

DELUSIONS *of* GENDER

How Our Minds, Society, and
Neurosexism Create Difference

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INTRODUCTION

Meet Evan.

When his wife, Jane, is upset, he sits with her on the couch, reading a magazine or book “to distract himself from his own discomfort” while he cradles Jane with the other arm. After a few years working on this issue, Evan gradually comes to be able to offer comfort in a more conventional way. The politically correct and/or scientifically uninformed among you may be wondering about the cause of Evan’s peculiar behavior. Does he secretly find Jane deeply unattractive? Is he in the slow process of recovery from some deeply traumatic incident? Was he raised by wolves until the age of thirteen? Not at all. He’s just a regular guy, with a regular guy-brain that’s wired all wrong for empathy. That a simple act of comfort is not part of Evan’s behavioral repertoire is the fault of the neurons dealt him by nature: neurons that endure a devastating “testosterone marination”; neurons that are lacking the same “innate ability to read faces and tone of voice for emotional nuance” as women’s; neurons, in a word, that are male.¹

Evan is just one of several curious characters who populate Louann Brizendine’s *New York Times* best seller, *The Female Brain*. In her depiction, men’s empathizing skills resemble those of the hapless tourist attempting to decipher a foreign menu and are sharply contrasted with the cool proficiency of females’ achievements in this domain. Take Sarah, for example. Sarah can “identify and anticipate what [her husband] is feeling—often before he is conscious of it himself.” Like the magician who

knows that you'll pick the seven of diamonds even before it's left the pack, Sarah can amaze her husband at whim, thanks to her lucky knack of knowing what he's feeling before he feels it. (*Ta-DA! Is this your emotion?*) And no, Sarah is not a fairground psychic. She is simply a woman who enjoys the extraordinary gift of mind reading that, apparently, is bestowed on all owners of a female brain:

Maneuvering like an F-15, Sarah's female brain is a high-performance emotion machine—geared to tracking, moment by moment, the non-verbal signals of the innermost feelings of others.²

Just what is it that makes the female brain so well suited to stalking people's private feelings as though they were terrified prey? Why, you are asking, are male neurons not capable of such miracles—better placed instead to navigate the masculine worlds of science and math? Whatever the answer du jour—whether it's the fetal testosterone that ravages the male neural circuits, the oversized female corpus callosum, the efficiently specialized organization of the male brain, the primitively subcortical emotion circuits of boys, or the underendowment of visuospatial processing white matter in the female brain—the underlying message is the same. Male and female brains are different in ways that matter.

Having marital problems, for instance? Turn to *What Could He Be Thinking?* by “educator, therapist, corporate consultant, and . . . *New York Times* bestselling author”³ Michael Gurian, and you will discover the epiphany the author experienced with his wife, Gail, on seeing MRI (magnetic resonance imaging) and PET (positron emission tomography) scans of male and female brains:

I said, “We thought we knew a lot about each other, but maybe we haven't known enough.” Gail said, “There really is such a thing as a ‘male’ brain. It's hard to argue with an MRI.” We

realized that our communication, our support of each other, and our understanding of our relationship were just beginning, after six years of marriage.

The information from those scans, says Gurian, was “marriage saving.”⁴

Nor are spouses the only ones who, it is now claimed, can be better understood with the benefit of a little background in brain science. The blurb of the influential book *Why Gender Matters* by physician Leonard Sax, founder and executive director of the National Association for Single Sex Public Education (NASSPE), promises to show readers how to “recognize and understand . . . hardwired differences [between the sexes] to help every girl and every boy reach their fullest potential.”⁵ Likewise, parents and teachers are informed in a recent Gurian Institute book that “Researchers [using MRI] have literally seen what we have always known. There are fundamental gender differences and they start in the very structure of the human brain.”⁶ Thus, Gurian suggests that “to walk into a classroom or home without knowledge of both how the brain works and how the male and female brains learn differently is to be many steps behind where we can and should be as teachers, parents, and caregivers of children.”⁷

Even CEOs can, it is said, benefit from a greater understanding of sex differences in the brain. The recent book *Leadership and the Sexes* “links the actual science of male/female brain differences to every aspect of business” and “presents brain science tools with which readers can look into the brains of men and women to understand themselves and one another.” According to the jacket blurb, the “gender science” in the book “has been used successfully by such diverse corporations as IBM, Nissan, Proctor [*sic*] & Gamble, Deloitte & Touche, PriceWaterhouseCoopers, Brooks Sports, and many others.”⁸

Is it realistic, you will begin to wonder, to expect two kinds of people, with such different brains, to ever have similar values, abilities, achievements, lives? If it's our differently wired brains

that make us different, maybe we can sit back and relax. If you want the answer to persisting gender inequalities, stop peering suspiciously at society and take a look right over here, please, at this brain scan.

If only it were that simple.

About 200 years ago, the English clergyman Thomas Gisborne wrote a book that despite its, to my mind, rather unappealing title—*An Enquiry into the Duties of the Female Sex*—became an eighteenth-century best seller. In it, Gisborne neatly set out the different mental abilities required to fulfill male versus female roles:

The science of legislation, of jurisprudence, of political economy; the conduct of government in all its executive functions; the abstruse researches of erudition . . . the knowledge indispensable in the wide field of commercial enterprise . . . these, and other studies, pursuits, and occupations, assigned chiefly or entirely to men, demand the efforts of a mind endued with the powers of close and comprehensive reasoning, and of intense and continued application.⁹

It was only natural, the author argued, that these qualities should be “impart[ed] . . . to the female mind with a more sparing hand” because women have less need of such talents in the discharge of their duties. Women are not inferior, you understand, simply *different*. After all, when it comes to performance in the feminine sphere “the superiority of the female mind is unrivalled,” enjoying “powers adapted to unbend the brow of the learned, to refresh the over-laboured faculties of the wise, and to diffuse, throughout the family circle, the enlivening and endearing smile of cheerfulness.”¹⁰ What awfully good luck that these womanly talents should coincide so happily with the duties of the female sex.

