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GENDER SYSTEMS:

TOWARD A THEORY OF HUMAN SEXUALITY

Portrait of the Scientist as a Young Girl

CONSIDER A CHILD BORN IN THE SUMMER OF 1944. LATER SHE BECAME a scientist. Does a portrait of her at age two (figure 9.1)—one hand holding a water-filled test tube up to the light, the other grasping a measuring cup—give evidence of the early expression of an inborn inclination to measure and analyze, of her genes leading her down the road to the research laboratory? Or is it testimony to her feminist mother's determination to find nontraditional toys for her young daughter? As the child grew, her mother began to write children's books about nature, and the young girl and her brother (who also became a scientist) learned on their walks through the woods to spot mosses, ferns, mushrooms, and insect homes.[1] When she was in graduate school, her father wrote a biography of Rachel Carson.[2] Science genes or environment? A logical argument can be made for each interpretation, and there is no way to prove whether either answer is right.[3]

For many who would think about this girl's life path, gender is not far from the surface. Her early interest in frogs and snakes marked her as a tomboy, a label some social scientists today interpret as an early sign of untoward masculinity.[4] When she was eleven, her friends at summer camp wrote her epitaph—"In memory of Anne, who liked bugs better than boys" —perhaps foreshadowing a future homosexuality. But that summer she developed a painful crush on one of the young male camp counselors, and by the time she was twenty-two she would marry for love and lust. Only years later would that epitaph for an eleven-year-old seem prophetic.

This young girl didn't like dolls, kept pet snakes and frogs, and grew up first with heterosexual interests and later developed homosexual ones. How are we to interpret her life, or any life? Speculating about genes for analytical personalities or homosexuality may make for good party chitchat or provide

FIGURE 9.1: A budding scientist? (Source: Philip Sterling)

solace for those eager to explain why someone turned out "that way." But partitioning genes from environment, nature from nurture, is a scientific dead end, a bad way of thinking about human development. Instead, I suggest we heed the words of the philosophers John Dewey and Arthur Bentley, who half a century ago "asserted the right to see together . . . much that is talked about conventionally as if it were composed of irreconcilable spheres."[5]

In this book I have shown how medical and scientific knowledge about anatomy and physiology acquires gender. I started at the outside, with genital gender, and moved inward, from the brain to body chemistry and ultimately to something quite intangible: behavior (in rodents). It turns out, however, that we cannot understand the underlying physiology of behavior without considering an animal's social history and contemporary environment. True to the image of the Möbius strip, when we reached a level of analysis that involved chemistry (and, by implication, genes)—that is, when we were at the most interior moment in our journey—we had, suddenly, to consider the most exterior of factors: What was the animal's social history? What was the architecture of the test apparatus? Why did specific genetic strains respond to hormone stimuli only under certain conditions? And while the driving question on the exterior surface of the Möbius strip is, "How does knowledge about the body acquire gender?" the active question on the inside surface is, "How do gender and sexuality become somatic facts?" How, in other words, does the social become material? Answering this inside question would require a book-length essay, so in this concluding chapter I offer but a framework for future research.

Successful investigations of the process of gender embodiment must use three basic principles. First, nature/nurture is indivisible. Second, organisms—human and otherwise—are active processes, moving targets, from fertilization until death.[6] Third, no single academic or clinical discipline provides us with the true or best way to understand human sexuality. The insights of many, from feminist critical theorists to molecular biologists, are essential to the understanding of the social nature of physiological function.

"R" Genes Us?

