structured, open-ended interviews with samples of women and men from STEM disciplines:
 - Late-stage graduate students
 - Instructors
 - Research Associates and post-docs
 - Tenure track faculty

All interviews are coded in detail for responses that addresses aspects of the research question, and are entered into a software program for retrieval of thematic content, frequency counts, and analysis.

The Institutional Map

- Difficulties of definition and categorization
- Surprising variety of academic work
- Many combined roles

Instructor group: Combinations of advising, administration, program development alongside teaching

Research Associate group: professional support roles (e.g., oversight of lab courses), special teaching roles (e.g., writing courses)

Outreach professionals have been found in both Instructor and RA categories

How does this Square with the National Picture?

Women in Science, Career Processes and Outcomes.
Yu Xie and KimberleeA. Shauman
Harvard University Press, 2003

1997. Women earned these proportions of STEM Ph.D.s:
41% in the life sciences
24% in geosciences
22% in physical sciences
16% in computer sciences
12% in engineering

In other disciplines, (including law and medicine), women have begun to reach parity with men in attaining graduate degrees.

Women were 35% of all US faculty and 20% in STEM disciplines.

In all disciplines, women held faculty positions in the lower ranks and at less prestigious institutions.

They were 10% of STEM full professors at four-year institutions.

Faculty Publishing: a closing gender gap

Women published:

1969 58% of that published by men
1973 63%
1988 70%
1993 82%

**Becoming a tenure track faculty member requires
a perfect trajectory.**

Beginning in graduate school, having to cope with any serious life contingency is apt to be terminal for the prospects of a traditional faculty career.

Academe is experienced by women from graduate school onward as a career path with little or no capacity to deal with real-life situations.

- Serious illness or accident
- Illness, disability, accident, or death of a child or family member
- Care of elderly parents
- Parenting before career is established (especially single-parenting)
- Financial problems (including insufficient support as graduate student)
- Re-location or co-location with a partner or spouse (two-body problem)

Any one of these factors may be sufficient to prevent continuation of a tenure-track career.

This is partly because the consequences of these situations fall disproportionately more on women than on men.

Also found in two recent studies of Ph.D. Careers in the Physical Sciences by Liane Pedersen-Gallegos and Steve J. Smith:
(2002) The Training, Careers, and Work of Ph.D. Physical Scientists: Not Simply Academic. American Journal of Physics, 70 11 pp 1081-1092

Aspects of Faculty Life that Appear Unattractive

Balance with Family Life

Includes issues of boundary-setting and time management

Arose in several of our data sets and workshop experiences:

1. Senior undergraduates participating in summer undergraduate research: a five-year study in seven STEM disciplines at four liberal arts institutions.

Female undergraduates noted to be watching faculty with whom they are working closely for the summer:

- Women with children*: How do they manage?
- Men with children*: How much do they contribute to family life?
- All other faculty: How do they respond to colleagues with children?

*Often two-career families

Questions about how well a faculty career can accommodate family life were also raised:

3. By senior women STEM undergraduates on seven campuses in the Talking about Leaving study
4. By female participants in six (annual) summer Workshops in the NSF's Science and Engineering Education Scholars Program for new doctorates and newly-appointed young faculty
5. Interviews with women faculty, faculty of color, dual career faculty couples, and young male faculty with at Penn State University (Londa L. Schiebinger)

Other Life and Career Balance Issues

Self-knowledge of whom I am a rounded person with a balance of interests (music, sport, hobbies, outdoor or volunteer activities, politics, church etc.) is described as making it harder to choose a faculty career.

Issues of time, balance, self-actualization, and value of being a whole person

Tenure-track life is observed to be too all-demanding and inflexible to accommodate the balanced life

What else makes faculty life seem unappealing to these women?

