

and methods." Many of these men attributed "partner sexual satisfaction and the stability of their relationships to their need to make extra effort including non-penetrating techniques."¹⁰²

My vision is utopian, but I believe in its possibility. All of the elements needed to make it come true already exist, at least in embryonic form. Necessary legal reforms are in reach, spurred forward by what one might call the "gender lobby": political organizations that work for women's rights, gay rights, and the rights of transgendered people. Medical practice has begun to change as a result of pressure from intersexual patients and their supporters. Public discussion about gender and homosexuality continues unabated with a general trend toward greater tolerance for gender multiplicity and ambiguity. The road will be bumpy, but the possibility of a more diverse and equitable future is ours if we choose to make it happen.

SEXING THE BRAIN:

HOW BIOLOGISTS MAKE A DIFFERENCE



The Callosum Colossus

SUPPOSE MY UTOPIAN VISION, AS DESCRIBED IN THE LAST CHAPTER, came to pass. Would all gender differences disappear? Would we award jobs, status, income, and social roles based only on individual differences in physique, intellect, and inclination? Perhaps. But some would argue that no matter how widely we opened the door, ineluctable differences between groups would remain. Scientists, such as naysayers would argue, have proven that in addition to our genitalia, key anatomical differences between the male and female brain make gender an important marker of ability. To drive home their point, they might cite well-publicized claims that, compared to men's, the corpus callosum—the bundle of nerve fibers connecting the left and right brain hemispheres—in women's brains is larger or more bulbous. And *that*, they would exclaim, will limit forever the degree to which most women can become highly skilled mathematicians, engineers, and scientists. But not everybody believes in this difference in brain anatomy.

External anatomy seems simple. Does the baby's hand have five or six fingers? Just count them. Do boys have penises and girls vaginas (intersexuals notwithstanding)? Just look. Who could disagree about body parts? Scientists use the rhetoric of visibility to talk about gender differences in the brain, but moving from easily examined external structures to the anatomy of the interior is tricky. Relationships among gender, brain function, and anatomy are both hard to interpret and difficult to see, so scientists go to great lengths to convince each other and the general public that gender differences in brain anatomy are both visible and meaningful.¹ Some such claims provoke battles that can last for hundreds of years.² In coming to understand how and why these battles can last so long, I continue to insist that scientists do not simply read nature to find truths to apply in the social world. Instead, they use truths

steroids as one of a number of components important to the creation of male, female, masculinity, and femininity. Not only will we then start to see non-steroid, physiological constituents of such development, but we will become able to conceptualize the ways in which environment, experience, anatomy, and physiology result in the behavior patterns that we find interesting or important to study.

One of the lessons of this chapter is that social belief systems weave themselves into the daily practice of science in ways that are often invisible to the working scientist. To the extent that scientists proceed without seeing the social components of their work, they labor with partial sight. In the case of sex hormones, I suggest that widening our scientific vision would change our understanding of gender. But of course, such changes can occur only as our social systems of gender change. Gender and science form a system that operates as a single unit—for better and for worse.

THE RODENT'S TALE



Using Hormones to Sex the Brain

BY THE 1940s, HORMONE BIOLOGISTS, BIOCHEMISTS, AND REPRODUCTIVE endocrinologists had identified, crystallized, named, and classified a host of new hormones. They had also outlined the roles of hormones—both gonadal and pituitary—in the control of the reproductive cycle, leaving researchers poised to look more seriously at the possibility that hormones regulated human behavior. The study of the chemical physiology of behavior came into its own, beginning in the late 1930s, as the old institutional and funding coalitions that had facilitated and directed the blossoming of hormone biology experienced a sea change.¹

Until 1933, the Rockefeller Foundation had funneled its support of sex research through the social service-oriented Bureau of Social Hygiene, but then the Foundation took over direct funding of the Committee for Research in Problems of Sex (CRPS).² The transfer marked a transition from the development of national science in direct service to social change to one in which the scientists themselves developed research agenda, which appeared, at least on the surface, to be motivated solely by the ideal of knowledge for knowledge's sake.³ As early as 1928, CRPS had signaled this change in its new five-year plan. "Modern science," CRPS committee members had written, "particularly experimental medicine, has shown that the greatest benefits to mankind have come from fundamental researches, the implications of which could not be foreseen. . . . Pressing social and medical problems" would most likely only be solved by first obtaining a scientific understanding of human sexuality.⁴

The Rockefeller Foundation took over the Committee for Research in Problems of Sex just as the conservative engineer Warren Weaver became the full-time director of Rockefeller's Division of Natural Sciences. Weaver

the very thing that we attempt to analyze." Nevertheless, Crew believed that science would ultimately define sex, "the object of its searchings," instead of vice versa. "If in a decade so much has been disclosed," he wrote, "what shall we not know after a century of intelligent and industrious work?"⁹⁸ Despite growing scientific evidence to the contrary, sex *must* exist.