We live in a genocentric world.[7] The "genes 'r' us" habit is so deeply imbued in our thought processes that it seems impossible to think otherwise. We think of our genes as a blueprint for development, linear information that need only be read out of the book of life. We go to movies in which the major premise is that a DNA sequence isolated from a fossilized mosquito is all we need to create *Tyrannosaurus rex*. (The nicety, clearly found in *Jurassic Park*, that the

DNA needed an egg to become a *T. rex* is lost in the shuffle).[8] And we hear almost daily on the news that the project to sequence human DNA molecules has led us from the genes for breast cancer and diabetes to Parkinson's and more. Present-day students of human genetics can do the rest, "discovering" genes for alcoholism, shyness, and—yes—homosexuality.[9]

Even when scientists are themselves cautious about imbuing all power to the gene, popular renditions of new scientific findings dispense with linguistic subtlety. When Dean Hamer and his colleagues published evidence that some male homosexuals possessed the same region of DNA located on the X chromosome, for instance, they used fairly cautious language. Phrases such as "the role of genetics in male homosexual orientation," "genetically influenced," or "a locus related to sexual orientation" abound in the paper.[10] Such caution did not, however, extend to other pages in the same issue of *Science*, the journal in which the Hamer group's report appeared. In the Research News section of the same issue, the headline ran: "Evidence for Homosexuality Gene: A genetic analysis . . . has uncovered a region on the X chromosome that appears to contain a gene or genes for homosexuality."[11] Two years later, coverage in a more popular venue, *The Providence Journal*, had, on the same page, headlines referring to "gay gene" research and "schizophrenia gene search."[12]

But what does it mean to speak of gay genes or genes for some other complex behavior? Do such phrases, or Hamer and colleagues' more circumspect language advance our understanding of human sexuality? I think that the language not only fails to illuminate the issues at hand; it gives us intellectual cataracts.[13]

A brief review of basic genetic physiology demonstrates why: genetic function can be understood only in the context of that developmental system we call the cell. Most protein sequence information in a cell can be found in DNA located in the cell's nucleus. The DNA itself is a large molecule composed of linked chemicals called bases.[14] Genetic information is not continuous in the DNA molecule. A stretch that codes for part of a protein (called an *exon*) may be linked to a noncoding region (called an *intron*). Before a gene's information can be used in protein construction, the cell must make an RNA caste for both the coding and noncoding regions of the DNA. Then enzymes snip out the introns and stitch the exons together into a linear sequence containing the template for a specific protein. Making the protein requires the coordinated activity of additional special types of RNA molecules and many different proteins.

In shorthand, we sometimes say that genes make proteins; but it is precisely such shorthand that gets us into trouble. Naked DNA cannot make a

protein. It needs many other molecules—special RNAs to carry the amino acid to the ribosome and secure it, like a vise, so that other proteins can link it to its next neighbor. Proteins also help transport the DNA's message out of the nucleus and into the cytoplasm, help the DNA unwind so that other molecules can interpret its message in the first place and cut and splice the RNA template. In short, DNA or genes don't make gene products. Complex cells do. Put pure DNA in a test tube and it will sit there, inert, pretty much forever. Put DNA in a cell and it may do any number of things, depending in large part on the present and recent past histories of the cell in question.[15] In other words, a gene's actions, or lack thereof, depend on the microcosm in which it finds itself.[16] New work, suggesting that as many as 8,000 genes can be expressed in a developmentally stimulated cell, shows just how complex that microcosm can be.[17]

Development, to paraphrase the philosopher Alfred North Whitehead, is a moving target. As an organism emerges from a single fertilized egg cell, it builds on what has gone before. By analogy, consider how a forest grows back in an empty, unmowed field. At first annuals, grasses, and woody shrubs appear, then a few years later scattered cedars, willows, hawthornes, and locusts. These trees need full sun to grow, so as they get larger, they create so much shade that their own seedlings cannot survive. But the white poplar does well under the conditions created by the cedar and its companions. Eventually, the poplar and other trees create a cool, leaf-covered forest floor on which the seedlings of hemlock, spruce, red maple, and oak thrive. Finally these create conditions for hemlock, beech, and sugar maple to grow. These new trees, in turn, create a microclimate under which their own seedlings thrive, and a stable constellation of trees, called a climax forest, finally develops. The regularity of such a succession of growth does not result from some ecological program found in the genes of cedar, hawthorne, and willow trees, "rather it arises via a historical cascade of complex stochastic [random processes that can be studied statistically] interactions between various" living organisms.[18]

