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INNATE GENDER-RELATED DIFFERENCES: A CONTINUING CONTROVERSY

Introduction by Lillian C. McDermott

Recently a letter by Michael Levin and a guest commentary by Mary Beth Ruskai appeared in the *American Journal of Physics*. Both addressed the issue of innate gender differences in the learning of mathematics. Since this topic is likely to be of interest to readers of the *CSWP Gazette*, the letter and commentary are reprinted here.

Both of the authors were invited to expand on their original comments. In response, Mary Beth Ruskai added an appendix to her remarks. Citing advice of counsel, Michael Levin stated that he is unable to respond to Dr. Ruskai at this time. (He is involved in litigation with The City University of New York.)

Sheila Tobias was invited to write a commentary on the Ruskai-Levin exchange. A feminist educator and author, she has written several articles and books on issues related to the lack of participation of women in science and mathematics. Her remarks follow those of Michael Levin and Mary Beth Ruskai.

[Levin's letter appeared in Am. J. Phys. **58**, 905 (1990); Ruskai's response in Am. J. Phys. **59**, 11 (1991); both are reprinted here with the permission of the authors and editor, Robert H. Romer.]

WOMEN—WHY SO FEW?

Janice Button-Shafer's Guest Comment ["Why so few women?," Am. J. Phys. **58**, 13 (1990)] attributes the underrepresentation of women in physics wholly to environmental factors, such as social pressure and lack of early hands-on experience. This is to ignore evidence of innate cognitive gender dimorphism.

It is not disputed that males outperform females on tests of mathematical ability. Thus, when Benbow and Stanley[1] administered the Mathematics part of the Scholastic Aptitude Test to approximately 40,000 male and female junior high-school students, all rated "mathematically gifted" at that level of achievement, the boys did dramatically better. The performance gap widened at each level, with 13 boys scoring 700 or more on the SAT-M for every girl. This study is especially notable for controlling for the socialization variables mentioned by Professor Button-Shafer.

Girls do as well as boys in mathematics until adolescence, but this appears due to the emphasis in the lower grades on computation rather than insight into abstract structure, and the physiological changes that overtake males and females at puberty. Male idiopathic hypogonadics, who develop normally until puberty but do not mature sexually because of a pituitary malfunction, perform less well on tests of spatial visualization (but equally well on tests of verbal ability) than control acquired hypogonadics who have passed through a normal puberty.[2] This finding is consistent with speculation about the greater brain lateralization of males and its implications for cognitive functioning.[3]

A significant genetic component in male/female mathematical ability differences has the advantage of explaining the differential expectations to which society holds boys and girls. Parents encourage male interest in mathematics-related activities (such as the exact sciences) because parents find boys more apt to excel. This initial difference in treatment reinforces the innate male advantage, which further differentiates parental expectations about male and female success. . . , creating a biosocial feedback loop.

Some of the variance in female mathematical performance is clearly environmental in origin. Low infant mortality, coeducation, and regnant social pressures *against* pursuit of traditionally female tasks have created an environment in which genetic male/female ability differences express themselves near the low end of their environmental variance. Yet much of the increased female participation in science may be artificial. MIT adds up to 20 points to the SAT-M scores of its female applicants.[4]

The editor for this issue is Lillian C. McDermott; assistant editor is Amy Halsted.

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ply that one cannot draw conclusions about the relative ability of students whose scores differ by as much as 70 points.[21] MIT's policy is also consistent with both the College Board's strong recommendation that SAT scores not be used as the *sole* basis for admission[22] and with a number of studies showing that other factors, such as high-school grades, may correlate better with college math performance than the SAT.[21,23] As noted above, Benbow and Stanley themselves report[9] that, lower math SAT scores notwithstanding, the girls in their SMPY study *subsequently* outperformed the boys in mathematics courses. Levin distorts Professor Janice Button-Shafer's argument[24] when he suggests that she necessarily finds a 50/50 ratio for male and female physicists intrinsically optimal. Her thesis (amply supported by data from government agencies and professional societies)[25–28] is that the current percentage of women in physics is much lower than the percentages in mathematics and other areas of science and engineering which require the same type of skills and abilities as physics. Furthermore, a number of other countries, including Belgium, France, Israel, Spain, Poland, and China, have far more women physicists in high-level positions than the US.[29] In the US, even girls in advanced math classes are much less likely to study high-school physics than boys at the same level of mathematical ability; according to American Institute of Physics data,[25] 80% of such boys study physics, but only 60% of girls. The point is not that, in a perfect world, a 50/50 ratio would be either inevitable or desirable, but that many capable women do not pursue careers in the physical sciences, often making critical decisions at a rather young age.

I do agree with Levin that a complete absence of innate gender differences has also not been established, but find that of little importance. None of the tests measure large gender differences, and there is substantial evidence that at least some of those differences can be attributed to culture, education, and social factors. Therefore, any reasonable interpretation of the data gives evidence for, at most, a very small *average* gender difference in ability, yielding a substantial cohort of women quite capable of successful careers in science and engineering. Unfortunately, even these women may be discouraged by the publicity and distortions. Indeed, it is not uncommon for girls at the very top of the distribution (e.g., first in a math class) to be told that *they* cannot be scientists because girls (in general) aren't as good as boys. (My own experience was that such comments are most likely to come from nonscientists; however, other women scientists have reported differently.) Nor is there much evidence for Levin's assertion that parents who encourage sons in math more than daughters are reflecting their children's performance. On the contrary, Eccles *et al.*[30] have found that parents often deny their daughters' math ability even when they perform well, and that this phenomenon has been exacerbated by the publicity given to assertions of innate gender differences.[15]

"The point is not that, in a perfect world, a 50/50 ratio would either be inevitable or desirable, but that many capable women do not pursue careers in the physical sciences, often making critical decisions at a rather young age."