Fast-forward 200 years, turn to the opening page of *The Essential Difference*, a highly influential twenty-first-century book about the psychology of men and women, and there you will find Cambridge University psychologist Simon Baron-Cohen expressing much the same idea: “*The female brain is predominantly hard-wired for empathy. The male brain is predominantly hard-wired for understanding and building systems.*”¹¹ Just like Gisborne, Baron-Cohen thinks that it is those with the “male brain” who make the best scientists, engineers, bankers, and lawyers, thanks to their capacity to focus in on different aspects of a system (be it a biological, physical, financial, or legal system), and their drive to understand how it works. And the soothing reassurance that women, too, have their own special talents remains present and correct. In what has been described as a “masterpiece of condescension,”¹² Baron-Cohen explains that the female brain’s propensity for understanding others’ thoughts and feelings, and responding to them sympathetically, ideally suits it to occupations that professionalize women’s traditional caring roles: “People with the female brain make the most wonderful counsellors, primary-school teachers, nurses, carers, therapists, social workers, mediators, group facilitators or personnel staff.”¹³ Philosopher Neil Levy’s neat summary of Baron-Cohen’s thesis—that “on average, women’s intelligence is best employed in putting people at their ease, while the men get on with understanding the world and building and repairing the things we need in it”¹⁴—can’t help but bring to mind Gisborne’s eighteenth-century wife, busily unbending the brow of her learned husband.

Baron-Cohen does, it must be said, take great pains to point out that not all women have a female, empathizing brain, nor all men a male, systemizing one. However, this concession does not set him apart from traditional views of sex differences quite as much as he might think. As long ago as 1705, the philosopher Mary Astell observed that women who made great achievements in male domains were said by men to have “*acted above their Sex.* By which one must suppose they wou’d have their Readers under-

stand, That they were not Women who did those Great Actions, but that they were Men in Petticoats!”¹⁵ Likewise, a few centuries later intellectually talented women were “said to possess ‘masculine minds.’”¹⁶ As one writer opined in the *Quarterly Journal of Science*:

The *savante*—the woman of science—like the female athlete, is simply an anomaly, an exceptional being, holding a position more or less intermediate between the two sexes. In one case the brain, as in the other the muscular system, has undergone an abnormal development.¹⁷

Baron-Cohen, of course, does not describe as “abnormal” the woman who reports a greater tendency to systemize. But certainly there is an incongruous feel to the idea of a male brain in the body of a woman, or a female brain housed in the skull of a man.

The sheer stability and staying power of the idea that male and female psychologies are inherently different can’t help but impress. Are there, in truth, psychological differences hardwired into the brains of the sexes that explain why, even in the most egalitarian of twenty-first-century societies, women and men’s lives still follow noticeably different paths?

For many people, the experience of becoming a parent quickly abolishes any preconceptions that boys and girls are born more or less the same. When the gender scholar Michael Kimmel became a father, he reports that an old friend cackled to him, “Now you’ll see it’s all biological!”¹⁸ And what could be more compelling proof of this, as a parent, than to see your own offspring defy your well-meaning attempts at gender-neutral parenting? This is a common experience, discovered sociologist Emily Kane. Many parents of preschoolers—particularly the white, middle- and upper-middle-class ones—came to the conclusion that differences between boys and girls were biological by process of elimination. Believing that they practiced gender-neutral parenting, the “biology as fallback” position, as Kane calls it, was the only one left remaining to them.¹⁹

Some commentators, casting their eye over society at large,

find themselves falling back on biology in much the same way. In her recent book *The Sexual Paradox*, journalist and psychologist Susan Pinker tackles the question of why “gifted, talented women with the most choices and freedoms don’t seem to be choosing the same paths, in the same numbers, as the men around them. Even with barriers stripped away, they don’t behave like male clones.” Considering this, to some, unexpected outcome, Pinker wonders “whether biology is, well, if not destiny exactly, then a profound and meaningful departure point for a discussion about sex differences.”²⁰ The gender gap, she suggests, has in part “neurological or hormonal roots.”²¹ As the barriers of a sexist society continue to fall, there seem to be fewer and fewer social scapegoats to call on to explain continuing gender inequalities and work segregation. When we can’t pin the blame on outside forces, all eyes swivel to the internal—the differences in the structure or functioning of female and male brains. Wired differently from men, many women choose to reject what Pinker calls the “vanilla” male model of life—in which career takes priority over family—and have different interests.

