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CONFESSION WITHOUT GUILT?

M.I.T. JUMPED THE GUN TO AVOID A SEX-DISCRIMINATION CONTROVERSY, BUT SHOT ITSELF IN THE FOOT

Special Report

by Patricia Hausman, Ph.D. and
James H. Steiger, Ph.D.

- In conceding to the findings of sex discrimination by an ad-hoc faculty committee, the Massachusetts Institute of Technology may have reacted to political correctness before checking all the evidence.
- This paper represents a productivity study of the MIT biology department faculty and can serve as a model for other universities responding to claims of sex discrimination.

February 2001

*This special report reflects the research and conclusions of the authors.
The Independent Women's Forum presents this paper as a public service.*

PREFACE

In March 1999, the Massachusetts Institute of Technology published a report confessing to unintentional, but “institutionalized” discrimination against female faculty. Entitled *A Study on the Status of Women Faculty in Science at MIT*, it was the result of an investigation led by biology professor Nancy Hopkins, who had filed a complaint with MIT’s president alleging discrimination against female faculty.

MIT responded to the report by giving substantial raises and resources to a number of female faculty members. Shortly thereafter, the Ford Foundation provided MIT with a million-dollar grant to fund activities designed to investigate and correct alleged inequitable treatment of women faculty—not only at MIT, but also throughout the United States.

In December 1999, The Independent Women's Forum presented a special report by Judith S. Kleinfeld, Ph.D. describing numerous methodological flaws and serious omissions in MIT’s study. This report criticized MIT for acquiescing to the demands of female faculty without having collected or examined relevant evidence in a manner consistent with its reputation as a premier scientific institution. Kleinfeld’s report sparked widespread debate at universities throughout the country as well as in the news media, ultimately raising questions about the validity of MIT’s confession.

In January 2001, Nancy Hopkins and several of her colleagues hosted a conference to encourage other universities to emulate MIT’s actions. Articles in the *Chronicle of Higher Education* and *New York Times* detailed how nine major research universities, including Stanford and the California Institute of Technology, signed a statement pledging a major initiative to assure equal treatment for women and advance their status in scientific fields. The obvious assumptions were that universities are treating women unfairly and that MIT’s report and subsequent behavior provide a commendable model for corrective action.

IWF believes that whether women are being treated unfairly is an empirical question, one that universities should investigate with the same scientific rigor as any other issue. This study employs standard measures of performance (publications, citations, grant support) often used by universities to evaluate faculty.

The results clearly show that regardless of sex, biologists at MIT boast impressive professional records. At the same time, the analysis reveals some striking differences in the relative performance of males and females, primarily among the more senior members included in the study. These differences are relevant to deciding whether disparities in compensation and/or access to resources have a legitimate basis or can only be attributed to sex discrimination.

An interesting aspect of the findings is the trend for sex differences in performance to vary much less among younger MIT biologists as compared to their more senior colleagues. The small size of this study precludes generalizations from these results. However, it is worth noting that in recent decades, women’s career gains have progressed at a pace that is remarkable when placed in historical context. It is therefore possible that younger women may be more likely, both subjectively and objectively, to be on an equal footing with their male colleagues. Productivity studies can be useful in clarifying whether a general trend in this direction does in fact exist.

IWF emphasizes that discrimination is not the only possible explanation for differences in such career outcomes as salary or laboratory size. A productivity study, while seldom conclusive by itself, is an essential component of any investigation into group-based claims of discrimination. Charges of bias may be well founded, but only if differential outcomes for men and women have no legitimate basis. IWF believes that investigations into gender bias must include an analysis of how productive each member of the faculty has been, and in fairness to all parties, examine every plausible explanation for differences in career outcomes.

CONFESSION WITHOUT GUILT?

Sex discrimination is a hot topic in academia. Despite decades of policies designed to insure equal opportunity, many people remain convinced that unfair treatment is still the order of the day, and that women are still years away from achieving true equality.

For those who hold this view, the 1999 publication of *A Study on the Status of Women Faculty in Science at MIT* was a watershed event.¹ According to the report, female scientists at the Institute had suffered “pervasive” discrimination. After it was leaked to the news media, the report became front-page news—and a frequently cited model for combating sex discrimination.