It is worth observing that the same forces that discourage capable women from scientific careers often simultaneously encourage boys with mediocre talent. There is evidence that female students generally receive higher grades in calculus than male students. For example, Hughes[31] reported the results of a survey in which 31% of women vs 20% of men received *A*; 34% of women vs 27% of men received *B*; but only 15% of women vs 25% of men received *D* or *F*. Because fewer women choose to study calculus, such differences say little about relative ability, but they do say something sobering about the caliber of students pursuing various career paths. My own experience, which I suspect is typical, suggests that the picture is even more distorted than the data indicate. Women who receive calculus grades of C, or even low B, rarely pursue careers in science or engineering; however, I have frequently encountered men who intend to become engineers despite repeated calculus grades at the D or low C level. Thus it appears our society's propensity to encourage children on the basis of gender stereotypes rather than achievement may actually serve to *lower* standards.

Furthermore, there are several examples of high-quality educational environments in which males and females perform equally well.[32] This leads me to speculate that some of the gender gap observed in North America may be the result of deficiencies in our educational system, and to hope that improved math and science education would diminish the sex differential. Real reform will require an enormous investment in both personnel and resources, as well as changes in attitude. I believe such efforts are worth the price, and will reduce the gender gap; in any case, the worst that could happen is that we would have better male scientists.

As a physical scientist, accustomed to quantitative reasoning and objective, reproducible experiments, I found reading some of the literature on this subject, particularly the reviews by Benbow[9] and Caplan *et al.*,[18] to be almost surreal at times. Most of the respondents to Benbow's review[9] were identified as affiliated with psychology departments; a few with education or biosciences (e.g., neurophysiology); but not one from a department of mathematics, statistics, or physical science. Although many of these respondents gave very cogent critiques, I missed the voice of a statistician and regret the consequent lack of a serious critique about the reliability of inferences obtained from data in the tail of a curve.It is understandable that experiments in psychology and education do not meet the same standards of rigor and objectivity as those in a physics laboratory. However, that is no excuse for presenting speculation based upon dubious data to the news media and general public as if it were scientific fact.

It may be useful for physicists to compare the gender difference controversy with the recent suggestion of a "fifth force" or other modification to Newton's law of gravity.[33] In both cases, individual experiments, some of them carefully done, seem to provide strong support for a particular hypothesis. However, other experiments suggest the opposite. While physicists may not have been entirely satisfied with the coverage of the "fifth force" controversy in the news media, they did at least report the existence of contradictory data. By contrast, the news media frequently report speculative

work alleging a gender difference as if it were scientific fact, but give scant attention to those who find otherwise.

It is unfortunate that the continued need to rebut assertions of sex-based differences in mathematical ability diverts attention away from related serious issues—namely, the need to find ways to counter the cultural factors that still deter women from studying the physical sciences, the need to substantially improve mathematics and science education for children of *both* sexes in the United States, and the need to find ways to encourage children of both sexes and all races to aspire to excellence and choose careers on the basis of interests and ability rather than sexual, ethnic, and racial stereotypes.

My own views on some of these matters have been expressed elsewhere.[34] I hope that other readers will accept Editor Romer's invitation to use this Journal as a forum for further discussion of how to meet this challenge.

I am grateful to many people, including Professor Richard Dudley, Professor Gila Hanna, Allyn Jackson, and Dr. Barbara Peskin, for helpful information, discussions, and comments on an early draft of this manuscript. Needless to say, both the opinions expressed here and the responsibility for the accuracy of the citations are entirely my own.

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APPENDIX

This Appendix contains excerpts from an article to appear in the Association for Women in Mathematics Newsletter (March–April) which amplifies the parenthetical remark added to paragraph 1 of the above article. Although it is well known that many women take less mathematics in high school, it does not seem to be appreciated that the socio-economic distribution of female students is very different from that of male students and that these differences have a significant effect on SAT scores. Therefore, it seems worth citing some data.