The work of M. C. Escher offers a helpful analogy. In the early 1940s he produced a series of woodcuts designed to divide a plane into interlocking figures. Two features of these images help us see how developmental systems theory applies to cells and development (see figure 9.2). First, as one stares at the image, the birds jump into view, then the fish swim up. Both are always there, but how one focuses at a particular moment makes one animal more visible than the other. Second, each line simultaneously delineates the outline of both a fish and a bird. If Escher were to change the shape of the bird, the

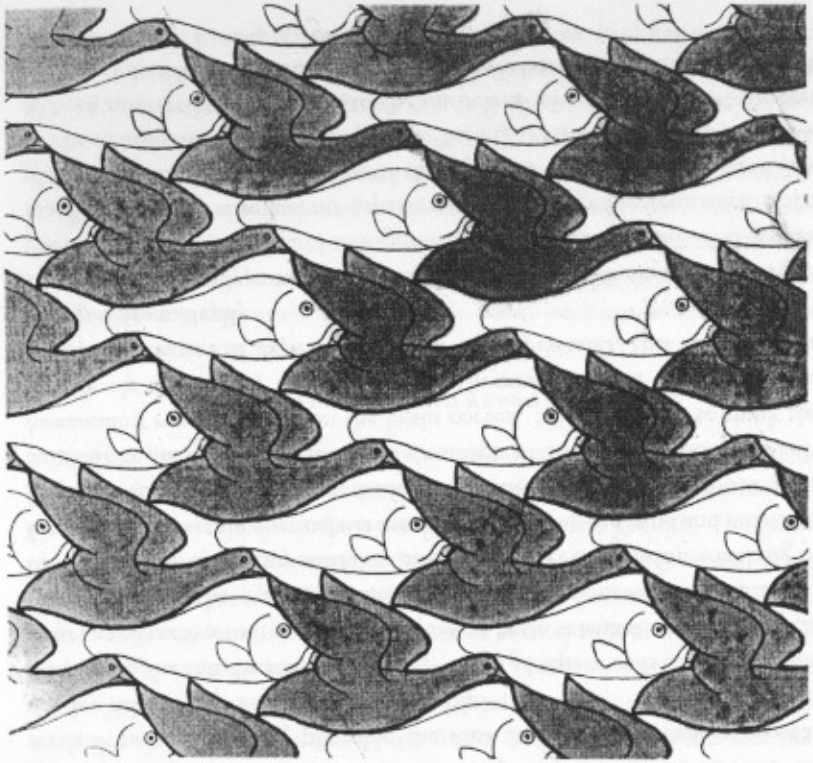

FIGURE 9.2: Symmetry drawing E34B, by M. C. Escher. (© Cordon Art, reprinted with permission)

fish would change shape as well. Thus it is with a systems account of cellular physiology. Genes (or cells or organisms) and environment are like the fish and the bird. Change one change all. See one see all.

Socializing the Cell

NERVE CELLS AND BRAINS

Genes, then, function as part of a complex cell with its own important history. Cells, in turn, operate as large, intimately connected groups that form coherent organs within a complex, functionally integrated body. It is at this level, when we look at cells and organs within the body, that we can begin to glimpse how events outside the body become incorporated into our very flesh.

Just after the turn of the twentieth century in the Bengal Province of India, the Reverend J. A. Singh "rescued" two children (whom he named Amala and Kamala), girls succored since infancy by a pack of wolves.[19] The two girls could run faster on all four limbs than other humans could on two. They were profoundly nocturnal, craved raw meat and carrion, and could communicate so well with growling dogs at feeding time that the dogs allowed the girls to eat from the same bowls. Clearly these children's bodies—from their skeletal structure to their nervous systems—had been profoundly changed by growing up with nonhuman animals.

