

include hematopoietic stem cells, stem cell transplantation, HIV, cancer immunotherapy and other cancer targets (including anti-angiogenesis and apoptosis) and nervous system diseases. These chapters, written by leaders in the field, should serve as indicators of the progress so far, with suggestions for future directions, rather than as completed pieces of work.

The field of gene therapy will also evolve

in the public arena. Thus, discussions regarding public policy and regulatory issues are required. Ethical issues are paramount, particularly regarding stem cell transduction. Forums for discussion must include ethicists, scientists, public interest groups, and legislators. Two chapters are appropriately devoted to public policy issues.

The past 30 years have seen an accep-

tance of the concept of gene therapy as a paradigm for the treatment of human disease. *The Development of Human Gene Therapy* is a benchmark for the field in 1999. The book should be of interest to scientists and nonscientists alike. Friedmann has captured the prevailing feeling that efforts must be focused on the basic principles of gene transfer to translate the science into effective therapeutics in the future.

Has Feminism Changed Science?

by Londa L. Schiebinger

Harvard University Press, \$27.95, 256 pp.
ISBN 0-674-38113-0, 1999

REVIEWED BY FLOSSIE WONG-STAAL
Departments of Biology and Medicine
University of California at San Diego
La Jolla, California 92093 USA

Whether women scientists, though no longer a rare breed, are still subject to subtle forms of discrimination is a matter of much debate. Londa Schiebinger, a professor of history of science at Pennsylvania State University, has written several books on the relationship of gender and science. Her latest, *Has Feminism Changed Science?*, addresses two parallel themes: the representation of women in science through the ages and the role of gender in influencing the content of science. The first part tramples across a lot of familiar territory. We are all aware of the gross under-representation of women in all areas of science worldwide. The inequity is greater in the scientific disciplines that are deemed more abstract and theoretical, such as physics and mathematics, and in countries where science is accorded with greater prestige. Theories have been concocted to support the notion that women, by nature, were incapable of hard, analytical science. Female brains, according to popular wisdom, were too small to handle such complicated tasks. The ultimate compliment given to the few women who succeeded was that they were "just like men." Schiebinger also points out that other bases of discrimination, such as race and class, can often intersect with gender, creating another barrier for women. For example, she recounts how during the 1960s Vivienne Malone Mayes, the only African-American female PhD student in mathematics at the University of Texas, was barred from the café where her advisor and classmates met for discussions.

After winning the battle to desegregate the café, she discovered that all women, regardless of race, were not admitted. It is not surprising that feminists, in general, have greater empathy for other victimized minority groups.

Although feminism has created a clear agenda to recruit more women into the scientific community, Schiebinger feels that more fundamental and substantive changes need to take place in society to create a more friendly culture for women to pursue their scientific careers. They should not have to barter their femininity or biological destiny for a seat in the elite academies populated by men. Clearly, women face more than just a glass ceiling when they enter the sciences. Schiebinger tackles issues from child-care and domestic chores to gender-biased student evaluations.

In the second part of the book, Schiebinger deals with gender and the substance of science, using several scientific areas to illustrate her points. The most blatant case of gender bias exists in medical research. Here, women are scarce not only as researchers but also as research subjects. Anatomy, physiology, pathology and pharmacology have all focused on the male patient, treating women as mere replicas, albeit imperfect ones, of men. Women were only specifically considered in processes or diseases related to reproduction. It was not until the late 1980s that the National Institutes of Health and other federal agencies initiated a series of measures to mandate the inclusion of women in medical research, and to allocate resources for women-specific diseases such as breast and ovarian cancers and osteoporosis.

Primatology is the only area in which women have outdone men professionally, probably because women are more patient and observant than men. Here, Schiebinger does not balk at the purported sexual differences in research styles that gave women the edge. The influence of women on pri-

matology research effectively shaped this field. Once-accepted stereotypes of the dominant, aggressive male primate and the submissive, supporting female primate were debunked. It is not inconceivable that the 'alpha male' of a population could turn out to be female.

Although I found many of her points provocative, the chapter on biology struck me as being a little overzealous, even absurd at times. The revelation that the 'egg' is an energetic participant of the fertilization process, rather than a passive partner to the active 'sperm' may have significant political implications, but as a molecular biologist, I think the symbolism of the nucleus—and its DNA content—representing the male and the cyto-

plasm representing the female is shaky at best. Nevertheless, Schiebinger uses this symbolism to advocate the importance of cytoplasmic inheritance and condemn the Human Genome Project as wasteful. Surely, the goal of the Genome Project is not merely to satisfy the male ego, and its potential benefits should reach much beyond genetic diseases. She also seems to think that molecular biology, because of its more quantitative nature, is "masculine" science and something like embryology is more "feminine". Doesn't this thinking submit to the very prejudice that most of the book fights against? In fact, statistics in Table 2 showed that the numbers of male and female molecular biologists are almost equal. Some of her complaints also seem a bit trivial. I was puzzled as to why she took offense at the term "Mammalia" that Linnaeus coined for animal taxonomy. Would she have preferred a term more evocative of a male characteristic to represent our class?

This book is more than just a straight history of gender and science, as the author definitely injects her personal viewpoints. Overall, though, I found the book informative and enjoyable. It reminds us how much feminism has changed science. And how much it has not.