Unless otherwise stated, the data given below are taken from the College Board's *1990 Profile of SAT and Achievement Test Takers*;[35] these statistics should be typical of students who took the test in recent years. Women are substantially over-represented (59%) amongst students whose family income is less than $10,000/year, a group which constitutes 5% of the total and whose average math SAT score (419) is 57 points below average; they are also over-represented (57%) in the $10,000–$20,000/year, a group which constitutes 12% of the total and whose average math SAT score (437) is 39 points below average. However, women are under-represented (49%) amongst students whose family income is more than $70,000/year, a group which constitutes 17% of the total and whose average math SAT score (527) is 51 points above average. Women are also over-represented amongst both students whose parents did not finish high school (57% female), a group which constitutes 5% of the total and whose average math SAT score (412) is 64 points below average; and students whose parent(s) had only a high-school diploma (55% female), a group which constitutes 38% of the total and whose average math SAT score (445) is 31 points below average. Clearly, these subgroups are not independent. Thus, although women are also over-represented amongst blacks (58% female) and hispanics (55% female), it seems likely that the low SAT scores of these ethnic subgroups are also correlated with low family income and education (although the data in Ref. 35 do not give sufficient detail to verify this). By contrast, men are significantly over-represented (55%) amongst students who attended (non religious) private high schools, a group which constitutes 5% of the total and whose average math SAT score (523) is 47 points above average. Although separate male and female average SAT scores are not given in Ref. 35 for students within the socio-economic subgroups cited above, comparative data are available for students matched by years of high-school mathematics for the period 1974–83.[23] The difference of 51 points between the male (499) and female (448) averages for students in this period is larger than that for any subgroup matched by years of math studied. In fact, the "gender gap" drops by over half to 24 or 25 points for students who studied two or three years of high-school math, respectively. Unfortunately, this is a good news/bad news story. The bad news is that, although both male and female scores rise with the number of years of math studied, the "gap" is actually largest (49 points) for students who have studied more than four years of math. It seems likely that this is associated with another perplexing phenomenon—the fact that the male:female ratio of high scorers (750–800) is over 4:1 (at least in 1990).[35] In any case, it is evident that some, but not all, of the "gender gap" on the math SAT is due to differences in math education. One would expect the "gap" to diminish further if subgroups were matched for ethnicity and economic factors as well as education. Other work, such as that of Hyde[5] cited previously, suggests that if male and female subgroups were matched for education and socio-economic factors, there would still be a "gender gap" on the math SAT, but it would be much smaller than that currently reported.

Most of the data cited are from a brochure[35] (No. 207062) available at no cost from College Board Publications, Box 886, New York, NY 10101. Another useful brochure, the *ATP Guide for High Schools and Colleges* (No. 200649) can also be requested without charge, while Ref. 23 (No. 001834) costs $19.95. If anyone wishes to investigate these matters in more detail, additional compendia of annual data are available under the titles "19-- National Ethnic/Sex Profiles for the SAT." For price and ordering information, call (212) 713-8000.

This work has been supported in part by the National Science Foundation under Grant No. DMS-89-08125.

[1]M. Levin, "Women—why so few?" Am. J. Phys. **58**, 905–906 (1990).
[2]D. Dickson, "Britain's Royal Society condemns sex bias in math teaching," Science **233**, 618–619 (1986).
[3]G. Hanna, "Mathematics achievement of girls and boys in grade eight: Results from 20 countries," Educ. Stud. Math. **20**, 225–232 (1989).
[4]G. Hanna, "Sex differences in geometry: Results from 20 countries," paper presented at the Conference on Learning and Teaching Geometry; reprinted in Assoc. Women Math. Newslett. **19**(4), 10–17 (1989) and **19**(5), 14–17 (1989).
[5]J. S. Hyde, E. Fennema, and S. J. Lamon, "Gender differences in mathematics performance: A meta-analysis," Psychol. Bull. **107**, 139–155 (1990); see also M. C. Linn and J. S. Hyde, "Gender, mathematics, and science," Educ. Res. **18**, 17–27 (1989).
[6]C. Norman, "Math education: A mixed picture," Science **241**, 408–409 (1988).
[7]K. R. Sheehan and M. W. Gray, "Gender bias in standardized mathematics tests," preprint.

[8]E. G. J. Moore and A. Wade Smith, "Sex and ethnic group differences in mathematics achievement," J. Res. Math. Educ. **18**, 25–36 (1987).

[9]C. P. Benbow, "Sex differences in mathematical reasoning ability in intellectually talented preadolescents: Their nature, effects, and possible causes," Behav. Brain Sci. **11**, 169–232 (1988).

[10]C. P. Benbow and J. C. Stanley, "Sex differences in mathematical ability: Fact or artifact," Science **210**, 1262–1264 (1980).

[11]A. Bellisari, "Male superiority in mathematical aptitude: An artifact," Hum. Organ. **48**, 273–278 (1989).

[12]E. Fennema, "Explaining sex-related differences in mathematics: Theoretical models," Educ. Stud. Math. **16**, 303–320 (1985).

[13]P. Campbell, T. Kibler, and Kathryn Campbell-Kibler, "The SAT at twelve: A family's view of the Johns Hopkins talent search," Coll. Prep. (in press). Campbell reports that she was unable to find a reference to this aspect of the program in any of Benbow and Stanley's numerous publications describing their research.

[14]Center for Advancement of Academically Talented Youth, "Educational Planning Guide," Johns Hopkins University (1989). [This is the brochure sent to students before they take the SAT through the SMPY program. My copy was received courtesy of P. Campbell.]

[15]J. E. Jacobs and J. S. Eccles, "Gender differences in math ability: The impact of media reports on parents," Educ. Res. **14**, 20–25 (1985); J. S. Eccles and J. E. Jacobs, "Social forces shape math attitudes and performance," Signs **11**(2), 367–80 (1986).

[16]Center for the Advancement of Academically Talented Youth, "The 1989 Talent Search Report," Johns Hopkins University (1989). [This brochure was sent to students after they took the SAT through the SMPY program. My copy was received courtesy of P. Campbell.]

[17]I quote these numbers only to refute Benbow's assertion that this ratio is constant, and to demonstrate that it is simply not a reliable measure. It is hardly credible that these ratios accurately describe a gender difference which declined dramatically in 1988 and then doubled in 1989. In any case, the ratio was substantially less than 12:1 in both years. (Benbow also reported that this ratio is only 4:1 for Asian–American children.)