The fallback conclusion that there must be hardwired psychological differences between the sexes also appears to enjoy impressive scientific support. First, there is the surge of fetal testosterone that takes place during the gestation of male, but not female, babies. As *Brain Sex* authors Anne Moir and David Jessel describe this momentous event:

[At] six or seven weeks after conception . . . the unborn baby “makes up its mind,” and the brain begins to take on a male or a female pattern. What happens, at that critical stage in the darkness of the womb, will determine the structure and organisation of the brain: and that, in turn, will decide the very nature of the mind.²²

Like other popular writers, Moir and Jessel leave us in little danger of underestimating the psychological significance of what goes on

“in the darkness of the womb.” While Louann Brizendine is content to merely state that the effect of prenatal testosterone on the brain “defines our innate biological destiny,”²³ Moir and Jessel are openly gleeful about the situation. “[Infants] have, quite literally, made up their minds in the womb, safe from the legions of social engineers who impatiently await them.”²⁴

Then, there are the differences between male and female brains. Rapid progress in neuroimaging technology enables neuroscientists to see, in ever-increasing detail, sex differences in brain structure and function. Our brains are different, so surely our minds are too? For example, in a *New York Times Magazine* feature on the so-called opt-out revolution (that is, women who give up their careers to take up traditional roles as stay-at-home mothers) one interviewee told journalist Lisa Belkin that “[i]t’s all in the M.R.I.,’ . . . [referring to] studies that show the brains of men and women ‘light up’ differently when they think or feel. And those different brains, she argues, inevitably make different choices.”²⁵ The neuroscientific discoveries we read about in magazines, newspaper articles, books, and sometimes even journals tell a tale of two brains—essentially different—that create timeless and immutable psychological differences between the sexes. It’s a compelling story that offers a neat, satisfying explanation, and justification, of the gender status quo.²⁶

We have been here before, so many times.

In the seventeenth century, women were severely disadvantaged educationally; for example, in their political development they were hindered “through their lack of formal education in political rhetoric, their official exclusion from citizenship and government, the perception that women ought not to be involved in political affairs, and the view that it was immodest for a woman to write at all.”²⁷ Yet despite such—to our modern eyes—obvious impediments to women’s intellectual development, they were widely assumed to be naturally inferior by many. While, in retro-

spect, it might seem to go without saying that men's apparently superior intellect and achievements might lie in sources other than natural neural endowments, at the time it *did* need saying. As one seventeenth-century feminist put it: "For a Man ought no more to value himself upon being Wiser than a Woman, if he owe his Advantage to a better Education, and greater means of Information, then he ought to boast of his Courage, for beating a Man, when his Hands were bound."²⁸

In the eighteenth century, as we've seen, Thomas Gisborne felt no need to consider an alternative explanation of his observations of sex differences within society. As the writer Joan Smith has pointed out:

[V]ery few women, growing up in England in the late eighteenth century, would have understood the principles of jurisprudence or navigation, but that is solely because they were denied access to them. Obvious as this is to a modern observer, the hundreds of thousands of readers who bought his books accepted his argument at face value because it fitted in with their prejudices.²⁹

And in the late nineteenth and early twentieth centuries, women still did not have equal access to higher education. And yet, "[w]omen," declared the well-known psychologist Edward Thorndike, "may and doubtless will be scientists and engineers, but the Joseph Henry, the Rowland, and the Edison of the future, will be men." This confident proclamation, made at a time when women were not granted full membership to, for example, Harvard, Cambridge, or Oxford University seems—I don't know—a bit premature? And, given that at the time women couldn't vote, was it not also a little rash for Thorndike to claim with such confidence that "even should all women vote, they would play a small part in the Senate"?³⁰ In retrospect, the constraints on women are perfectly obvious. *Hey, Professor Thorndike*, we might think to ourselves, *ever think about letting women into the Royal Society, or*

maybe offering them a little civil entitlement known as the vote, before casting judgment on their limitations in science and politics? Yet to many of those who were there at the time, the slope of the playing field was imperceptible. Thus philosopher John Stuart Mill's denial in 1869 that "any one knows, or can know, the nature of the two sexes, as long as they have only been seen in their present relation to one another"³¹ was revolutionary, and derided. Decades later it was still with only the utmost tentativeness that the early-twentieth-century researcher of "eminence," Cora Castle, asked, "Has innate inferiority been the reason for the small number of eminent women, or has civilization never yet allowed them an opportunity to develop their innate powers and possibilities?"³²

There is also nothing new about looking to the brain to explain and justify the gender status quo. In the seventeenth century, the French philosopher Nicolas Malebranche declared women "incapable of penetrating to truths that are slightly difficult to discover," claiming that "[e]verything abstract is incomprehensible to them." The neurological explanation for this, he proposed, lay in the "delicacy of the brain fibers."³³ Presumably, one abstract thought too many and—*ping!*—those fibers snap. Over the intervening centuries, the neurological explanations behind men and women's different roles, occupations, and achievements have been overhauled again and again, as neuroscientific techniques and understanding have become ever more sophisticated. Early brain scientists, using the cutting-edge techniques of the time, busily filled empty skulls with pearl barley, carefully categorized head shape using tape measures, and devoted large portions of careers to the weighing of brains.³⁴ Infamously, they proposed that women's intellectual inferiority stemmed from their smaller and lighter brains, a phenomenon that came to be widely known among the Victorian public as "the missing five ounces of the female brain."³⁵ The hypothesis, widely believed, that this sex difference in the brain was of profound psychological significance was championed by Paul Broca, one of the most eminent scientists of the time. Only when it became inescapably clear that brain weight did not

correlate with intelligence did brain scientists acknowledge that men's larger brains might merely reflect their larger bodies. This inspired a search for a measure of relative, rather than absolute, brain weight that would leave the absolutely bigger-brained sex ahead. As historian of science Cynthia Russett reports:

Many ratios were tried—of brain weight to height, to body weight, to muscular mass, to the size of the heart, even (one begins to sense desperation) to some one bone, such as the femur.³⁶

These days, we have rather more of an inkling of the complexity of the brain. It's undeniable that by moving into the realm of the brain itself, rather than its outer casing, scientific advance was made. It was certainly an important moment when a forward-thinking nineteenth-century scientist, fingering his tape measure with the tense distraction of one who suspects that his analysis has left certain important details unpenetrated, said thoughtfully, "Pass me that brain and those scales, will you?" But even the untrained twenty-first-century layperson can see that this brought scientists only a little closer to understanding the mystery of how brain cells create the engine of the mind, and can sense the unfortunate hastiness of the conclusion that women's cognitive inferiority to men could be weighed in ounces.

