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THE X-FILE

The X in Sex How the X Chromosome Controls Our Lives

David Bainbridge

Harvard University Press, \$22.95, 224 pp.

M. Therese Lysaught

Who would ever have guessed that the X chromosome could be so entertaining? Properly speaking, perhaps, the X chromosome itself may not put one in stitches, but David Bainbridge's *The X in Sex: How the X Chromosome Controls Our Lives* certainly will. The title may suggest a treatise dry, arcane, and—well, frankly, biological. But do not be put off. This book will inform, delight, and challenge readers whose interests range from the scientific to philosophical, from pop culture to gender studies. For those who may think they have no particular reason to find the X chromosome read-worthy, just remember—we each have one.

Bainbridge lectures in comparative anatomy and physiology at the Royal Veterinary College in London, and *The X in Sex* is first and foremost a book on biology. So what, by the way, is the X

chromosome? Chromosomes are those paired structures in the nucleus of each cell in our bodies that are made up of DNA. They are where our genes live, so to speak. Human cells usually have forty-six chromosomes, two of which determine our sex—the X and Y.

Bainbridge's essay is divided into three main chapters. The first explores the question of sex determination. How do X and Y chromosomes make us either male or female? Here, in good detective-story fashion, is recounted how the sex chromosomes were discovered in the late nineteenth and early twentieth centuries, as also the many and varied ways sex is determined in the animal kingdom. Interestingly, how the sex of human offspring is determined is only one of many ways nature can do it. Bainbridge's narrative weaves together the history of science, scientific heroes (including, importantly, women), key experiments, and chance events, highlighting how crucial the latter are to the advance of scientific knowledge.

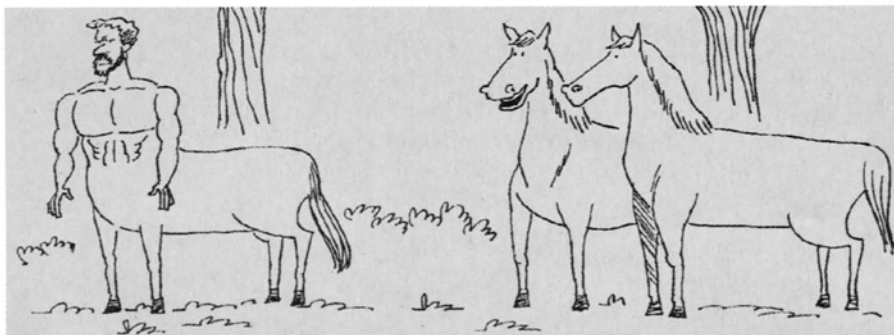
The second chapter, titled "The Duke of Kent's Testicles," reflects what can go wrong if one gets only one X chromosome. It focuses on the biology of what are known as "sex-linked" disorders. These disorders are a unique phenomenon because they affect males primarily. If something happens to a gene on a male's lone X chromosome, it has no counterpart (on the Y chromosome) to counteract its effects. The chapter be-

gins with an imaginative account of how the mutation for hemophilia was introduced into the British royal family (thus the title of the chapter), but goes on to tell the story of the discovery of the genetic basis for hemophilia and other disorders like Duchenne muscular dystrophy and color blindness.

The final chapter takes up the question: If men can get along just fine with one X chromosome, how in the world do women live with two, since usually having an extra chromosome can be lethal? Here we learn about the fascinating process of "X inactivation" (the fact that in all women, one of the X chromosomes in each cell is essentially turned off). Illustrating that more is not always better, this chapter also explores diseases that disproportionately affect women, primarily autoimmune diseases.

What make Bainbridge's treatment of these fundamental yet complicated biological processes engaging are his literary style and wacky humor. He interweaves the story of biology with the history of science and philosophies of sex and gender. Granted, he treats the latter topics with far less depth, but he effectively shows how careful attention to biology radically complicates what we think of as "naturalized" social norms. For example, he lets biology challenge the idea that humans exist only in two sexes (male and female). Provocatively, he also shows how one can read biological data either to support notions of women as passive, defective men or to demonstrate the superiority of women.

Three deficiencies in the book deserve mention. First, the title promises more than it delivers. Bainbridge does not actually show "how the X chromosome controls our lives." Although he outlines quite clearly how the Y chromosome determines male sex, he does not provide a parallel account of how the X chromosome determines (or influences) female sex. And while he gives compelling accounts of how serious disorders can be traced to the activity or failure of the X chromosome, he does not explain how the X chromosome may "control" the lives of those of us who have been spared such illnesses. In truth, biologists still know comparatively little



"Look, it's one of those new hybrid models that everyone is talking about."

MIKE SHAPIRO

about the X chromosome.

Second, although the book does not intend to explicitly engage religion or theology, the occasional aspersions Bainbridge casts on faith and organized religion are unfortunate. While he exhibits remarkable nuance in his treatment of other disputed topics, he is benighted about the historical relationship between religion and science.

Finally, Bainbridge follows many of his scientific comrades in overreaching when it comes to ethics. For example, he discusses the issue of sperm-sorting technologies that can be used in conjunction with artificial insemination or in vitro fertilization to determine a baby's sex. His moral reasoning is essentially utilitarian and emotive. In short, for Bainbridge, preconception sex selection is mostly a bad idea because of the effects it might have on society or how it might make individual offspring feel (either the child or the siblings). He cautions that such technology might be the preferred alternative in societies where baby girls are less prized and routinely terminated. Yet his utilitarian calculus prevents him from considering how sex selection becomes a tool reinforcing societal prejudices. A more satisfying analysis would have considered how such practices exacerbate tendencies to view children as commodities and are a first step in tinkering with our offspring for nontherapeutic reasons. Social-justice questions are also important. How can we justify the use of limited health-care resources for such reproductive technologies when a high percentage of people within the United States and beyond go without basic medical attention?

Despite these weaknesses, *The X in Sex* is that rare thing, a real page-turner. Those looking for a lucid, up-to-date account of biology and genetics on questions of how biology, philosophy, and social practices intertwine will not be disappointed. No one will read this book without gaining a deeper appreciation of what connects us and what makes us all tick. □

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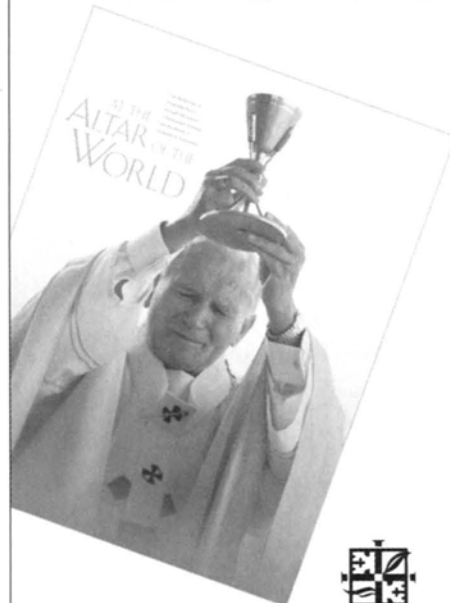


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