[18]P. J. Caplan, G. M. MacPherson, and P. Tobin, "Do sex-related differences in spatial abilities exist? A multilevel critique with new data," Am. Psychol. **40**, 786–799 (1985).

[19]S. Blakeslee, "Female sex hormone is tied to ability to perform tasks," *The New York Times* (18 November 1988), pp. A1 and D20; see also, "Sex hormones linked to task performance," Science **242**, 1509 (1988). As with many such reports in the news media, the report was based upon an oral presentation at a professional conference and no citation was given to a published paper in a refereed Journal; nor was sufficient other information presented to permit serious scientific scrutiny.

[20]Although MIT has not released any of their extensive data on these matters in a public report, the accuracy of this information was verified, before publication, by two of the representatives with whom I spoke.

[21]College Board, *ATP Guide for High Schools and Colleges 1990–91* (CEEB, New York, 1990).

[22]College Board, *Guidelines on the Uses of College Board Test Scores and Related Data* (CEEB, New York, 1988).

[23]*The College Board Technical Handbook for the Scholastic Aptitude Test and Achievement Tests*, edited by T. F. Dolan (CEEB, New York, 1984).

[24]J. Button-Shafer, "Guest Comment: Why so few women?" Am. J. Phys. **58**, 13–14 (1990).

[25]B. F. Porter, "Scientific resources for the 1990's: Women, the untapped pool," invited paper presented in the panel *Women in Physics: Why so Few?* organized by CSWP at the January 1989 joint APS/AAPT/AAAS meeting in San Francisco. (Dr.Porter is manager of the Education and Employment Statistics Division of the American Institute of Physics.)

[26]"Statistics on women mathematicians compiled by the AMS" Not. Am. Math. Soc. **37**, 946–947 (1990).

[27]National Science Foundation, "Achieving full participation of women in science and engineering" (1989 NSF report); "Women and minorities in science and engineering" (1988 NSF report).

[28]National Research council, "Women: Their under-representation and career differentials in science and engineering" (1987).

[29]B. Wilson, "Women in physics: An international perspective," CSWP Gaz. **7**(2), 1–3 (1987).

[30]J. Eccles-Parsons, T. F. Adler, and C. M. Kaczala, "Socialization of achievement attitudes and beliefs: Parental influence," Child Dev. **53**, 310–321 (1982); D. Y. Yee and J. Eccles, "Parent perceptions and attributions for children's math achievement," Sex Roles **19**, 317–333 (1988).

[31]R. J. Hughes, "Calculus reform and women undergraduates," in *Calculus for a New Century*, edited by L. A. Steen (MAA, Washington, DC, 1987), pp. 125–129.

[32]L. Gilman, "Teaching programs that work," Focus **10**(1), 7–10 (1980); P. Rogers, "Thoughts on power and pedagogy," in *Gender and Mathematics: An International Perspective*, edited by L. Burton (Unesco, 1990); reprinted in Assoc. Women in Math. Newslett. **19**(4), 6–10 (1989).

[33]B. Schwarzschild, "From mine shafts to cliffs—the 'fifth force' remains elusive," Phys. Today **41**(7), 21–24 (1988).

[34]M. B. Ruskai, "How stereotypes about science affect the participation of women," invited paper presented in the panel *Women in Physics: Why so Few?* organized by CSWP at the January 1989 joint APS/AAPT/AAAS meeting in San Francisco. M. B. Ruskai, "Why women are discouraged from studying science," The Scientist (5 March 1990); reprinted in the June 1990 issue of the CSWP Gaz.

[35]College Board, *College-Bound Seniors: 1990 Profile of SAT and Achievement Test Takers* (CEEB, New York, 1990).

COMMENTARY *by Sheila Tobias*[1]

"Women may be equal to men, but they are not equal to our men!"

This is one response, spoken or unspoken, among some of the nation's mathematical and scientific elite to women's growing participation in their professions. In its most recent incarnation, Michael Levin takes the stand. Levin is neither a mathematician nor a scientist, but he sets himself to rebut Janice Button-Schafer's Guest Comment in the *American Journal of Physics* [**58**, 1 (1990)], on their behalf. "To attribute the under-representation of women in physics wholly to environmental factors," he begins, "is to ignore evidence of innate cognitive gender dimorphism," specifically female inferiority in mathematics.[2]

Levin rests his case partly on the findings of researchers Julian Stanley and Camilla Benbow, who for years have run an enrichment program at Johns Hopkins University for mathematically gifted 11-year-old girls and boys. In publication after publication, Stanley and Benbow have reported the fact that at the high end (i.e., above 700 on the junior level SAT-M exams), the males in their program outscore (on average) the females.[3]

Critics of Stanley and Benbow have pointed out what Stanley and Benbow consistently fail to report, namely that of the top 5 percent (sometimes 2 percent) of the mathematically gifted children who are invited to attend their program, half are female, half are male; that parental lack of interest goes far to explain female underenrollment in the program; and that the girls who drop out do so very often not because they can't do the work, but because the boys are "nerdy."[4]

Still, apologists for the male domination of mathematics and science continue to rest their case on the myth of the "male math gene."

Levin concedes that "some of the variance in female mathematical performance is clearly environmental in origin," but attributes this to *parental response to genetics*. In a cart-before-the-horse reversal, he writes, "A significant genetic component in male/female mathematical ability differences has the

advantage of explaining the differential expectations to which society holds boys and girls."