It may seem like the same sort of prejudice couldn't possibly creep into the contemporary debate because now we are all so enlightened; perhaps even . . . *overenlightened*? Writers who argue that there are hardwired differences between the sexes that account for the gender status quo often like to position themselves as courageous knights of truth, who brave the stifling ideology of political correctness. Yet claims of "essential differences" between the two sexes simply reflect—and give scientific authority to—what I suspect is really a majority opinion.³⁷ If history tells us anything, it is to take a second, closer look at our society and our science. This is the aim of *Delusions of Gender*.

At the core of the first part of this book, “‘Half-Changed World,’ Half-Changed Minds,” is the critical idea that the psyche is “not a discrete entity packed in the brain. Rather, it is a structure of psychological processes that are shaped by and thus closely attuned to the culture that surrounds them.”³⁸ We tend not to think about ourselves this way, and it’s easy to underestimate the impact of what is *outside* the mind on what takes place inside. When we confidently compare the “female mind” and the “male mind,” we think of something stable inside the head of the person, the product of a “female” or “male” brain. But such a tidily isolated data processor is not the mind that social and cultural psychologists are getting to know with ever more intimacy. As Harvard University psychologist Mahzarin Banaji puts it, there is no “bright line separating self from culture,” and the culture in which we develop and function enjoys a “deep reach” into our minds.³⁹ It’s for this reason that we can’t understand gender differences in female and male minds—the minds that are the source of our thoughts, feelings, abilities, motivations, and behavior—without understanding how psychologically permeable is the skull that separates the mind from the sociocultural context in which it operates. When the environment makes gender salient, there is a ripple effect on the mind. We start to think of ourselves in terms of our gender, and stereotypes and social expectations become more prominent in the mind. This can change self-perception, alter interests, debilitate or enhance ability, and trigger unintentional discrimination. In other words, the social context influences who you are, how you think, and what you do. And these thoughts, attitudes, and behaviors of yours, in turn, become part of the social context. It’s intimate. It’s messy. And it demands a different way of thinking about gender.

Then, there’s the less subtle, consciously performed discrimination against women, the wide-ranging forms of exclusion, the harassment, and the various injustices both at work and home. These stem from not-all-that-old, and still powerful, ideas about men and women’s proper roles and places in the world. By the end of the first part of the book, one can’t help but wonder if we have

stumbled on the twenty-first-century blind-spot. As University of California–Irvine professor of mathematics Alice Silverberg commented:

When I was a student, women in the generation above me told horror stories about discrimination, and added “But everything has changed. That will never happen to you.” I’m told that this was said even by the generations before that, and now my generation is saying similar things to the next one. Of course, a decade or so later we always say, “How could we have thought *that* was equality?” Are we serving the next generation well if we tell them that everything is equal and fair when it’s not?⁴⁰

In the second part of the book, “Neurosexism,” we take a closer look at claims about male and female brains. What do people *mean* when they say that there are inherent gender differences, or that the two sexes are hardwired to be better suited to different roles and occupations? As cognitive neuroscientist Giordana Grossi notes, these readily used phrases, “along with the continual references to sex hormones, evoke images of stability and unchangeability: women and men behave differently because their brains are structured differently.”⁴¹ Avid readers of popular science books and articles about gender may well have formed the impression that science has shown that the path to a male or a female brain is set in utero, and that these differently structured brains create essentially different minds. There *are* sex differences in the brain. There are also large (although generally decreasing) sex differences in who does what, and who achieves what. It would make sense if these facts were connected in some way, and perhaps they are. But when we follow the trail of contemporary science we discover a surprising number of gaps, assumptions, inconsistencies, poor methodologies, and leaps of faith—as well as more than one echo of the insalubrious past. As Brown University professor of biology and gender studies Anne Fausto-Sterling has pointed out, “despite the many recent insights of brain research, this organ remains a

vast unknown, a perfect medium on which to project, even unwittingly, assumptions about gender.”⁴² The sheer complexity of the brain lends itself beautifully to overinterpretation and precipitous conclusions. After combing through the controversies, we’ll ask whether modern neuroscientific explanations of gender inequality are doomed to join the same scrap heap as measures of skull volume, brain weight, and neuron delicacy.

And it’s important for scientists to remain aware of this possibility because from the seeds of scientific speculation grow the monstrous fictions of popular writers. Again and again, claims are made by so-called experts that are “simply coating old-fashioned stereotypes with a veneer of scientific credibility,” as Caryl Rivers and Rosalind Barnett warn in the *Boston Globe*.⁴³ Yet this “popular neurosexism” easily finds its way into apparently scientific books and articles for the interested public, including parents and teachers.⁴⁴ Already, sexism disguised in neuroscientific finery is changing the way children are taught.

Neurosexism reflects and reinforces cultural beliefs about gender—and it may do so in a particularly powerful way. Dubious “brain facts” about the sexes become part of the cultural lore. And, as I describe in “Recycling Gender,” the third part of the book, refreshed and invigorated by neurosexism, the gender cycle is ready to sweep up into it the next generation. Children, keen to understand and find their place in society’s most salient social divide, are born into a half-changed world, to parents with half-changed minds.