Some, however, have questioned the report’s claims, and we find their skepticism is well founded. A careful reading of the report and its media coverage leads to the inescapable conclusion that *something is just not right with this story*.

Among the more curious facts:

- The authors of the MIT gender study conclude that female faculty “*proved to be underpaid*” (p. 10) despite acknowledging that “*primary salary data [for MIT professors] are confidential and were not provided to us*” (p. 8).*
- Nine months after the report appeared, one professor involved with it told the *Chronicle of Higher Education* that, contrary to claims that bias was found, “*There was no conclusion that anything was wrong,*” nor any evidence of discrimination against women faculty. Another committee member denied that the report accurately described her experience at MIT, asserting “*I never felt marginalized.*”² *
- The report claims “discrimination consists of a pattern of powerful, but unrecognized assumptions that work systematically against women faculty” (p. 11). Yet, it states (p. 8) that “*data reviews revealed that in some departments, men and women faculty appeared to share equally in material resources and rewards . . . ,*” a comment seemingly at odds with claims of systematic discrimination.*
- Few of those responsible for the report were disinterested parties. Most were women who had signed a letter alleging discrimination; the primary author had already seen a lawyer.
- The report provided virtually no data to support its claims.

Though the report presents no evidence documenting disparities in working conditions between the sexes, for the sake of argument, let us assume that these exist. In our

¹ This study was published by the Massachusetts Institute of Technology in a Special Edition of the MIT Faculty Newsletter, Vol. XI, No. 4 (March 1999).

² Wilson, R. “An MIT Professor’s Suspicion of Bias Leads to a New Movement for Academic Women.” *Chronicle of Higher Education*, December 3, 1999.

* Italics added.

view, the next step is not to turn up the rhetoric of discrimination, but to consider whether a reasonable basis for these differences might exist.

WHY OUTCOMES DIFFER

In any workplace, differences in compensation often occur among co-workers. In the university, most of these differences can be explained by one of more of the following factors:

- **Rank.** Full professors typically earn more than those of lower rank.
- **Time in rank.** A full professor with many years of service usually has a higher salary than one who has just attained the same rank.
- **Market value of expertise.** Competition for professors varies depending on their area of expertise. Medical school professors, for instance, command higher salaries than those trained in areas that are in lesser demand.
- **Academic performance.** Professors whose work is widely published and cited—as well as those who attract honors, awards, or large amounts of research support—generally earn more than their less distinguished colleagues.

These factors are also relevant to evaluating the fairness of working conditions such as access to resources and appointment to positions of responsibility.

The MIT report adequately addresses the rank factor by focusing on the situation of senior female faculty. But it appears to overlook length of time in rank. According to the website of MIT's biology department, about 60 professors there currently run laboratories. Eighteen of them completed their doctoral degrees in 1970 or earlier, and all but two of the 18 are male.

Nothing in the report indicates that this difference was taken into account. The authors claim only to have compared males and females. But such a comparison is flawed because the former exceed the latter for time in rank.

It also seems that the authors of the MIT gender study neglected the market value of expertise. They appear to have compared female biologists not only to other biologists, but also to physicists. This, too, raises questions about the design of their study since one cannot presume that salaries would not vary between fields.

In the remainder of this paper, we consider academic performance.

FINDING THE FACTS

To avoid problems created by comparing scientists in one discipline to those in another, we limited our analysis to members of the biology department.

We first analyzed information on awards and honors posted on the MIT website. It shows that male biologists have been more likely to receive prestigious awards than females. The biology department has three Nobel laureates, two recipients of the National Medal of Science, and one Mac

Arthur Fellow—all of them male. However, we hesitated to consider this finding significant, because so many more males than females have reached the age when prestigious prizes are typically awarded.

Next, we considered research productivity. Because both professorial rank and age influence output, we looked for clusters of faculty members at reasonably similar stages of their careers. We found two natural groups. The first (which we call Group 1) earned doctorates between 1971 and 1976. Members of Group 2 received their doctoral degrees between 1988 and 1993.