In the face of growing participation of girls and women in mathematics and science, Levin resists the obvious conclusion that a changing environment of expectations will affect female aspirations and performance. Rather, he persists: ". . . much of the increased female participation in science may be artificial," citing as one example that "MIT adds up to 20 points to the SAT-M scores of its female applicants." That his admissions procedure may compensate undersupported girls is not Levin's concern. Rather, as he states quite baldly in the concluding sentence of his "letter," his fear is that in an effort not to miss future Lise Meitners, the nation will be losing Leo Szilards (both foreign-born, interestingly, and hence the product of different socializations).

What are we to make of this argument? Who is Michael Levin, anyway, and what is his beef? The biographical index of academics lists him as currently a professor of philosophy at City University of New York; his specialities are ethics and the philosophical foundations of mathematics. He has written professionally on causations and the mind-body problem. More to the point, Levin fancies himself a social critic, particularly a critic of all aspects of liberalism.

In a 1984 article in *Commentary*, Levin labels comparable worth "the feminist road to socialism." In an article for *The National Review* in 1987, he denounces his colleagues in philosophy who speak out against nuclear weapons and strategic thinking as an unthinking "dissenting mob."[5] Michael Levin and his wife, Margarita Levin, don't much like affirmative action either which, as they see it, "invariably penalize[s] whites, innocent of discriminating."[6]

But most revealing of his recent attack on women in mathematics and physics is his "no-holds-barred" attack on feminism, more generally in his 1988 book, *Feminism and Freedom*.[7] "Feminism," as he writes, is "wrong about everything," at worst anti-democratic, ". . . if not totalitarian," at best misguided, "a program for making different beings, men and women, turn out alike." He is studying feminism, he says, because no one is saying what needs to be said, namely that "feminism conflicts with every activity . . . central to a free society."[8]

What does that make women who aspire to take their rightful places in the work of science and mathematics? Are we to assume that they, too, are "misguided," "anti-democratic," and "wrong" about everything? And what about Levin's wife, Margarita, who according to their joint byline in the *New York Times* Letters section, holds an *adjunct* position as assistant professor of philosophy at Yeshiva University? Is she *misguided* and *inferior*, too? Or do cognitive sex differences stop at the gateway to mathematics and science?

Levin's colleagues in the Faculty Senate at the City University recently formally "condemned" him, by a vote of 61 to 3 and forced him to give up one of his courses. As the president of City University stated, Levin's prejudiced views make it "henceforth inappropriate for him to teach any required courses."[9] The grounds: "racist views" as expressed in several articles and published letters. Levin's public view is that "there is now quite solid evidence that . . . the average black is significantly less intelligent than the average white."[10]

Feminists and women in mathematics and science may not want to silence Levin. His letter to the *American Journal of Physics* has prompted the able response of Mary Beth Ruskai and much discussion, bringing out into the open the often-closeted sexism that continues to destroy the lives and careers of able women in science.

[1]Sheila Tobias is a feminist educator and author who has written two books on mathematics learning and two on science. Her most recent publication is entitled *They're not dumb, they're different: Stalking the second tier* (Research Corporation, 1990).

[2]All quotes are from Michael Levin's Letter, published in Am. J. Phys. **58**, 905 (1990).

[3]Camilla Benbow and Julian Stanley, "Sex differences in mathematical ability: Fact or artifact?" *Science* **210**, 1262–1264 (1980).

[4]An example of that critique can be found in my article "Sexist Equations," in *Psychology Today*, January 1982, 15–16, 36.

[5]Michael Levin, "Comparable Worth: The Feminist Road to Socialism," *Commentary* **78**, September 1984, 13–19; "Philosphers Discover the Bomb," *The National Review*, December 1987, 34–39.

[6]"Letter" to *The New York Times*, January 11, 1987, E-30.

[7]Michael Levin, *Feminism and Freedom* (New Brunswick, Transaction Books, 1987). The "no-holds-barred" epithet is taken from a review of the book by Laura A. Ingraham in *The Wall Street Journal*, January 25, 1988.

[8]From the review by Victoria Lee Erickson, in *Contemporary Sociology*, **18**, 18 (1989).

ALICE WHITE WINS 1991 MARIA GOEPPERT-MAYER AWARD

Alice E. White of AT&T Bell Laboratories is the winner of the 1991 Maria Goeppert-Mayer Award. Her citation reads as follows: "For her experimental skills and originality, recently displayed by pioneering work in the new field of 'mesotaxy.' In this technique, ion implantation produces buried epitaxial metallic and insulating layers in semiconductors; it is also used for controlled radiation damage to characterize high T_c superconductors, with applications to the fabrication of SQUID devices. Her earlier work on fabricating ultrathin wires and 2D metallic and superconducting layers, which is also noteworthy, served as a basis for these advances."

Dr. White received her B.A. in physics from Middlebury in 1976, followed by her M.S. in 1978 and Ph.D. in 1982, both from Harvard. She went to AT&T Bell Laboratories as a postdoctoral fellow in 1982, joined the technical staff in 1984, and became head of the physics of materials research department in 1988. Her work on buried layer crystal growth ("mesotaxy") is pioneering in nature and represents a major advance in the science and technology of film growth. The CSWP joins the Award

Selection Committee in congratulating Dr. White.