I don't think that in my lifetime there will be a woman Prime Minister.

—Margaret Thatcher (1971), Prime Minister of Great Britain from 1979 to 1990⁴⁵

It’s worth remembering just how much society can change in a relatively short period of time. Precedents are still being set. Could

a society in which males and females hold equal places ever exist? Ironically, perhaps it is not biology that is the implacably resistant counterforce, but our culturally attuned minds.⁴⁶ No one knows whether males and females could ever enjoy perfect equality. But of this I am confident: So long as the counterpoints provided by the work of the many researchers presented in this book are given an audience, in fifty years' time people will look back on these early-twenty-first-century debates with bewildered amusement, and wonder how we ever could have thought that *that* was the closest we could get to equality.

It's a good life. If I die tomorrow, I'll die a happy woman, because I'll feel like I've done a lot of good work.

—Kerin Fielding, orthopedic surgeon¹

Today, women are strongly represented in fields such as biology, psychology, medicine, and forensic and veterinary science. Some think this reflects “the feminine propensity to protect and nurture—and the desire to work with living things,” as Christina Hoff Sommers suggested by way of explaining the recent influx of women into the once male-dominated domain of veterinary medicine.²

Maybe. But there is something a little unsatisfying about this reframing of the life sciences as: *Now with added empathizing for extra feminine appeal!* Is the supposed female drive to work with living things, or to engage with mental states, really likely to be satisfied by looking at cells under microscopes or de-sexing cats? Even academic psychology, most of which *is* at least about people, is devoted to the pursuit of understanding the laws and principles—one might even say *systems*—that underlie cognition and behavior. Apart from the lab teamwork common to science in general, the core work of an academic psychologist—making sense of the literature, designing experiments, and analyzing and interpreting data—puts few demands on empathizing abilities. And what about forensic science, which draws in more than three

times as many women as men?³ On the one hand, it does indeed sometimes have *people* as its subject of study. But, on the other hand, when it does, often they are dead.

As journalist Amanda Schaffer has pointed out:

[I]f history is any guide, today's gender breakdowns are likely to keep changing. What's so magical, after all, about the current numbers? A few decades ago, most biology and math majors were men. So were most doctors. Now math undergraduate majors split close to 50/50. In 1976, only 8 percent of Ph.D.s in biology went to women; by 2004, 44 percent did. Today, half of M.D.s go to women. Even in engineering, physics, chemistry, and math, the number of women receiving doctorates tripled or quadrupled between 1976 and 2001. Why assume that we have just now reached some natural limit?⁴

It's a good point. Perhaps in a few decades we will be redefining women's new levels of participation in the physical sciences, politics, and business as reflecting their innate drive to nurture. After all, is there any more powerful way to help others than to develop sustainable technologies, set tough emissions targets or, like Bill Gates, write big fat checks to charitable causes?

As some psychologists have pointed out, such historical shifts—including the movement away from male dominance in teaching and secretarial work—don't lend themselves especially well to explanations in terms of hormones and genes.⁵ So with this malleability of sex segregation in mind, let's turn to the next two ways of investigating the link between fetal testosterone and later sex-typed behavior: females whose in utero living conditions were, hormonally speaking, wrong for their chromosomal sex; and monkeys.

In a condition called congenital adrenal hyperplasia (CAH), the child's genetic state results in the fetus's being exposed to unusually high levels of testosterone. In girls with CAH, this triggers devel-

opment of male external genitalia. (The female internal reproductive organs, however, develop normally.) Girls with CAH are born with genital virilization—that is, they look more-or-less like a boy at birth, depending on the severity of the condition. Usually the condition is detected at birth. The child is then given ongoing hormonal treatment, some time later undergoes surgery to feminize her genitalia, and is raised as a girl. This offers an opportunity for researchers to explore the effects of high fetal testosterone, disentangled from what normally comes with that experience, namely, also being reared as a boy. However, it's important to point out that girls with CAH are not simply girls plus extra fetal testosterone. Not only are other hormone levels also awry (and are therefore potential candidates for being behind any differences in behavior), but also these girls are born with ambiguous genitalia, and receive continuous hormonal treatment as well as, most likely, extensive surgery on the genitalia. (When this happens seems to be quite variable.) It's not impossible to imagine that this could create a certain ambivalence around the child's gender in the mind of a parent, and perhaps in the child herself, for which there is a little evidence.⁶

But, nonetheless, are girls with CAH more likely to be systemizers than empathizers? So far, we can't say. Older girls and adults with CAH do report less tender-mindedness, interest in infants, and social skills than their non-CAH relatives. But on the other hand, they report equal communication ability (assessed with questions like *I am good at social chit-chat*, and *I find it easy to "read between the lines" when someone is talking to me*) and no greater dominance (which includes masculine qualities like being aggressive, authoritative, and competitive).⁷ So the evidence is a little mixed and, as we learned in Chapter 2, self-report scales may tell us little about people's actual empathic tendencies and skills. As for systemizing, in the absence of an actual test of this ability it's impossible to know. One study found that girls with CAH report *less* attention to detail than control girls (a skill that Baron-Cohen considers especially important for systemizing).⁸ And there's no

evidence that the high prenatal-testosterone levels of CAH serve to improve mathematical performance—it's even been suggested that it *impairs* it.⁹ Researchers have also tested girls with CAH on the ubiquitous mental rotation tasks, and the evidence currently points toward an advantage for them over unaffected girls.¹⁰ But, as has been pointed out, this could be the result of their more boyish play experiences, rather than prenatal testosterone per se.