Observations of wild children dramatize what has become increasingly clear to neuroscientists, especially in the past twenty years: brains and nervous systems are plastic. Overall anatomy—as well as the less visible physical connections among nerve cells, target organs, and the brain—change not only just after birth but even into the adult years. Recently, even the dogma that no new cells appear in the adult brain has gone the way of the dodo.[20] Anatomical change often results when the body's nervous system responds to, and incorporates, external messages and experiences.

Examples abound in which a social interaction causes a physical change in the nervous system.[21] Two types of studies seem especially relevant to a framework for understanding human sexuality. One concerns the development and plasticity of nerve cells and their interconnections in the central and peripheral nervous systems.[22] The other addresses changes in nerve cell receptors that potentially can bind transmitters such as serotonin or steroid hormones such as estrogens and androgens, which can in turn activate the protein synthetic machinery of a particular set of cells.[23] These examples show how nervous systems and behaviors develop as part of social systems.

Scientists sometimes disrupt such systems by interfering with the genetic function of one or another component. Analytically, this is akin to removing a spark plug to see whether and how it interferes with the running of an internal combustion engine. For example, scientists have created mice that lack the gene for serotonin receptors and have observed their distorted behaviors.[24] But although such experiments provide important information about how cells function and communicate, they cannot explain how mice develop particular behaviors in particular social settings.[25]

How might social experience affect the neurophysiology of gender? The comparative neurobiologists G. Ehret and colleagues offer an example in their study of paternal behavior in male mice. Males that never have contact with young pups will not retrieve them in the spirit of good fathering (when they inch too far from the nest), but even a few hours or a day spent in the company of baby rats will evoke ongoing paternal pup retrieval. Ehret and colleagues found that early exposure to pups correlated with increased estrogen receptor binding in a number of areas of the brain and decreased binding in one area.[26]

In other words, parenting experience may have changed the hormonal physiology of the father's brain as well as the mouse's ability to care for his pups.

The fact that human brains are also plastic, a concept that recently has begun to make it into the mass media,[27] makes it possible to imagine mechanisms by which gendered experience could become gendered soma. Environmental signals stimulate the growth of new brain cells or cause old ones to make new connections.[28] At birth the human brain is quite incomplete. Many of the connections between nerve cells and other parts of the body are tentative, requiring at least a little external stimulation to become permanent. In some brain regions, unused neural connections disintegrate throughout the first twelve years of life.[29] Thus, early physical and cognitive experience shape the brain's structure.[30] Even muscular movements before birth play a role in brain development.

One way the brain "hardens" a neural connection is by producing a fatty sheath, called myelin, around the individual nerve fibers. At birth the human brain is incompletely myelinated. Although major myelination continues through the first decade of life, the brain is not completely fixed even then. There is an additional twofold increase in myelinization between the first and second decades of life, and an additional 60 percent between the fourth and sixth decades,[31] making plausible the idea that the body can incorporate gender-related experiences throughout life.

Finally (for this discussion at least),[32] large groups of cells can change their patterns of connectivity—or *architecture,* as brain scientists call it. For years neuroanatomists have performed experiments to find out what segment of the brain responds when they stimulate an exterior part of the body. Touching the face provokes certain cortical nerves to fire, touching the hand and individual fingers affects different nerves, the feet still other nerve cells. Textbooks often summarize such experiments with a cartoon of a misshapen body (called a *homunculus*) superimposed on the brain cortex. Scientists used to think that after early childhood, the shape of the homunculus did not change. But following a series of experiments with other primates, this viewpoint has changed dramatically.[33]

One recent study compared the representation on the cerebral cortex of the fingers of the left hand of stringed instrument players to age- and gender-matched controls who had no experience with stringed instruments. String players constantly move the second through fifth digits of the left hand. The left hand homunculus was visibly larger for digits two through five compared to both non-string players and to the musicians' own right hands.[34] Or consider people who, blind from a young age, have become accomplished Braille

readers.[35] Not surprisingly, they have enlarged the hand representation for their Braille-reading fingers. But their brains have made an even more amazing readjustment. They have recruited a region of the cortex that sighted people use to process visual information (the so-called visual cortex) and instead use it to process tactile sensations.[36]