Established in 1986 and sponsored by the General Electric Foundation, the Maria Goeppert-Mayer Award is given to an outstanding woman physicist in the early years of her career. The award consists of $2000, plus a travel allowance of $3000 for the recipient to present lectures in her field at four institutions of her choice, and at the APS meeting at which the award is bestowed. The award is designed to acknowledge the achievement of an individual, and also to increase her visibility and inspire those who hear her speak. Dr. White received the award and presented her talk at the APS March Meeting in Cincinnati.

A nomination form for the 1992 Maria Goeppert-Mayer Award will appear in an upcoming issue of the *Gazette.* Rules and eligibility as stated on the form specify that the award is given to a woman not later than ten years after the granting of the Ph.D. degree, or the equivalent career stage, for scientific achievements that demonstrate her potential as an outstanding physicist. The award is open to women of any nationality and the lectures may be given at institutions in any country within two years after the award is made. Supporting information should include at least one letter of nomination and a current *curriculum vitae* of the nominee. Additional supporting letters are helpful. Send names of proposed candidates and supporting information *before 1 September 1991* to Ronald F. Stebbings, Chairperson, Maria Goeppert-Mayer Award Selection Committee, Department of Physics, Rice University, Box 1892, Houston, TX 88251.

1991 EISENSTEIN AWARD TO JANET D. FINCH

Janet D. Finch, an undergraduate senior with a GPA of 4.9/5.0 at the University of Illinois, has received the 1991 Laura Eisenstein Award. In addition to the standard spectrum of courses, Finch has undertaken independent study in the areas of nonlinear dynamics and in plastic scintillators for particle detection. The CSWP congratulates Ms. Finch, and wishes her success in her graduate studies and future career.

The Laura Eisenstein Award recognizes that young woman at the University of Illinois at Urbana-Champaign who has achieved the highest academic excellence in her undergraduate studies or who has distinguished herself in teaching or research while persuing a graduate degree. In cooperation with the CSWP, the award was established in 1986 by the Physics Department at the University of Illinois at Urbana-Champaign.

YEAR ONE OF TRAVEL GRANTS FOR COLLOQUIUM SPEAKERS

In June of 1990, the APS Executive Committee approved a CSWP program proposal entitled Travel Grants for Women Colloquium Speakers. Under certain conditions, the program reimburses physics departments for travel expenses of women colloquium speakers. Program A reimburses the expenses of the second of two women colloquium speakers. Program B offers a grant of $1000 to departments who have more than one-third women among their colloquium speakers. Funding was approved at a rate of $5000 annually for the first two years of the program.

The program was announced in a mailing to physics department chairs in August of 1990. A program announcement and application forms were distributed in the October 1990 *CSWP Gazette,* which also contained the latest Colloquium Speakers List. In addition, an announcement of the program appeared on the October 1990 APS page in *Physics Today.*

In the first year of the program, approximately twice as many applications were submitted as the program funds could cover. Ten of the 20 applications received for Program A were paid, and both of the two eligible applications received for Program B. Expenses claimed in the 10 Program A applications that could not be paid for lack of funds came to over $4000.

Eligible expenses and speakers will be clarified in the program announcements for 1991–92. Only actual travel expenses are payable: not honoraria or other extraneous expenses. Travel by car may be paid at a rate of $0.25 per mile. Speakers must be in physics or a closely related field, but do not need to be chosen from the Colloquium Speakers List that the CSWP maintains. On request and at the discretion of the program's administrators, expenses for the first of the two speakers in a Program A application may be paid, rather than the second.

A proposal to continue and expand the Travel Grants for Women Colloquium Speakers program will be submitted to APS Council or the Executive Board in 1992, and will include statistics on the number of applications received in the first two years of the program. The more applications that have been received, the better the chances are that funding will be increased in the program's third and subsequent years. The CSWP encourages applications when the 1991–92 funds become available next fall, and welcomes comments on the program's utility.

QUESTIONNAIRE FOR THE ROSTER OF WOMEN IN PHYSICS

The Roster of Women in Physics is a data base compiled by the American Physical Society Committee on the Status of Women in Physics. It is used to form a mailing list for the CSWP Gazette, to select women to receive announcements of probable interest to them, and to compile demographic data on women physicists. The Roster will not be made available to commercial or political organizations as a mailing list, and all information provided will be kept strictly confidential. Being listed in the Roster only identifies you as a physicist, and does not imply agreement with or support for the activities of CSWP. Please give a copy of this form to other women who work as physicists and/or have a degree in physics if you think they may not be listed in the Roster.

INSTRUCTIONS: PLEASE COMPLETE ALL ENTRIES ON BOTH SIDES OF THE FORM, AND INDICATE CHANGES IN RED if this is an update of a previous entry. Where boxes are provided, print one character within each box, abbreviating as necessary. After completing the form, mail it to:

Dr. Miriam Forman
American Physical Society
335 East 45th St.
New York, NY 10017

Please indicate whether you are presently listed in the Roster: ☐ yes ☐ no ☐ not sure

If you are presently listed, please enter your registration number, if known. It appears in the upper right corner of a Roster or Gazette mail label:

Roster registration number: ☐☐☐☐☐☐ TODAY'S DATE: ____/____/____

NAME: _____ (last) _____ (first) _____ (middle)

Previous last name (if applicable): _____

GENDER: ☐ Female ☐ Male
Only address information will be entered for males, for mailing purposes.

