Sex and Status in Science

Fair Science. Women in the Scientific Community. JONATHAN R. COLE. Free Press (Macmillan), New York, and Collier Macmillan, London, 1979. xvi, 336 pp. $17.95.

In this book, a quantitative study of academically employed scientists in the United States, sociologist Jonathan Cole attempts to assess the extent to which women suffer discrimination in the post-Ph.D. phase of their careers. Beginning with a discussion of how to measure discrimination, one of whose main points is that simple differences between the sexes in academic status or scientific reputation prove little—they may reflect differences in scientific performance rather than any effects of discrimination—Cole goes on to perform correlation and regression analyses of the relative status and reputation of the sexes in biology, psychology, sociology, and chemistry. The penultimate chapter of the book extends the analysis historically, and the final chapter discusses some problematics in affirmative action.

As the book's title suggests, Cole concludes that science today is basically "fair" (it was less so in the past). This conclusion rests on the analysis of five dimensions of inequality in science: (i) the quality of scientists' academic departments five or more years after the Ph.D., (ii) their academic rank, (iii) the number of honorific awards received, (iv) visibility among colleagues, and (v) reputation among colleagues, specifically, what others perceive to be the quality of their work. When the four disciplines Cole considers are analyzed together, no differences between women and men are found on the first and third dimensions. On the other three, women are at a disadvantage relative to men: they have lower academic rank, more limited visibility among colleagues, and poorer scientific reputations. These are, however, simple differences. To assess discrimination, Cole introduces two measures of scientific performance as control variables in his analysis (other variables are implicitly controlled through the selection of samples); these are quantity and quality of publications. When these controls are applied, all observed differences between women and men in status and reputation disappear, except for the one in academic rank. In this one regard, then, Cole suggests there is prima facie evidence of discrimination against women. His overall conclusion, however, is that "the measurable amount of sex-based discrimination against women scientists is small. The data do not require that we modify prior conclusions that the scientific stratification system is basically universalistic" (p. 86).

On its dust jacket, this book is acclaimed by several eminent social scientists as an important and scholarly work; it has also been cited in one of the nation's most prestigious daily newspapers as proving that women scientists suffer no bias (*New York Times*, 17 Dec. 1979, p. D12). The book's major conclusion, however, contradicts what many women in science perceive to be their collective and individual situations. Thus evaluation of Cole's analysis is especially important. For reasons that I will describe in the remainder of this review, I do not find Cole's basic argument convincing.

First, the empirical measures used by Cole seem to overstate women's professional status while understating their contributions to scientific knowledge. Women, in other words, probably make more contributions to knowledge but end up with fewer rewards than Cole suggests, a point unlikely to surprise those familiar with the biographies of such accomplished but unrewarded scientists as Judith Pool or Rosalind Franklin. Cole fails to consider monetary remuneration to women and men in academic science at all, even though published data suggest major sex discrepancies in this respect (E. L. Babco, "Salaries of scientists, engineers, and technicians," Scientific Manpower Commission, Washington, D.C., ed. 9, Nov. 1979). Moreover, of the two dimensions of inequality he considers that show no difference between the sexes—department quality and honorific awards—the latter almost certainly fails to show women at a disadvantage relative to men because of the manner in which the variable was constructed. In counting honorific awards, Cole includes not only the Nobel Prize, membership in the National Academy of Sciences, and other unquestionably honorific awards but also postdoctoral fellowships, a dubious categorization. Postdocs rarely are granted to honor past scientific achievement; indeed, in some social sciences, they are often awarded to fullfill the awarder's research needs and are frequently sought by young Ph.D.'s unable to find assistant professorships. Were the receipt of postdoctoral fellowships uncorrelated with sex, their dubious status as honorific awards would make little difference for Cole's analysis. But, as Cole informs us, receipt of postdocs has been shown to be correlated with sex, women being more likely than men to receive them. Cole's measure thus is likely to overstate the number of genuine honorific awards made to women in science. At best, then, it is only with regard to the quality of their academic departments that Ph.D.-holding women and men fare equally well in the sciences.

The validity of Cole's measure of research quality is also dubious. This measure is based on the number of citations of a scientist's work appearing in other scientists' papers (those published in journals, at least); the count is made irrespective of the number of papers the scientist has published. Because women publish fewer papers than men do, the seeming low quality of their work as measured by Cole may result entirely from the relatively low rate at which they publish, not from any lack of intellectual merit in individual publications. Cole's own data suggest this to be true. Using correlations from this book and an earlier one (J. R. Cole and S. Cole, *Social Stratification in Science*, University of Chicago Press, Chicago, 1973, p. 27), I have computed the partial correlation between gender and research quality while controlling for number of publications. This correlation is .005. Thus, on a per-publication basis, women's papers are as significant for science as men's. Only in the number of papers published—and literally only in the number of papers published, since Cole does not count books—are women's measured contributions to scientific knowledge inferior to men's.