And girls with CAH definitely do differ from their non-CAH sisters and relatives in their play. In as much as we can take at face value their caregivers' reports and behavior when under observation in the lab, this seems to be despite the best efforts of their parents.¹¹ Girls with CAH play much more at boyish activities and toys than do control girls (although not quite as much as boys do), and they are also less interested in girlish toys and pastimes.¹² This boyishness seems to continue into adolescence. For example, adolescent girls with CAH are intermediate between boys and girls in their interest in sex-typical activities (football versus needlepoint, embroidery, or macramé) and future occupations (like engineer versus professional ice skater).¹³

These tomboyish interests seem to provide a compelling case for the idea that fetal testosterone organizes the brain to be drawn to certain kinds of stimuli that lie behind sex differences in play behavior and, by implication, occupational segregation.¹⁴ But what is a little odd is that no attempt seems to have been made to work out whether girls with CAH are drawn to some particular *quality* in boyish toys and activities or whether they are drawn to them simply by virtue of the fact that they are associated with males.¹⁵ Take, for instance, the Pre-School Activities Inventory, on which girls with CAH score more like males than unaffected girls. The inventory includes questions about playing with cars and dolls, and so on.¹⁶ But girls with CAH can also get a higher score than unaffected girls by, for example, showing little interest in jewelry, pretty things, dressing up in girlish clothes, and pretending to be a female character.¹⁷ Another study (drawing on a different clinical group) found that greater prenatal androgen exposure led to

less interest in activities like ballet, dressing up as a fairy, dressing up as a witch, dressing up as a woman, gymnastics, playing hairdresser, and working with clay but more interest in basketball, dressing up as an alien, dressing up as a cowboy, dressing up as a man, dressing up as a pirate, and playing spaceman.¹⁸ Likewise, women with CAH asked to recall their childhood activities score significantly differently from controls on a questionnaire that, among other questions, asks about use of cosmetics and jewelry, hating feminine clothes, the gender of admired or imitated characters on TV or in movies, and whether they dressed up more as male or female characters.¹⁹

In most lab-based toy studies, too, there is a question mark over what the researchers are really measuring. The boyish toys on offer always include vehicles and construction toys, while the girlish toys always include dolls with accessories and tea sets. (Interestingly, one of the staples of the boyish toys, the Lincoln Logs construction set, recently had to be replaced because girls liked it so much!)²⁰ But if it's stimulation of their visuospatial skills that girls with CAH are drawn to, why don't they (and boys, for that matter) spend longer than girls on the neutral toys, which often include a puzzle and a sketchpad? What form of brain masculinization could lead to a preference for dressing up as an alien rather than a witch, an interest in fishing over needlepoint, a desire to wash and wax the car rather than try out for cheerleading, or masculine costumes over feminine ones?²¹ Is it possible that what researchers are seeing in girls with CAH is greater identification with male activities, whatever they might be?

Interestingly, studies that have looked at the correlations between early testosterone and later gendered-play behavior in nonclinical children—which so far have shown the most convincing relationships (although they are still not very impressive)—encounter this very same problem. For example, one study found correlations between amniotic testosterone and male-typical play within both boys and girls, while an earlier study found a correlation between maternal testosterone and play behavior, although

only in girls. But in both studies the behavioral measure used was the Pre-School Activities Inventory, which, as mentioned earlier, includes items that may have more to do with cultural gender rules than more fundamental psychological predispositions. (A third study, using a different measure of gendered play, found no relationship at all between amniotic testosterone and play preferences.)²²

In short, we just don't know what's going on. One researcher has suggested that "androgen may affect the reward value of moving stimuli, so that objects that move and have moving parts may be more rewarding to girls with CAH and to boys than to typical girls."²³ But we just don't know until this idea is tested. If in these toy preference studies Barbie came with a pink car instead of clothes and hair accessories, would girls with CAH play with her more than control girls? That's what the brain organization hypothesis would predict. Would a girl with CAH rather play with a toy stroller that can be wheeled around, over a firetruck that cannot? Would the changing proportion of men in an occupation, like veterinary medicine, have no effect on its appeal to girls with CAH?

Perhaps. But another possibility is that girls with CAH are drawn to what is culturally ascribed to males. Thirty years ago, primatologist Frances Burton put forward an intriguing suggestion that casts the data from females with CAH in an entirely new light. She proposed that the effect of fetal hormones in primates is to predispose them to be receptive to whatever behaviors happen to go with their own sex in the particular society into which they are born.²⁴ (We'll shortly see what led her to this hypothesis.) As Melissa Hines points out, this would provide a very "flexible design," enabling "new members of the species to develop sex-appropriate behaviors despite changes in what those behaviors might be. This hormonal mechanism would liberate the species from a 'hard-wired' masculinity or femininity that would be unable to adapt to changes in the environment that make it advantageous for males and females to modify their niche in society."²⁵