MAILING LABEL INFORMATION

In this section, please print information exactly as it is to appear on your mailing label:

Foreign addresses: Use only the first 3 lines, abbreviate as necessary.

Please indicate whether this address is for: ☐ home ☐ business

NAME and TITLE: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ADDRESS line 1: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ADDRESS line 2: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ADDRESS line 3: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

CITY/STATE/ZIP: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ (city) ☐☐ (state) ☐☐☐☐☐ (zip code)

Daytime phone: (☐☐☐) ☐☐☐-☐☐☐☐ Alternate phone: (☐☐☐) ☐☐☐-☐☐☐☐

EDUCATIONAL BACKGROUND

DEGREES	YEAR RECEIVED OR EXPECTED	NAMES OF INSTITUTIONS
BA or BS	_____	_____
MA or MS	_____	_____
PhD	_____	_____

THESIS TITLE (highest degree)
(abbreviate to 56 char. total) _____

_____

CURRENT EMPLOYMENT INFORMATION

INSTITUTION: (28 char) _____

DEPT/DIV: (28 char) _____

POSITION: (28 char) _____

YEARS OF PROFESSIONAL EXPERIENCE SINCE HIGHEST DEGREE: ____

TOTAL YEARS OF PROFESSIONAL EXPERIENCE: (include postdoc but not grad school) ____

COMMENTS:_____

_____

_____

PROFESSIONAL ACTIVITY INFORMATION

Highest degree (check one)	FIELD OF PHYSICS	Current interest (check one)
1__	Astronomy & Astrophysics	1__
2__	Acoustics	2__
3__	Atomic & Molecular Physics	3__
4__	Biophysics	4__
5__	Chemical Physics	5__
6__	Education	6__
7__	Electromagnetism	7__
8__	Electronics	8__
9__	Elementary Particles & Fields	9__
10__	Geophysics	10__
11__	High Polymer Physics	11__
12__	Low Temperature Physics	12__
13__	Mathematical Physics	13__
14__	Mechanics	14__
15__	Medical Physics	15__
16__	Nuclear Physics	16__
17__	Optics	17__
18__	Plasma Physics	18__
19__	Physics of Fluids	19__
20__	Thermal Physics	20__
21__	Solid State Physics	21__
22__	General Physics	22__
23__	Condensed Matter Physics	23__
24__	Space Physics	24__
25__	Physics - Other (please specify) _____	25__
26__	Accelerator Physics	26__
27__	Superconductivity	27__
28__	Surface Science	28__
29__	Non-Physics	29__

CURRENT WORK STATUS
(check one)
1__Student 3__Inactive/unemployed
2__Post Doc/Res.Assoc. 4__Retired
5__Long term/permanent employment
6__Self-Employed

(check up to two of the following:)
7__Full-time 8__Part-time: Student
9__Tenured faculty

DEGREE TYPE (for highest degree)
1__Theoretical
2__Experimental
3__Both
4__Neither (please explain below)
_____
_____

TYPE OF WORKPLACE FOR CURRENT OR LAST WORK (please check one or more, up to four)
1__University
2__College - 4 Year
3__College - 2 Year
4__Secondary School
5__Government
6__National Lab
7__Industry
8__Non-profit Institution
9__Consultant
10__Other (please specify below)
_____

TYPE OF WORK ACTIVITY
Please enter the numbers from the list below of the activities in which you engage most frequently, in order shown:

most frequent ____ ____ ____ least frequent

1 Basic Research
2 Applied Research
3 Development and/or Design
4 Engineering
5 Manufacturing
6 Technical Sales
7 Administration/Management
8 Writing/Editing
9 Teaching - Undergraduate
10 Teaching - Graduate
11 Teaching - Secondary School
12 Committees/Professional Org.
13 Proposal Preparation
14 Other (please specify below)
_____
_____

RACE
1__Black (non-Hispanic)
2__Hispanic
3__Native American
4__Asian or Pacific Islander
5__Caucasian (non-Hispanic)
6__Do not wish to specify

Are you interested in receiving information on employment opportunities? __Yes __No
(If you check no, you will be excluded from mailing lists generated when the Roster is searched to identify potential candidates for professional employment opportunities that have been brought to the attention of the CSWP.)

Are you an APS member? __Yes __No. If not, check here if you wish to receive an application: ☐
If you are an APS member, please provide your membership number, if available, from the top left of an APS mailing label:

APS membership number: ☐☐☐ ☐☐☐☐☐☐
(3 letters) (6 numbers)

Thank you for your participation. The information you have provided will be kept strictly confidential, and will be made available only to CSWP members and APS liaison personnel. Please return this form to the address on the reverse.

The Roster of Women in Physics is compiled by the American Physical Society Committee on the Status of Women in Physics. (KBL for CSWP 8/5/88)

COLLOQUIUM SPEAKERS LIST ENROLLMENT/MODIFICATION FORM

The PHYSICS COLLOQUIUM SPEAKERS LIST is compiled annually by the American Physical Society Committee on the Status of Women in Physics. Comments or questions, as well as modifications or new entries for the 1990/91 CSL should be addressed to

Luz Martinez-Miranda
University of Pennsylvania
Department of Electrical Engineering
Philadelphia, PA 19104

To modify an existing entry, or to make a new one, please fill out a copy of the form below and return it to the address above. PLEASE PRINT CLEARLY OR TYPE!