To measure the productivity and influence of males and females in the two groups, we used the on-line version of *Science Citation Index*. The version available to us indexes publications in academic journals for the period 1989–2000. It also lists citations of these works in other research papers. Although most members of Group 2 were still working on doctorates during part of this period, the average graduation date for males and females differed by less than four months. This small difference makes it likely that the sexes had roughly equivalent amounts of time to produce publications.

We considered three broad measures of research productivity.

- ***Published papers.*** This is a widely used measure of scientific productivity.
- ***Total citations.*** Also widely used, this standard assesses scientists' influence on their peers. The number of citations to their work that scientists accumulate over time is considered a barometer of stature in their fields.
- ***Citations per paper.*** This technique emphasizes the quality of work rather than quantity, allowing less prolific authors to stand out if their publications are cited frequently.

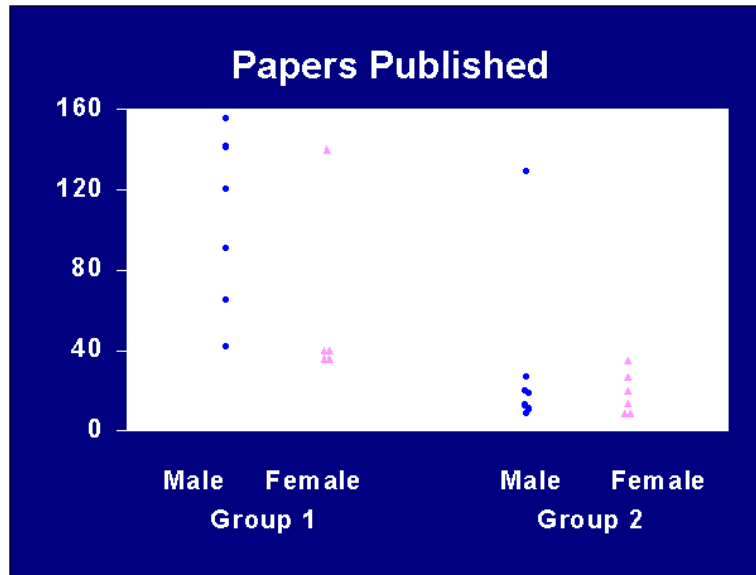
For each of these, we computed two adjusted scores. In the first adjustment, which we refer to as *weighted*, we took into account the number of authors on each paper, reducing the amount of credit granted as it increased. In our second set of adjustments, we used a technique called *rank-weighting* to factor in both the number of authors and the order in which their names appeared. By convention, authors are listed in descending order of contribution; the one who did the most is listed first, the one who contributed least, last. The technical appendix of this paper provides more on the adjusted measures.

We also considered success at raising funds for research. Specifically, we calculated the total amount of support that each scientist received from federal funding agencies between 1988 and 1998. Although these agencies support much of the university research in the U.S., we caution that this information is incomplete. Private sources, such as foundations or corporations, are also likely sources of support for MIT scientists, but information on such funding is not publicly available.

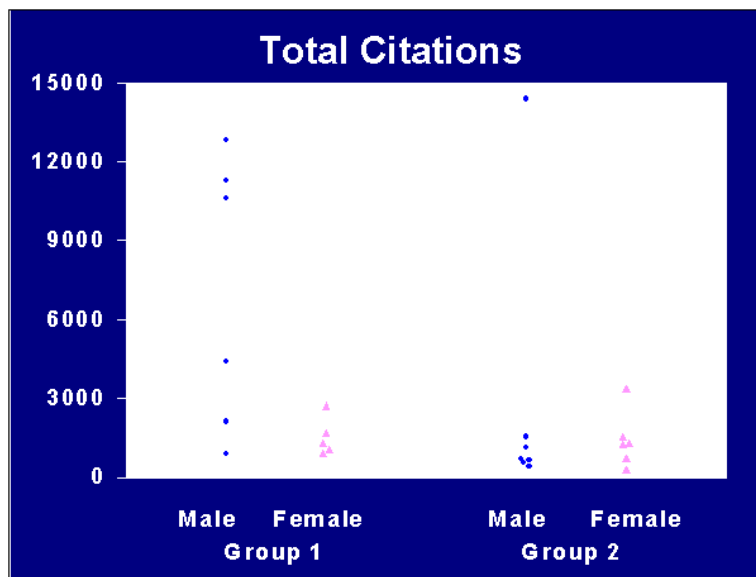
A PORTRAIT OF GROUP 1

Differences in number of published papers, total citations counts, and citations per paper between the sexes in this group were rather dramatic. Some highlights:

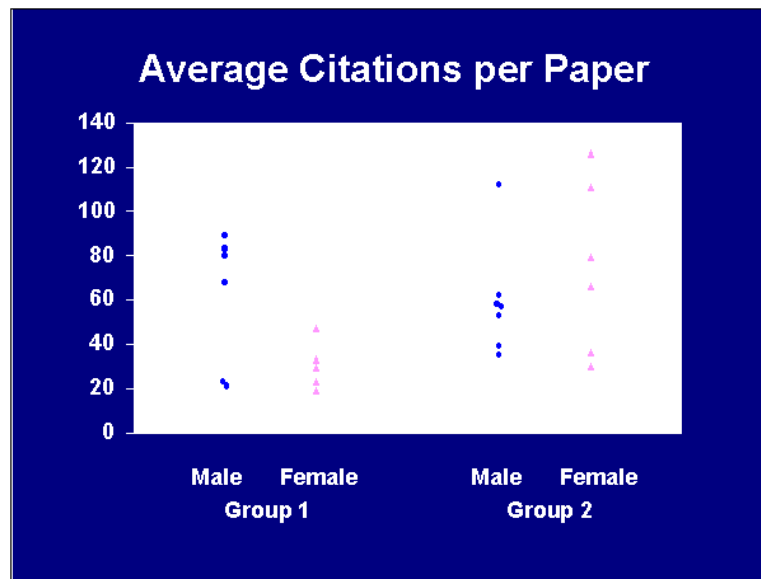
- Three of six males (50%), but only one female (20%) published more than 100 papers between 1989 and 2000. Only one of six males (17%) but four of five females (80%) published fewer than 50 papers during the same period.



- Citation counts showed a more dramatic pattern: *three of the six males have more than 10,000 citations*—more than three times as many as the most widely cited female.



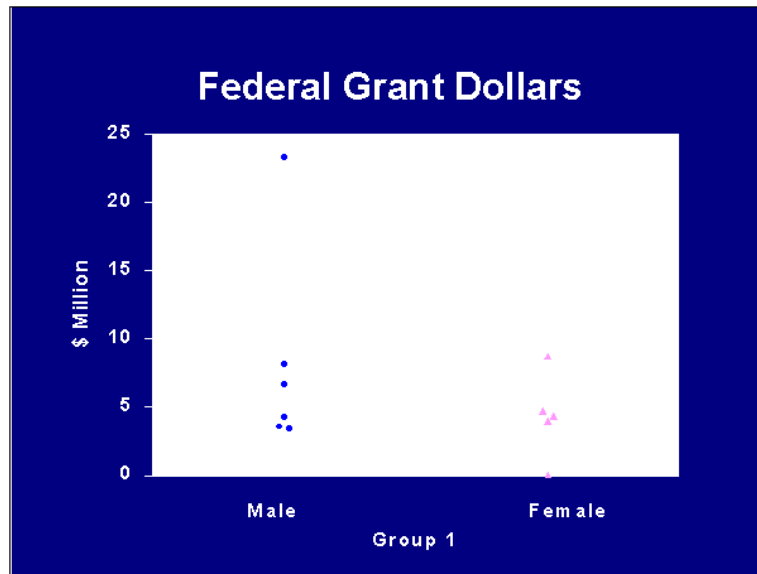
- Four males have considerably more citations per paper than do any of the females.



The relative status of males and females changed little with weighting or rank-weighting. For publications, males still ranked first and second by considerable margins. Trends for citation counts and citations per paper were lessened somewhat with these adjustments, but males remained in the top two or three positions.