However, Hines has argued that this can't be the whole answer

to gender differences in toy preferences. This is because, remarkably, similar sex differences in toy preference are also seen in monkeys. In a study with Gerianne Alexander, Hines put six toys, one at a time, into a large enclosure of vervet monkeys. There were two boyish toys (a police car and a ball), two girlish toys (a doll and a pan) and two neutral toys (a picture book and a stuffed dog). They measured how long each monkey spent with each toy, as a percentage of total toy-contact time. Both male and female vervets spent about a third of the total time with the neutral toys. Male vervets spent about another third each of their total playing time with the other toys. By contrast, females spent more time with the girlish toys than with the boyish toys.²⁶ If, by the way, you are curious about the choice of a pan as a girlish toy, you are not alone. Although it is true that primatologists regularly uncover hitherto unknown skills in our nonhuman cousins, the art of heated cuisine is not yet one of them. Frances Burton has informed me that, in her long career of observing monkeys, she has never met one that could cook.²⁷ (This raises the more general point, spontaneously made by more than one of the academics who read this chapter, that it is not at all clear that a toy taken from human culture has the same meaning to a monkey, to which it is unfamiliar, that it does to a child.)²⁸ It's worth noting, then, that when the researchers divided up their stimuli in a different way—comparing amount of play with animate toys (the dog and the doll) with object toys (the pan, ball, car, and book)—they found no differences between the sexes.

After an interval of about six years, a second group of researchers ran another toy-preference study with rhesus monkeys. This study was different in two important ways. First of all, trying to get to the bottom of *why* there are gender differences in toy preference, they compared wheeled toys that invite movement with stuffed-animal toys that supposedly invite nurturing. (Whether or not the stuffed animals *were* actually nurtured is unclear, especially as one trial had to be terminated early when “a plush toy was torn into multiple pieces.”) Second, the researchers gave monkeys

an outright choice between the two types of toy—one of each was put into the enclosure at the same time, which is a better test of preference. They found that females were as interested in wheeled toys as they were in plush ones, and played no less with wheeled toys than did male monkeys. However, unlike females, male monkeys had a preference for wheeled toys over plush ones.²⁹

What are we to make of the subtle sex differences seen in these two slightly contradictory studies? (Which doesn't seem like quite large enough a number on which to base any terribly firm conclusions about human nature.) One reasonable summary might be that male and female monkeys alike enjoy playing with both stuffed toys and mobile objects, but that in males the cuddly dolls have less of a shine than the mobile toys. (Just to confuse matters, stuffed toys don't seem to be disfavored by either vervet males or boys.)³⁰ What does this mean for humans, and the toys played with by little boys and girls?

These two studies have been taken as strengthening the evidence of “inborn influences on sex-typed toy preferences,”³¹ support for the idea that “biologically based sex differences in activity preferences significantly influence sex differences in childhood object choice,”³² and “another nail in the coffin for the idea that similar preferences in human children are entirely due to culture.”³³ Yet can we safely move to the conclusion that the higher levels of prenatal testosterone normally seen only in males increases interest in boyish toys that move or stimulate visuospatial skills, and reduces interest in toys related to babies and nurturing? These are two separate effects that are hard to disentangle when you compare interest in a moveable boyish toy *relative* to interest in a nurture-able girlish toy. Although male rhesus monkeys preferred the wheeled toys over the plush ones, because there was no gender-neutral toy condition we don't really know whether rhesus males were especially drawn to the wheeled toys or simply *less* interested in the plush animals. After all, in the first monkey study male vervets spent no longer with the moveable ball and car than with the neutral toys or the girlish toys. So neither monkey study does

a convincing job of showing that male monkeys are born with a built-in interest in objects that move. Researchers need to get more specific about what particular feature of boyish toys supposedly appeals to the male brain, and then see whether male monkeys more than females prefer novel toys that do have this feature over other equally novel toys that don't.

But what about the idea that females, thanks to their lower fetal-testosterone levels, are born with a greater built-in interest in toys that lend themselves to nurturing play? It's a compelling interpretation, especially given the lack of interest in babies and dolls shown by girls with CAH. (Interestingly, they are no less interested in pets.)³⁴ The only problem is, prenatal-testosterone levels have been found to have *no effect* on male or female rhesus monkeys' interest in infants. Male youngsters whose mothers had been experimentally treated prenatally with an androgen-receptor blocker were no more interested in infants than control males, despite their more-feminized hormonal environment. And crucially, female youngsters whose mothers had been given testosterone injections during pregnancy were no *less* interested in infants than control females. It should be said that the researchers who reported these surprising results, seeing no evidence that mothers differentially socialized male and female infants, declared themselves "reluctant . . . to dismiss prenatal hormonal influences altogether" in explaining sex differences in interest in infants among rhesus monkeys.³⁵ Yet there is good reason to think that this reluctance may be misplaced.

Frances Burton has pointed out that, just like us, primate societies have norms regarding which sex does what: who gets food, rears the young, moves the troop, protects the troop, and maintains group cohesion.³⁶ But, these norms are different across, or even within, primate species. Male involvement in infant rearing, for instance, ranges from the hands-off to the intimate. For example, "a specially intimate relation between adult males and infants" has been seen in some troops of wild Japanese macaque monkeys (the species *Macaca fuscata fuscata*) during delivery season: males pro-

tect, carry, and groom one- and two-year-old infants. Yet different troops of the same species, in different parts of the country, show less of this paternal care, or even none at all.³⁷ Similarly, in another species of macaque (*Macaca sylvanus*) Burton has seen extensive and lengthy male care of young in a Gibraltar troop. Indeed, so important is male baby-sitting in this troop that "young females are kept away from infants so that young males may learn their role."³⁸ Yet among the very same species in Morocco, male care is much less significant.