For both musicians and those blind from birth, cortical reorganization probably takes place during childhood, a fact that confirms something we already know: children have enormous learning capacities. Such studies extend our ideas about learning, however, by showing that the material anatomic connections in the brain respond to external influences. Such knowledge wreaks havoc with both attempts to maintain a distinction between mind and body and attempts to offer up the body as a precursor to behavior. Instead they back up an insistence that the environment and the body co-produce behavior and that it is inappropriate to try to make one component prior to the other.[37]

The studies on Braille users and musicians show brain plasticity in the young, but can adult brain anatomy change as well? The answer comes from the study of a phenomenon that has long fascinated students of the human brain, from neurosurgeons to phenomenologists: the mystery of the phantom limb. Amputees often feel that the missing part is still present. At first the phantom seems to the patient to be shaped like the missing part. With time, however, the perceived shape changes; in contrast to a real limb, a phantom part feels lighter and hollow. Like a ghost, the phantom limb seems able to penetrate a solid object.[38]

Someone who has lost a hand may "feel" the missing hand following light stimulation of the lips; a light touch to the face may make someone who has lost an arm "feel" the missing limb, a phenomenon called *referred sensation.* A series of recent studies tries to explain such sensations with the finding that nerves in the region of the homunculus previously devoted to the now-missing limb are "taken over" by adjacent areas—in the example given, the cortical field connecting exterior stimuli to the face. The size of the homunculus for the intact hand also increases, presumably in response to increased use demanded by the loss of one hand.[39] Although remapping of the brain's cortex probably doesn't explain all phantom limb phenomena,[40] it does provide a dramatic instance of how adult brain anatomy responds to new circumstances.[41]

How might all this apply to the development of sexual difference and human sexual expression? Answers developed to date have been impossibly vague, in part because we have been thinking too much about individual com-

ponents and not enough about developmental systems. Paul Arnstein, a practicing nurse concerned with understanding physiological links between learning and chronic pain, writes that: "The true nature of the central nervous system has eluded investigators because of its fully integrated, constantly changing structure and a symphony of chemical mediators. Each sensation, thought, feeling, movement and social interaction changes the structure and function of the brain. The mere presence of another living organism can have profound effects on the mind and body."[42] We will begin to understand how gender and sexuality enter the body only when we learn how to study the symphony and its audience together.

SEXUAL ANATOMY AND REPRODUCTION

During our lives, the brain changes as part of a dynamic developmental system that includes everything from nerve cells to interpersonal interactions. In principle, we can apply similar concepts to gonads and genitals. The gonads and genitals developed during fetal development continue to grow and change shape during childhood, affected by such things as nutrition, health status, and random accidents. At puberty anatomic sex expands to include not only genital differentiation but also secondary sex characteristics, which in turn depend not only on nutrition and general health but also on levels of physical activity. For example, women who train for long-distance events lose body fat, and below a certain fat-to-protein ratio, the menstrual cycle shuts down. Thus, gonadal structure and function respond to exercise and nutrition levels, and of course they also change during the life cycle.

Not only does sexual physiology change with age—so, too, does sexual anatomy. I don't mean that a penis drops off or an ovary dissolves, but that one's physique, one's anatomical function, and how one experiences one's sexual body change over time. We take for granted that the bodies of a newborn, a twenty-year-old, and an eighty-year-old differ. Yet we persist in a static vision of anatomical sex. The changes that occur throughout the life cycle all happen as part of a biocultural system in which cells and culture mutually construct each other. For example, competitive athletics leads both athletes, and a larger public who emulate them, to reshape bodies through a process that is at once natural and artificial. Natural, because changing patterns of diet and exercise change our physiology and anatomy. Artificial, because cultural practices help us decide what look to aim for and how best to achieve it. Furthermore, disease, accident, or surgery—from the transformations undergone by surgical transsexuals, to the array of procedures (applied to secondary sexual characteristics) that include breast reduction or enlargement and penile enlargement—can modify our anatomic sex. We think of anatomy as constant, but it isn't; neither, then, are those aspects of human sexuality that derive from our body's structure, function, and inward and outward image.