Turning to research grants, we found that all but one scientist in the group (a female) had received federal funding. The results show that :

- Each supported scientist received at least \$3 million in federal grants during the 11 years analyzed.
- Three of four females with federal support raised between 4 and 5 million dollars, and one brought in almost \$9 million. Two of the six males raised somewhat less (\$3.4-3.6 million).
- Three of the six males had higher totals than most of the women. One had raised \$6.6 million; another \$8.1 million. However, *one male dwarfed all group members, with more than 23 million dollars in federal grants.*



HOW GROUP 2 DIFFERED

The remarkable output of a single scientist was the most striking finding in this group. During the study period, he published 120 papers and was cited more than 14,000 times. The individual with the second highest publication count was female; however, her publications count was only about as third as high. This was also the case with citations; the second most widely cited individual was female, but had a citation count only about as fourth as large as the top-ranked male.

For citations per paper, the top performer was female, and several other women also scored above most males on this count. Due to a relatively small number of grants to members of this group, information on funding was difficult to interpret.

If the unusually productive male is excluded from consideration, the overall trend is for males and females to be more or less competitive with each other. (See Technical Appendix)

SOME PARTING THOUGHTS

Our findings show that MIT scientists of both sexes have impressive records in the areas of publications, citations, and federal research support. In the younger group, several females had more citations per paper than most males. It seems to us that this would be an unlikely outcome if, as commonly claimed, the work of females were truly devalued.

At the same time, we found compelling differences in productivity, influence, and grant funding between the more senior males and females that we studied. These differences may well have contributed to differences in working conditions alluded to in the MIT gender study. However, few would likely question the fairness of rewarding those who publish more widely, are

most frequently cited, or raise the most in grant funds. It is also possible that some scientists have more resources not because of their sex, but because they need them to honor the terms of their research grants.

Because MIT will not disclose the data on which its report is based, we have no way to judge whether its allocation of resources is consistent with these results. Nonetheless, if nontrivial differences in salary and working conditions exist among its male and female biologists, sex discrimination is obviously not the only credible explanation. Moreover, differences in resource allocation can be found in academic departments that are primarily female and are probably nothing more than random occurrences.

We realize that many sincerely believe that women at MIT have been victims of sex discrimination. But feelings, no matter how genuine, are not facts. Nor are confessions of discrimination necessarily admirable, fashionable though they may be. After all, it is not an institution that discriminates, but individuals affiliated with it. Admitting guilt implicates one or more of them. To do so in the face of publicly available evidence of a far more innocuous explanation is to travel perilously close to the realm of false accusation—a sobering place for a scientific institution.

ABOUT THE AUTHORS

Patricia Hausman is a consulting behavioral scientist, author, and member of the National Advisory Board of the Independent Women's Forum.

James H. Steiger is a statistician and Professor of Psychology at the University of British Columbia. Among his honors are the Cattell Award of the Society of Multivariate Experimental Psychology and a Killiam Research Prize. The views expressed here are his own and not necessarily those of the University.

TECHNICAL APPENDIX

Abbreviations Used in Tables (See Notes Also)

UP *Unweighted Publications Count.* Total of publications listed in the author's name.

WP *Weighted Publications Count.* Total publications after weighting each for the number of authors.

RWP *Rank-Weighted Publications.* Total publications weighted for both the number of authors and order of names in listing of contributors.

UC *Unweighted Citations Count.* Number of times papers with scientist's name are cited in indexed journals.

WC *Weighted Citations Count.* Total citations after weighting for the number of authors.

RWC *Rank-Weighted Citations.* Total citations weighted for both the number of authors and the order of names in listing of contributors.

UI *Unweighted Impact.* UC divided by UP.

WI *Weighted Impact.* WC divided by UP.

RWI *Rank-Weighted Impact.* RWC divided by UP.