- Time and productivity pressures
- Low priority and rewards for good teaching, scholarship in education, service
- Inadequate professional mentoring and collegial support
- Political in-fighting, competitiveness, ruthlessness
- Personal attacks veiled as collegial critique
- Insufficient collegiality

Faculty add:

- Always having to look as though you know what you are doing
- Having to exude confidence/success and hide failures (not telling anyone when you submit a paper only when accepted)

Time and Productivity Pressures

Aspects of both noted by female undergraduates, graduate students, and post-graduate interviewees.

Women faculty in the undergraduate research study describe relationship between the uses of time and the status system in lab sciences.

Their undergraduates also observe the effects.

Most female Research Associates and Instructors cite faculty working hours as unacceptable to them

The wider culture is changing faster than that of academe: part-time work, flexible hours, and working from home are now common among computer scientists, lawyers, doctors

Teaching as a Deviant Ambition : The Dominant Status of Research in a Departmental Context

Undergraduates and graduates who want to teach.

(Talking about Leaving study: found drop in intention to teach from 20% to 5% between junior year and end of senior year)

Instructors who describe wanting to focus on teaching as an important part of their career choice. Tenure-track faculty often feel they cannot make this a professional priority because of time and research productivity pressures.

STEM graduates and graduate students who love teaching may choose alternative careers that allow them to teach.

Also found to be an important factor in career choice in the Ph.D. study

Unmet Needs as a Graduate Student and Young Academic

Reported by graduate students and also by women with science doctorates who chose non-faculty careers

Lack of clear, personal mentoring

Not knowing that you were supposed to be mentored until it's too late to be useful

Insufficient information about the field and the work not knowing where to get such information

Not knowing how to work the system

Lack of role models

Little knowledge of range of career options among faculty advisors

- Work of both Chris Golde and Barbara Lovitts documents these deficiencies
- Willie Pearson: the consequences of inadequate mentoring of young African American faculty
- Mary Frank Fox: How advisors might advise women better

Results: Young, first-generation academics (working class, non-white, female) are more vulnerable to loss or to choosing out.

A situation of accumulated and perpetuated advantage

Social and economic replication of the profession

How do these perceived deterrents to the choice of faculty careers arise?

Elements in the History of the Culture of Science and Engineering

Some thoughts on origins and effects derived from findings and observations across several studies and from women in different stages or different parts of academic career paths.

An Anomic Profession.

Anomie: a social situation in which the rules for behavior are unclear, arcane, shifting, missing, or conflicting.

Includes: Failure to develop boundaries as to the demands that may be legitimately be made on the members of a social group (and, therefore, that members will demand of themselves) creates chronic anxiety about the adequacy of personal effort and achievement.

Without boundaries, nothing is ever enough.

Emile Durkheim *Du Suicide* (1897)

An Ascetic and Elitist Profession:

Anomie can be argued to arise from Calvinist (Puritan) influences on 17th Century English scientists the Doctrine of the Elect (R.K. Merton)

It provides a rationale for the search for those few who are presumed to have the ability to do science, and, thus against the need to make changes in the curriculum, or in pedagogy or learning assessment.

Beliefs about the Hardness of Science:

Confusion of cognitive elements that constitute the essential hardness of science or mathematics with teaching practices that encourage student confusion, incomplete understanding, and create impressions of the ineffability of science among many undergraduates.

Cf., Carter and Brickhouse; also found in *Talking about Leaving* , and in interviews with two large undergraduate samples as part of the ChemConnections evaluation.

The belief that science (as taught) is intrinsically hard, and that few can do it is one historic source for the informal caste system among disciplines, sub-specialties, and academic roles, as well as sexism, racism, and ageism

The Proving Imperative

A moral rather than an intellectual challenge whose nature and meaning is obscure or irrelevant to many women. Undergraduate women (noting it in male peers) interpret it (correctly) as an indicator that they have encroached on male territory.

