



**The contributions of feminism to science and the lack of women who have contributed to organic total synthesis are pointed out. A reader says that he "cannot remember reading a paper on total synthesis from which [he] did not learn something useful." Phylogenetic studies are said to lead us to expect chimp multiculturalism. It is emphasized that the discovery of DNA was reported in 1865 and that of DNA structure in 1953. And a reader points out that "90% of NASA-funded protein crystallization research is conducted on the ground."**

### How Women Contribute

I am grateful to Florence P. Haseltine for reviewing my book "Has feminism changed science?" (Harvard University Press, 1999) (*Science's Compass*, 23 July, p. 538). Her review, however, presents the central question of the book as, "What contributions have women made in science that a man could not have made?" This is precisely what the book argues against. The whole point of my book was to argue that it is wrong to imagine that women do science differently simply because they are women. My claim is that "feminism" as a broad-based social movement and an academic theoretical perspective and that "feminists"—both men and women—have changed science.

The question of who or what might create change in science beneficial to women has been confused by a mistrust of feminism. Feminism is, for many, still a dirty word, even though few people would claim to be against equal opportunity for women. People seem to prefer to discuss women rather than feminism. This refusal to acknowledge politics has led many to overemphasize women as agents in the process of opening up science to feminism. Primatologist Linda Fedigan once remarked how dismayed she was when, after having put many hours into learning to identify individual female monkeys within a large group, some of her colleagues attributed her success to her sex; females are "empathetic," she was told, and this approach therefore is easy for them. In fact, Fedigan's success depended on, among other things, her taking seriously the project of a feminist enlargement of science.

Some of the desire to map the successes of feminism directly onto women derives from the fact that, historically, women as a group were excluded from science for no reason other than their sex. Some of the confusion derives from the fact that femi-

nists have been far more likely to have been women than men. Confusion also derives from the fact that nonfeminist women have benefited from battles won by feminists.

Because modern science is a product of hundreds of years of actively shunning women, one can identify systematic gender bias in the institutions, cultures, and content of the sciences. Putting the test of gender bias to science is simply one further aspect of the critical method for improving human understanding of nature. As I argue in my book, the goal is not to create a "feminist science," if that means a special or separate science for women or feminists.

Science is a human endeavor; it must serve us all, including women and feminists—male and female.

A prominent (male) biologist once told me that he could name many more examples of feminist perspectives in biology than the ones I document in my book, but that as soon as they become part of mainstream biology, they are no longer identified as "feminist." It is interesting that when feminist insights become mainstreamed in a science, they are thought of simply as "good science." And perhaps they simply are. Nonetheless, we should not forget the historical circumstances of their origins.

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### "Macho Total Synthesis"

Robert F. Service (*News Focus*, 9 July, p. 184) has written an insightful critique of what insiders call "macho total synthesis," in which huge teams (20 to 30 postdocs and graduate students representing a critical mass) race to be the first to accomplish the synthesis of extremely complex natural products. In his list of superstars, Service does not mention one, who not only is a striking exception—hardly ever publishing

a paper with more than a couple of collaborators—but also one who has trained at least three of the "superstars" listed by Service: Gilbert Stork of Columbia University, whose accomplishments over the course of five decades have won him every major award except the Nobel Prize.

But there is an interesting cultural point that to my knowledge has also never been raised. Women now represent 30 to 40% of the graduate student pool in most chemistry departments of major American research universities, and just about every branch of chemistry but one can now boast of some distinguished female tenured professors. The striking exception is "organic total synthesis." Even worse, I know of no serious total synthesis team that has more than a couple of female members. Any practitioner of this testosterone-drenched sub-branch of chemistry should consider what practices deter talented women from even entering such academic laboratories, let alone leading them. I could provide a list of such practices, but I believe that it would be more persuasive if women cited them.

Service concludes that making natural products and their kin in large quantities so biologists can study their effects should be one of the justifications for pursuing such macho syntheses. Worthy as such an aim might be, it seems to me unrealistic; nor do I believe that it applies to any of the 10 examples listed in Service's table of "total synthesis highlights." That should not be surprising, because practitioners in the field cannot afford the effort—in terms of financial resources, manpower, and time—to repeat such multi-step syntheses on the required scale. In fact, what possible incentives could be offered to new graduate students or postdocs to repeat over and over again synthetic sequences that their predecessors had already published?

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Service's article is a poor catalyst for the debate it attempts to stimulate. For example, I cannot remember reading a paper on total synthesis from which I did not learn something useful. Papers dealing with contemporary "molecular summits" are among the most educational. Also, the most fundamental benefits of apprenticeship in and practice of total synthesis are not mentioned by Service. No other field of organic chemistry provides a richer context for personal scientific growth, both intellectually and technically. And it is largely because of total synthesis that other fields and interfaces of organic