Scientists struggled to understand the role of hormones in constructing sex difference, in a cultural milieu awash with changes in the meaning and structure of gender systems. In 1926, Gertrude Ederle stunned the world by becoming the first woman to swim the English Channel, besting the preexisting men's record in the process. Two years later, Amelia Earhart became the first woman to fly across the Atlantic. While the symbols were dramatic, far-reaching changes proceeded a bit more doggedly. From 1900 to 1930, gainful employment of married women outside the home doubled, but only to about 12 percent, and in the decade following the passage of the 19th Amendment, feminist efforts to infiltrate all corners of the labor market remained an uphill struggle.

But while resistance to complete economic equality persisted, during the period from 1920 to 1940, a major reconceptualization of the family, gender, and human sexuality took place. For example, in Kinsey's famous survey, only 14 percent of women born before 1900 admitted to premarital intercourse before the age of twenty-five; for those born in the first decade of the twentieth century, the percentage rose to 36.⁹⁹ Feminism, the growing popularity of Freudian psychology, the new field of sexology, and the increasing knowledge about sex hormones and internal secretions all "swelled a tide of scorn for 'Victorian' sexual morality."¹⁰⁰

Diversity in scientific voices paralleled diversity within feminism itself. For example, some feminists argued that women could labor in any field on a par with men; others thought that their special reproductive differences made them deserving of protective legislation governing their hours and the degrees of danger in which their jobs might place them.¹⁰¹ By the end of the 1930s feminists faced a dilemma of their own rhetorical making (one, I might add, with which contemporary feminism also struggles): if women and men were complete equals, then organizing as members of one or the other sex made little sense. If, on the other hand, they were truly different, then just how far might one push the demand for equality? In 1940, Eleanor Roosevelt summed up the problem with precision: "women must become more conscious of themselves as women and of their ability to function as a group. At the same time they must try to wipe from men's consciousness the need to consider them as a group or as women in their everyday activities, especially as workers in industry or the professions."¹⁰²

Amid such gender turmoil, it was never possible to resolve the identity of the sex hormones. In 1936, John Freud, a Dutch biochemist working on hormone structure, suggested abandoning the entire concept of sex hormones. Estrogen and its relatives acted as "growth-promoters to the smooth muscle, stratified epithelium and some glandular epithelia of ectodermal origin."¹⁰³ Envisioning hormones as catalysts would make it "easier to imagine the manifold activities of each hormonal substance." He imagined that "the empirical concept of sex hormones will disappear and a part of biology will definitely pass into the property of biochemistry."¹⁰⁴

While we should honor (albeit with some feminist hindsight) the intellectual heritage of hormone research, starting with Berthold's experiments on gonad implants in capons, the time has come to jettison both the organizing metaphor of the sex hormone and the specific terms *androgen* and *estrogen*. What could we put in their stead? Our bodies make several dozen different, but closely related and chemically interconvertible, molecules belonging to the chemical group we call steroids. Often, these molecules reach their destination via the circulatory system, but sometimes cells make them right at the site of use. Hence, it is usually appropriate to call them hormones (given the definition that a hormone is a substance that travels through the bloodstream to interact with an organ some distance from its place of origin). So, for starters, let's agree to call them *steroid hormones* and nothing else. (I'm willing to keep their technical biochemical designations, provided we remember the etymological limits of the naming system.)

A variety of organs can synthesize steroid hormones, and an even wider variety can respond to their presence. Under the right circumstances these hormones can dramatically affect sexual development at both the anatomical and the behavioral level. They are present in different quantities and often affect the same tissues differently in conventional males and females. At the cellular level, however, they can best be conceptualized as hormones that govern the processes of cell growth, cell differentiation, cell physiology, and programmed cell death. They are, in short, powerful growth hormones affecting most, if not all, of the body's organ systems.

Retraining ourselves to conceptualize steroid hormones in these terms provides us with important opportunities. The theoretical near-unity achieved by hormone biologists at the end of the 1930s is dead. If any possibility exists for obtaining a meaningful, all-encompassing theory of action and physiological effect of these cholesterol-based molecules, we must leave the sex paradigm behind. Second, if we are to understand the physiological components of sexual development, and of mating-related animal behaviors, we must be willing to break out of the sex hormone straitjacket, looking at the