Group 1 Results

ID	SEX	PHD	UP	WP	RWP	UC	WC	RWC	UI	WI	RWI
9	M	1970	42	15	9	893	282	174	21	7	4
5	M	1971	155	25	13	12830	1866	853	83	12	6
6	M	1971	141	43	33	11313	6984	6387	80	50	45
4	M	1974	120	44	30	10628	3337	2047	89	28	17
11	M	1974	91	34	21	2133	840	539	23	9	6
7	M	1976	65	20	14	4396	1153	792	68	18	12
8	F	1970	40	15	12	935	263	177	23	7	4
3	F	1971	36	12	8	1051	296	151	29	8	4
10	F	1971	140	37	27	2719	712	549	19	5	4
1	F	1974	36	13	10	1690	385	325	47	11	9
2	F	1976	40	18	13	1301	537	470	33	13	12

Group 2 Results

ID	SEX	PHD	UP	WP	RWP	UC	WC	RWC	UI	WI	RWI
17	M	1988	129	32	24	14407	2652	2007	112	21	16
22	M	1988	20	8	7	1144	714	775	57	36	39
14	M	1990	13	5	5	690	151	150	53	12	12
23	M	1991	9	3	2	562	239	292	62	27	32
13	M	1993	27	9	9	1556	476	576	58	18	21
15	M	1993	11	4	5	431	146	194	39	13	18
16	M	1993	19	4	5	674	148	195	35	8	10
12	F	1988	35	15	16	1243	374	428	36	11	12
18	F	1990	27	6	6	3405	785	868	126	29	32
19	F	1991	9	3	3	272	59	92	30	7	10
21	F	1992	9	3	4	712	192	255	79	21	28
20	F	1993	14	3	4	1551	363	474	111	26	34
24	F	1993	20	8	8	1325	371	430	66	19	21

Group Averages

	Group 1		Group 2	
	Men	Women	Men	Women
UP	102	58	33	19
WP	30	19	9	6
RWP	20	14	8	7
UC	7032	1539	2781	1418
WC	2411	439	647	357
RWC	1799	334	598	425
UI	61	30	60	75
WI	21	9	19	19
RWI	15	7	21	23

NOTES ABOUT PRODUCTIVITY MEASURES

1. *Data Adequacy.* Some scholarly publications (i.e. books and articles not listed in *Science Citation Index*) are not included in the calculations. These omissions are assumed not to be a systematic source of significant bias for either sex.
2. *Error Checking.* Some authors have the same last name and initials as one or more other individuals named in the scientific literature. To avoid crediting any author with the work of another, each article was checked author affiliation, topic, and the mailing address. In virtually every case, authors with the same name worked in radically different academic fields and geographical locations.
3. *Unweighted Measures.* These do not attempt to compensate for the number of authors of a paper or position of an author's name. Despite their limitations, they are widely used.
4. *Simple Weighting.* A single author is assigned a value of 1; a paper with 2 authors is credited as one-half (0.5); one with 3 authors as one-third (0.33), etc.
5. *Rank Weighting.* If a paper has N authors, the first one named receives a rank of N , the second author a rank of $N-1$, etc. These values are then converted to "rank-weights" for each publication by dividing by the sum of the ranks. For example, if a publication has three authors, the first is assigned a rank of 3, the second of 2, and the last of 1. Summing 3, 2, and 1 yields 6. The first author's rank weight is therefore $3/6$ (0.5). The second author's rank weight is $2/6$ (0.33), and the last author's is $1/6$ (.167).

ABOUT THE IWF

The Independent Women's Forum (IWF), founded in 1992, provides a woman's voice on important policies and issues of the day. Our goal is to reinstate women as a positive force for freedom, opportunity and self-government.

Through our educational programs and publications, we encourage people to make decisions based on facts, common sense and consideration of what is best for society as a whole, not just "women" or any special interest group. Among the subjects we address are –

- women and work (tax reform, regulatory reform, retirement security, balancing job and family)
- women in education (feminism on campus, Title IX regulation, single-sex schools, gender equity)
- equal opportunity (affirmative action, women in the military, sexual harassment) and
- science and health (junk science and women's health).

We communicate our ideas to decision makers and the public through many means. We publish books such as *Women's Figures: An Illustrated Guide to the Economic Progress of Women in America* and our magazine *The Women's Quarterly*. We also assist college women through our new campus webzine, www.SheThinks.org. Visit our website, www.IWF.org, where many of our publications, including our newsletter *Ex Femina*, are available electronically.

IWF sponsors a monthly speaker series in addition to special conferences and debates. IWF representatives appear frequently on major television and radio shows, and often publish articles in nationally known newspapers and magazines. We are frequently invited to testify before Congress, and we have filed *amicus curiae* briefs in several important constitutional law cases.

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