Check whether this is a modification of an existing entry (_____) or a new entry (_____).

Name: _____ Phone:_____

Short name of institution (for use in second section of CSL):_____

Address: (please use no more than three lines of about 38 char maximum per line)

_____

_____

_____ zipcode_____

Please check if you would be available for occasional "Career-Day" presentations to students in

- ☐ Middle Schools
- ☐ High Schools

CSWP Roster registration number, if known: _____

Bitnet address OR FAX number (only one will be listed): _____

To cancel a listed talk, give the title as it appears in the list and the section(s) where it is to be cancelled. If you wish to delete all old entries, just enter "ALL", and register the new titles in the next section. Use an additional sheet if necessary:

To register a new title, give the title as you want it to appear (first word and proper nouns capitalized) in the left column below. Then check the section(s) where it is to be inserted. Also check the top box if this is a CORRECTION of an existing title. If more than 4 talks are registered, please use an additional copy of this form, stapling them together. A limit of seven total entries (checks in right hand column) will be imposed.

Title
1.

☐ CORRECTION

☐ Astrophysics	☐ Bio/Medical	☐ Chem/Statistical
☐ Cond. Matter	☐ Env/Energy	☐ Fluid/Plasma
☐ Geophysics	☐ Interface/Device	☐ Molec/Polymer
☐ Nuclear/Particle	☐ Talks for General Audiences	
☐ Optics/Opt. Phys.	☐ Accelerator Physics	

Title
2.

☐ CORRECTION

☐ Astrophysics	☐ Bio/Medical	☐ Chem/Statistical
☐ Cond. Matter	☐ Env/Energy	☐ Fluid/Plasma
☐ Geophysics	☐ Interface/Device	☐ Molec/Polymer
☐ Nuclear/Particle	☐ Talks for General Audiences	
☐ Optics/Opt. Phys.	☐ Accelerator Physics	

Title
3.

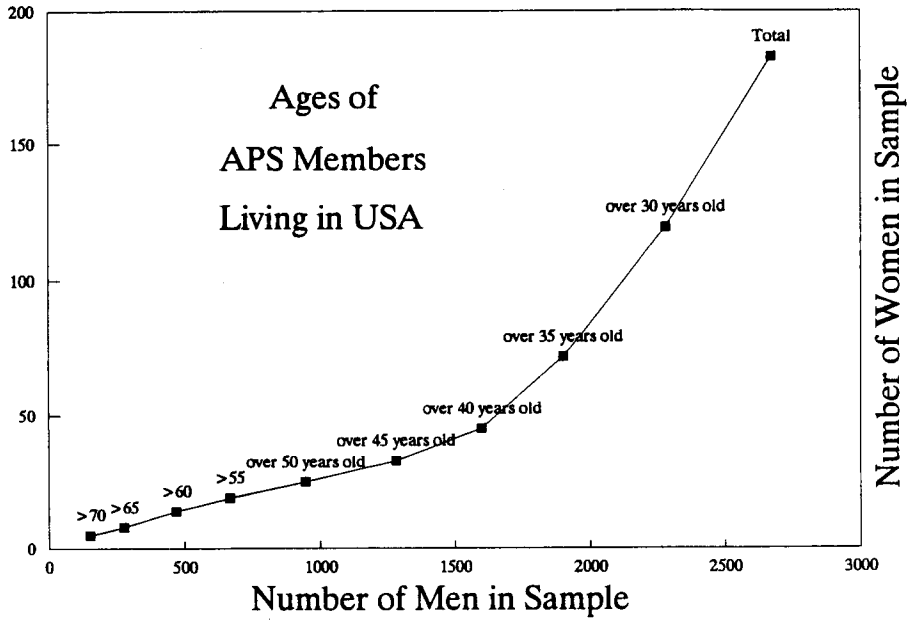
☐ CORRECTION

☐ Astrophysics	☐ Bio/Medical	☐ Chem/Statistical
☐ Cond. Matter	☐ Env/Energy	☐ Fluid/Plasma
☐ Geophysics	☐ Interface/Device	☐ Molec/Polymer
☐ Nuclear/Particle	☐ Talks for General Audiences	
☐ Optics/Opt. Phys.	☐ Accelerator Physics	

Title
4.

☐ CORRECTION

☐ Astrophysics	☐ Bio/Medical	☐ Chem/Statistical
☐ Cond. Matter	☐ Env/Energy	☐ Fluid/Plasma
☐ Geophysics	☐ Interface/Device	☐ Molec/Polymer
☐ Nuclear/Particle	☐ Talks for General Audiences	
☐ Optics/Opt. Phys.	☐ Accelerator Physics	



In 1990, a random sample of about 2800 APS members responded to a membership survey conducted by the APS Committee on Membership, chaired by Kate Kirby of the Harvard-Smithsonian Center for Astrophysics. The survey inquired into demographics of APS members, and attempted to assess members' satisfaction with Society programs and services. The above graph shows one of the outstanding demographic facts revealed by the survey, i.e., age distributions are distinctly different for men and women members. The ratio of women to men, given by the slope of the curve, changes from about one in 40 for the population over 45 years, to about one in seven for the population under 35. Note that the median age of men is 44; median age of women, 33. Most men are accustomed to the one-in-40 ratio, whereas most women are used to the one-in-seven ratio. Can this possibly lead to different perceptions of a problem?

The American Physical Society
335 East 45th Street
New York, New York 10017