Reproduction also changes throughout the life cycle. As we grow, we move from a period of reproductive immaturity into one during which procreation is possible. We may or may not actually have children (or actually be fertile, for that matter), and when and how we choose to do so will profoundly affect the experience. Motherhood at twenty and at forty, in a heterosexual couple, as a single parent, or in a lesbian partnership is not a singular, biological experience. It will differ emotionally and physiologically according to one's age, social circumstance, general health, and financial resources. The body and the circumstances in which it reproduces are not separable entities. Here again something that we often think of as static changes across the life cycle and can be understood only in terms of a biocultural system.[43]

In their book *Rethinking Innateness*, the psychologist Jeffrey Elman and his colleagues ask why animals with complex social lives go through long periods of postnatal immaturity, which would seem to present big dangers: "vulnerability, dependence, consumption of parental and social resources." "Of all primates," they note, "humans take the longest to mature."[44] Their answer: long periods of development allow more time for the environment (historical, cultural, and physical) to shape the developing organism. Indeed, development within a social system is the sine qua non of human sexual complexity. Form and behavior emerge only via a dynamic system of development. Our psyches connect the outside to the inside (and vice versa) because our multiyear development occurs integrated within a social system.[45]

Thank Heaven for Little Girls—and Little Boys, Too

THE PROCESS OF GENDER

"All this cell, brain, and organ development stuff is fascinating," a frustrated parent might say to me. "But I still want to know why my little boy rushes around shooting imaginary laser guns, while my little girl prefers jump rope." Many Loveweb participants raise similar challenges, citing studies showing that gender differences appear at an early age—surely, they believe, an argument for inborn difference. How can I reconcile the observations of countless parents and the multitude of studies by sociologists and developmental psychologists with a systems approach to gender acquisition? Here I fit together already existing pieces of the puzzle.

"Gender," argue some sociologists, "is a situated accomplishment . . . not merely an individual attribute but something accomplished in interaction with others."[46] Both children and adults learn through direct feedback from

others to "do gender."[47] Classmates, parents, teachers, and even strangers on the street evaluate how a child dresses. A boy who wears pants conforms to social norms, while one who dons a skirt does not. And he hears about it right away! Gender, then, is never merely individual, but involves interactions between small groups of people. Gender involves institutional rules. If a gay man made up as a woman walks down the street, he soon learns that he has deviated from a gender norm. The same man in a gay bar will receive compliments as he partakes in a subculture that plays by a different set of guidelines. Furthermore, we "do gender" as part of "doing difference." We establish identities that include race and class as well as gender, and we do gender differently depending upon our location in racial and class hierarchies.[48]

In America and Europe, boys and girls begin to behave differently during the preschool years. By middle school each group thinks the other has "cooties," but during the years of hormonal hell, they return to each other for sex and socializing. As adults they live and work in overlapping but gender-divided institutions, and as old people they are separated once more, this time by the differential death rates for men and women. Developmental psychologists, sociologists, and systems theorists have some tantalizing findings about how children acquire gender, although obtaining similar information for the rest of the life cycle remains for future scholars.[49]

