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Notes on the Two-body Problem

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The two-body problem came up during the Family Matters panel. It will be the topic of the AWM panel Dual Careers or Dueling Careers?: Jobs and the Two-Body Problem at the Joint Mathematics Meetings. Given that this article is sandwiched chronologically between these panels, it's an opportune place to put the information that I have been collecting.

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Marion Pour-El's article "Spatial Separation in Family Life" may have been the first article that I read about the two-body problem. It appeared in the *AWM Newsletter* in 1982. (I am sad to note that this mention of her article appears with the announcement that she is no longer with us.)

Pour-El's article and several others documented solutions for the two-body problem (see Bettye Anne Case and Anne Leggett's *Complexities* for examples). In the past, it seemed to me that these solutions did not include both members of a couple having full-time jobs in the same department. I did hear of one couple that split a job. But, it seemed that most mathematician couples either lived in different cities so both could have jobs or lived in the same city while one (often a wife, it seemed) had part-time or temporary jobs, or no job at all.

The extent of the two-body problem seems never to have been well documented, although I think that everyone suspects that many mathematicians, particularly female mathematicians, are part of a two-mathematician couple. We now have this information for U.S. mathematicians before 1940. In her review of *Pioneering Women in American Mathematics*, Marge Bayer pointed out, "Our readers will certainly recognize one common aspect of the personal lives of the early women math PhDs. The husbands of 40% of those who married also had PhDs in mathematics, and another 21% had PhDs in other fields." And, "Of the 228 women in the study, 84 were married at some point, and 36% of those had little or no employment while they were married."

In her book about mathematicians who received their PhDs between 1940 and 1959, *Women Becoming Mathematicians*, Margaret Murray notes that by the 1950s cultural norms had changed, making marriage more acceptable—or even desirable—for women mathematicians. "In an odd way, despite all the complications it added to her life, marriage seemed to make the completion of the PhD [in mathematics] a more acceptable pursuit for a woman in the 1950s, since it signified her intention to take on the normal female roles of wife and mother" (p. 127).

Some of you may be now thinking "But, what about the *Science* article in 1992?" That article said, "A remarkable 80% of female mathematicians are married to other scientists and engineers"—but, although at the time I contacted its author, I could not track down a source for this statement.

The 80% was repeated in 2004, again apparently without a source. A book called *The Two-Body Problem* said 80% of married female mathematicians are married to other mathematicians. The source it gave was a 1998 survey of physicists—which does not report this statistic. However, the survey did find that 43% of married female physicists are married to other physicists and over 68% of married female physicists are married to scientists.

Fortunately, some information about mathematicians is now available—although it may not be in the optimal form. A study called PhDs—Ten Years Later surveyed people who earned PhDs in biochemistry or mathematics between 1982 and 1985. Of those, 180 men and 37 women had held post-docs in mathematics. The responses from mathematicians displayed below suggest that the two-body problem affected married women more than married men in 1995. (Note that, as is frequent in surveys, responses were not given for every question.)

	Married at Ph.D.		Not married at Ph.D.	
	M	F	M	F
Respondents with spouse when Ph.D. was earned	66	20	119	15
Respondents with spouse in 1995	64	19	85	10
Spouse had PhD, MD, or JD in 1995	25%	84%	22%	80%

The researchers who conducted the study comment, “A substantial percentage of women who did postdoc training in the hope of becoming a professor did not realize this aspiration. Women who were married at the time of PhD completion were more likely to end up in research positions in the BGN [business, government, non-profit] sectors than in academia.”

More recent statistics from the 1999 Survey of Earned Doctorates are given in *Beyond Bias and Barriers* (published in 2007). For married PhDs between the ages of 30 and 44:

- 78% of female mathematicians were married to a scientist or engineer.
- 41% of male mathematicians were married to a scientist or engineer.

For the same married PhDs:

- 88% of female mathematicians had a husband who worked full time.
- 48% of male mathematicians had a wife who worked full time.

Dual-career Academic Couples, a study published in 2008, includes same-sex as well as opposite-sex couples. It is based on a survey of faculty members of 13 leading research

universities. The number of mathematicians who responded was small, about 20 women and 30 men. Their responses followed the pattern described above—far more women had partners who were similar than did men. In this case, the similarity was the partner's department: 70% of the women had a partner in the same department, as did 38% of the men.

In 1994, Susan Landau praised departments with programs to assist spouses in finding positions but concluded, "With rare exceptions, the problem of the two-career academic couple has been viewed as the problem of the individuals involved. That is a narrow view, as this complication affects a majority of women scientists."

In 2008, *Dual-career Academic Couples* reiterated this theme for women and men:

Academics practice "disciplinary endogamy"; that is to say, they tend to couple in similar fields of study and are often found in the very same department.

Endogamy rates are high in the natural sciences, particularly among women. Fully 83 percent of women scientists in academic couples are partnered with another scientist, compared with 54 percent of men scientists.

The good news is that attitudes about hiring dual-career couples appear to be changing—sometimes at the university level, sometimes at the department level. Some institutions are members of a Higher Education Recruitment Consortium (HERC). The HERC for a particular region maintains listings of all faculty and staff openings at member institutions (see www.hercjobs.org). Some institutions have explicit guidelines for hiring couples that are intended to address concerns about academic qualifications of the "second hire" of a dual hire. Such guidelines were discussed at the Dual-Career Academic Couples Conference at Stanford in June by administrators from Princeton, Stanford, and Berkeley.

But, the Clayman study notes that many women are still at a disadvantage:

It is true that U.S. women still practice hypergamy, the tendency to partner with men of higher (or at least not lower) status than their own. Consequently, in heterosexual couples male partners may be somewhat more established professionally than are female partners.

Although this tendency is not universal, it affects us all. Prevailing practices seem still to make hiring a more junior "trailing spouse" more difficult, thus lessening the likelihood of hiring women.

References in Chronological Order

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Maresi Nerad and Joseph Cerny. (1999). Postdoctoral patterns, career advancement, and problems. *Science* 285(5433), 1533–1534. See also, <http://depts.washington.edu/cirgeweb/c/research/phds-ten-years-later/>.

Lisa Wolf-Wendel, Susan B. Twombly, and Suzanne Rice. (2004). *The two-body problem: Dual-career-couple hiring practices in higher education*. Baltimore, MD: Johns Hopkins University Press.

National Research Council. (2007). *Beyond bias and barriers*. Washington, DC: National Academies Press. Can be read on-line. See pp. 171–173.

Clayman Institute. (2008). *Dual-career academic couples: What universities need to know*. Stanford University. Can be downloaded at www.stanford.edu/group/gender/ResearchPrograms/DualCareer/index.html. See p. 31.

Dual-Career Academic Couples Conference: Strategies and Opportunities. June 16, 2009. Some presentations and other information posted at www.stanford.edu/group/gender/ResearchPrograms/DualCareer/conference2009.html.

Dual Careers or Dueling Careers?: Jobs and the Two-Body Problem. AWM panel, Joint Mathematics Meetings, San Francisco, January 13, 2010, 2:15 p.m.–3:40 p.m., Room 2007, 2nd Floor, Moscone Center West.