Although these faults in measurement most obviously affect simple differences between the sexes in professional status and performance, the remainder of Cole's analysis, in which scientific performance is statistically controlled, is no more convincing than is his initial description of gross differences between the sexes. Cole's conclusion that science treats women fairly rests not only on the lack of an initial sex difference in department quality and, supposedly, honorific awards, but also on the disappearance of

any sex difference in visibility or reputation once quality and quantity of publications are controlled. To view this disappearance as confirmation that discrimination does not exist, however, assumes that women's inferior publication records do not themselves reflect discrimination. For if women publish fewer articles than men because, on the basis of their gender, they are denied access to the "means of production" in science—to research facilities, collaborative arrangements, graduate student assistants, professional sponsorships, secretarial help, or time off from teaching—then to find that the immediate cause of women's low status is their low publication rate hardly proves that the reward system of science is universalistic in any but the narrowest sense. Cole himself speculates that male faculty may be reluctant to sponsor female students because of the sexual motives colleagues might attribute to their doing so, but he apparently fails to recognize that such situations, in which women's careers are determined not by their scientific talent or performance but rather by the mere fact of their being female, are indeed a matter of discrimination. Thus, to argue that science is basically fair because women and men become equal once their publication records are taken into account makes no more sense than to argue from simple sex differences that discrimination clearly exists. To draw sound inferences, the cause of women's low publication rates must be understood.

Cole himself stresses that this is the single most important question for further research. Yet in this book he makes little attempt to marshall statistical materials on the causes of publication rates. (Qualitative materials are equally ignored.) A brief examination of a marital-cum-family-status classification and of type of academic employer (college vs. university) suggests that neither explains women's low productivity vis à vis men, but no attempt is made to measure such possible causes as professional isolation or failure to obtain research grants, even where data could have been found. For example, by counting single-authored and collaborative papers separately, rather than together as Cole does, one could ascertain whether men's superior publication counts derive largely from collaborative efforts, a pattern consistent with the hypothesis that women's professional isolation contributes to their low productivity. The more basic point, however, is that, unless there is clear evidence that discrimination does *not* play a role in women's low productivity, to explain any number of sex differences in professional status by the difference in publication rates is to beg the question. Cole's conclusion that discrimination plays no significant role in the careers of female scientists simply is not supported by his data.

This is especially true given the inability of research productivity to explain the paucity of women in the ranks of associate and full professor. Cole downplays this result by suggesting that women eventually "catch up" to men, a depiction that makes their failure to obtain the higher professorial ranks seem a temporary inconvenience. This view, however, is contradicted by Cole's own historical statistics, statistics that cover dates as recent as 1967 and that in all periods they cover show an *increase* in the gap between women's and men's academic ranks as their careers progress. It is also contradicted on several key points by another recently published study (*Climbing the Academic Ladder: Doctoral Women Scientists in Academe*, National Academy of Sciences, Washington, D.C., 1979). Cole acknowledges that academic rank has important consequences for scientists' careers; for example, rank partly determines academic salaries and may also influence access to the "means of scientific production." In addition, for the great majority of scientists who, as Cole notes, publish little and cannot even aspire to the greatest rewards their scientific community has to offer, gaining tenure or becoming a full professor may be among the most important achievements of their career. It is entirely arbitrary, then, to conclude as Cole does that "science" generally does not discriminate against its female practitioners because it discriminates against them in only one obvious way.

This book is thus a failure from the standpoint of substantiating its central conclusion. Is it nonetheless valuable because, for example, it provides new insight into women's scientific careers or suggests new strategies for overcoming the apparent liabilities female scientists suffer, whatever their cause? In my estimation, the answer is no. Some readers may of course find interesting or valuable material in the book, although the frequent recourse to regression statistics and sociological jargon is likely to deter many. For a social scientist familiar with the literature on sex inequality and on the sociology of science, however, the book is likely to prove more disappointing and tedious than insightful or stimulating. In reifying "science" and the "scientific community" from its subtitle onward, in failing to assess differences between fields or interpret differing statistical results for these fields, in largely ignoring biographies, women's letters to professional journals, and other qualitative sources, in failing to cite or incorporate results from recently published work bearing on its subject, and in repeatedly employing concepts that have been used elsewhere to characterize women's scientific careers but that are largely inappropriate to the data at hand, this book generally leaves the reader with a dry, superficial view of women's scientific careers. There are indeed important gaps in our understanding of women's careers in academic science, as this book helps make clear. It is therefore regrettable that it does not provide more substantial answers to the question why so many women in science have been unable to reap the recognition and rewards their male colleagues enjoy.

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The Ancient Oceans

Paleoceanography. THOMAS J. M. SCHOPF. Harvard University Press, Cambridge, Mass., 1980. xiv, 342 pp., illus. $25.

The science of oceanography is about 100 years old, if we take the global expedition of H.M.S. *Challenger* in the 1870's as its starting point. The science of paleoceanography is essentially a post–World War II development and is, in fact, only about 15 years old if we take the initial Phase I drilling of the JOIDES Deep Sea Drilling Project in 1965–1966 as the point at which modern studies of the deep-sea geologic record were initiated. And now in 1980 we have the first (to my knowledge) textbook in paleoceanography.

The book is based on a course in paleoceanography taught for the past ten years by the author. In a rather unorthodox approach Schopf divides the text into chapters on ocean volume, bathymetry, water studies, temperature, chemistry, climatology, and biology. An appendix (grain size nomenclature), references (over 900 of them), an index of names, and an index of subjects complete the book. Each chapter begins with an outline of the present-day pattern of the oceanographic feature in question, followed by an analysis of the methodology for delineating ancient corollaries or analogs of the feature and a concise summary of the history of the feature through geologic time.