As Burton argued, "while hormones are the same" throughout these different species, there is "no universal pattern" to how the different tasks of the society, including infant care, are divided. Sometimes both sexes perform the role, sometimes only one or the other sex does. "If the hormones determine the roles, one would expect to find the same sex occupying the same roles in all societies. This is patently not the case."³⁹ In line with this flexibility, it seems that the potential for primate male care-giving is by no means destroyed or even diminished by fetal testosterone. Another primatologist, William Mason, points out that "schemas for parental behavior are present in infancy, they appear in the same form in both sexes, and they continue to be accessible throughout life."⁴⁰ However, interest toward infants soon begins to diverge in the sexes. At one year of age, male and female rhesus monkeys exhibit few differences in behavior toward infants. Yet at two and three years of age, females contact, embrace, groom, touch, and initiate closeness with infants more often than do males—and the females who show this greater interest in infants include females treated with prenatal androgens.⁴¹ We may need to look elsewhere to find a reason for the lack of interest in infants and dolls in girls with CAH.

So how does a male macaque monkey in Takasakiyama, Japan, become an involved carer while his counterpart in Katuyama perfects paternal indifference?⁴² Perhaps the action of prenatal testosterone on the genitalia plays an important part in explaining how primate infants come to learn the idiosyncratic traditions of

their group. Monkeys take great interest in the genitalia of newborns. Unable to avail themselves of the convenience of observing whether it is a pink or blue balloon tied to the entrance of the nest, monkeys take a more direct approach to satisfying themselves as to the answer to the question that appears to be as important to them as it is to us:

In most monkey societies, the neonate is a strong attraction: all members of the troop rush over; attempt to touch or hold it, sniff it, lick it, and otherwise exhibit interest in it. Through visual and olfactory stimuli, the sex of the individual is as much registered as its maternity.⁴³

Is this interest in genitalia purely academic? To suggest that non-human primates have socially constructed gender roles seems more or less akin to pinning a notice to one's back that says, *MOCK ME*. But does the registration of sex—of others and perhaps of self—play an important role in maintaining traditional sex-division of labor in primate societies? When Burton studied troops of macaque monkeys in Gibraltar, she observed that the head male was intimately involved in neonate care: sniffing, licking, caressing, patting, holding, and chattering to it, as well as encouraging it to walk. Interestingly, when the head male was in charge of the infant, he would be followed and imitated by subadults—but only males. The male subadults then themselves became involved in caring for the infant.⁴⁴ As we'll see in the third part of the book, human children have a powerful drive to self-socialize into gender roles. That is, even in the absence of any encouragement by parents, they are attracted to things and behaviors associated with their sex. Although children from the age of about two have the advantage of an explicit, reportable knowledge of their own sex, is it possible that some primitive sense of sex identity brings about self-socialization in nonhuman primates? As Hines and Alexander recently asked, "if some animals of one sex could be trained to use a particular object, would others of that sex model them?"⁴⁵

If more researchers interested in human gender differences start to investigate questions like this, which acknowledge that nonhuman primates, like us, have social norms that need to be learned, perhaps the answers will surprise us.

For many years, attention was focused on adulthood sex differences in the levels of hormones like testosterone and estrogen. Could these circulating sex hormones, via their effect on cognition, go some way toward explaining gender inequality? Many assumed too quickly that it did. Unfortunately, as Hines concludes from her review of this research, “influences have been assumed to exist despite a lack of consistent supporting data.”⁴⁶ To offer just one comical example, various studies have found that higher testosterone levels are associated with better mental rotation performance, worse mental rotation performance, or equal mental rotation performance.⁴⁷ Likewise, Steven Pinker describes this literature as “messy” and “contradictory” (although he nonetheless thinks that “something will be salvaged” from it).⁴⁸

And so it seems as though fetal testosterone has become the explanation of choice for gender inequality in science. In a 2005 conference on diversifying the science and engineering workforce, Lawrence Summers, then president of Harvard University, controversially suggested that women might be intrinsically less capable, on average, of high-level science. Fetal testosterone was rushed to the scene of the mishap. In the *New Republic*, Steven Pinker reminded an irrationally outraged public that variations in sex hormones, “especially before birth, can exaggerate or minimize the typical male and female patterns in cognition and personality.”⁴⁹ In the *New York Times*, Simon Baron-Cohen set out a path that passes from fetal-testosterone levels, to different brains, to different cognitive talents. He also cited Connellan’s newborn study, in which boys looked longer at a mobile, as support for Summers’s suggestion that sex differences in science-related skills are innate.⁵⁰ And Canadian researcher Doreen Kimura wrote in the *Vancouver Sun*

that Larry Summers was not mistaken in his suggestion that men and women differ in their innate talents, because sex differences “in levels of sex hormones early in prenatal life . . . strongly influence many behaviours into adulthood. Those behaviours include the intellectual or cognitive pattern, hormonal influences being especially well-documented for certain kinds of spatial ability, like being able to mentally rotate or manipulate visual objects.”⁵¹

And yet as we’ve seen, higher fetal testosterone in nonclinical populations has not been convincingly linked with better mental rotation ability, systemizing ability, mathematical ability, scientific ability, or worse mind reading. Connellan’s newborn study was gravely flawed. And the research with girls with CAH and non-human primates—which at first glance seems to show that there are built-in sex differences in toy preferences—turns out to jumble up vague, untested ideas about what the male and female brain might be interested in with what is socially ascribed to the two sexes. One can’t help but feel a weary sense of irony in response to Pinker’s complaint that the “taboo” of innate sex differences “needlessly puts a laudable cause [the modern women’s movement] on a collision course with the findings of science.”⁵² So far as I can tell, that collision has yet to occur.

And there’s still so much inequality to be explained! We need to press on, into the brain itself.