Especially strong in engineering with historic roots (and ongoing relationship with) the military

A traditional element in the ordeal-based education of young men and of their induction rituals into manhood (Joseph Campbell)

Strong evidence in our Talking about Leaving and Women in Computer Science studies

The basis of much male rudeness and crudeness towards male undergraduates, and of the failure of male faculty to restrain this.

A daily irritant to female undergraduates (and graduates) in the physical and applied sciences.

Faculty disinclination to nurture freshmen and sophomores, or to develop a Socratic teacher-learner dialogue with them is also a response to a deeply-socialized moral imperative to push students to prove their worth.

The combined impact of these behaviors by both male peers and faculty was found to be the most significant contributor to rapid decline in the incoming confidence of talented female students (documented by many researchers)

Positive Elements in Alternative Career Choices

Includes teaching, educational scholarship, curriculum development (labs and courses): local impact not necessarily published pure and applied research.

Doing Something Meaningful in the World

A strong gender-linked value raised especially by RAs

Also noted in four earlier studies:

- Study of Undergraduate Women in Computer Science (at CU)
Contrast between strong female participation in applied IT/CS courses, CS minors, and the advanced degree program, and low participation in CS majors

An important factor in shaping the career thinking of women in:

- The Talking about Leaving study
- The Ph.D Careers Study (and the University of Washington Pilot Study that preceded it)
- The Undergraduate Research Study

STEM faculty often do work with real-world significance but this may not be presented or seen by possible entrants. However, may seem more distant and less immediate in its effect or significance

Leaving the Faculty Track: How do Female Graduate Students and Doctorally-Prepared Women Develop Alternative Career Pathways?

1. Contingencies that the faculty life appears unable to accommodate
2. Ruling out what they do not want: unappealing aspects of the faculty life
3. Open-ness to options that allow them to choose valued lifestyles
4. Responding positively to opportunities presented rather than pursuing a known path.
5. Interviewees rarely knew anything about the work they are now doing beforehand. The why not try this factor. Willingness to take risks.
6. Looking for a fit

Satisfying careers emerge, or can be constructed by taking up these (often serendipitous) opportunities. Careers are created by openness to opportunity and avoidance of less acceptable lifestyles.

I never thought I would be doing this, but it turned out pretty well.

However, there is also a risk of making choices that offer limited professional mobility

Losing Able Women from the Tenure-track

Is this an issue? These women are doing useful work where they are.

However, they do experience the academic caste system

Noted among women in the RA and Instructor samples:

- Class Valedictorians
- Research Grants
- NSF Post-Docs
- Fellowships
- Prestigious Research Awards
- Job offers from prestigious institutions
- Opportunities for non-faculty openings in research, management, education, etc. commonly came from colleagues who valued their abilities, potential, or quality of work.

We will continue to track markers of ability and success among non-faculty women.

Theories of Attrition

If we wish to understand why there are not more women in (say) physics, there may be limits to the explanations that women IN physics can offer

Ability or effort does not appear to be a sufficient or valid explanation for the loss of qualified women from the STEM tenure-track ranks, but it may be perceived to be so by STEM faculty (including women):

There must be something lacking in women who don't pursue tenure-track positions

As already noted: women faculty have largely escaped the contingencies that have prematurely constrained other women. They have not been derailed and have less interrupted career trajectories

An uninterrupted experience of serial success and a history of adequate professional support is apt to encourage a belief (in any group) that they are in control of their own destiny.

In such a circumstance, success may be believed to be largely or solely determined by ability, hard work, confidence, and will.

A deficit model: A common finding of racial discrimination studies is that many people do not see patterns of stunted opportunities or discrimination unless they have experienced them.

This combination of experiences and attitudes may explain why the loss of qualified women from the ranks of tenure-track STEM faculty has been largely invisible.

Last Thoughts

Are we looking at this issue the wrong way? Should we be examining the working life being offered rather than the people who do not choose it?

Are these women the canaries in the mine? Should we be listening to their song?

Why would anyone want to become a member of the STEM professorate?