Traditionally, psychology has offered three approaches to understanding gender development: Freudian psychodynamics, social learning, and cognitive development. For Freud, the child's own awareness of his or her genitals produces erotic fantasies, which in turn lead to identification with a suitable adult figure and the development of an appropriate gender role.[50] Social learning proponents focus on adult awareness of an infant's genitals, which leads to differential reinforcement, the offer of gender-appropriate models, and thus the development of gender role and identity.[51] Cognitive theory also starts with others' awareness of a child's genitals. This leads to labeling and thence to gender identity and finally to the acquisition of an appropriate gender role.[52] Feminist social scientists have used each of these paradigms to produce information about the development of sexual difference. A primary goal in the past has been to produce better accounts of female development, since in their original forms all three theories primarily produced narratives about how boys became men. More recently, however, a number of feminist voices have begun to challenge the very structure of the field, calling for more complex accounts of difference *and* a return to the study of male-female similarities.[53] Here I depend especially on the work of cognitive and social learning researchers. Regardless of the particular approach, the goal remains that of understanding the development of the self: "behavior, experience, and identifications, including sexual desire and object choice, [that] are relatively stable or fixed or that, at least, . . . [are] a basic or primary 'core' of identity."[54]

Gender and sexuality often appear to us as universal features of human existence. Need such apparent universality mean that human sexuality and gender are inborn and only superficially shaped by social experience? We can see that this is the wrong way to ask the question by looking at the development of another apparently universal human behavior: smiling.[55] Newborns have a simple smile: the face relaxes while the sides of the mouth stretch outward and up. An identical "smile" has been seen in fetuses as young as twenty-six weeks of gestation. This suggests that, initially, a basic set of neural connections develops that enables a developing human to "smile" as a reflex, even in utero. In the newborn, smiling occurs spontaneously in rapid eye movement (REM) sleep states, but at first does not function as a mode of emotional expression.

By two weeks after birth, smiles begin to appear infrequently when the baby is awake, and more body parts are recruited into the event. The lips curl up farther, "cheek muscles contract, and the skin around the eyes wrinkles." Three-month-old babies smile much more frequently when awake, and they do so in nonrandom bursts, in response to stimuli in the environment. By the time an infant is from half a year to two years old, smiling blends with a wide variety of other facial expressions—surprise, anger, excitement. Furthermore, the facial expressions have become both more complex and individually varied. Accompanying the smile may be "nose wrinkles, jaw drops, blinks, blows, and brow raises that served to communicate affects from pleasure to mischief."[56] Thus, over two years, smiling changes in shape (and all that shape implies in terms of muscle and nerve recruitment), timing, and connection to other expressive actions. A smile is not a smile is not a smile (to butcher Gertrude Stein a bit).

At the same time that the muscles and nerves that govern smiling develop and become more complex, so too do the functions and social contexts that elicit smiling. While at birth, drowsiness and a decrease in sensory input elicits smiling, soon infants respond by smiling at familiar voices and sounds, and less regularly to touch. By six weeks, a baby smiles mostly while awake, in response to visual cues. By three to six months, a baby is more likely to smile at its mother than at inanimate objects, and by the end of the first year "smiling serves a variety of communicative functions, including the intent to flirt or do mischief."[57] At first blush, smiling seems to be a simple reflexive response, but over time it changes in complex ways—in terms of the nerves and muscles involved, but also in terms of what social situations elicit smiling and how the child uses smiling as part of a complex system of communication—

with other humans. Thus a physiological response becomes "socialized" not only in terms of intentional use but also in terms of the actual body parts (which nerves and muscles are used and what stimulates them) themselves.

Looking at the smile response as a developmental system enables us to exchange meaningless claims such as that "smiling is inborn and genetic" for carefully designed experimental studies "that systematically vary the conditions . . . which . . . may influence the form, timing and function of smiling" over different parts of the life cycle.[58] The psychologist Alan Fogel and his colleagues have used their studies of the smile response to develop what they call a dynamic systems perspective on emotion.[59] First they argue that emotions are relational rather than individual. Young infants, for example, smile in response to other people or objects. Second, they view emotions as self-organizing, stable systems. But stability does not imply permanence. Thus visual induction of the smiling response is stable in infants for three to four months, but is eventually replaced by a new stable system involving a variety of forms of physical interactions with its mother (or other caretaker).[60]

Little if any of the work on dynamic developmental systems has made its way into the study of human sexual development, but its applicability seems obvious. First, we need to stop looking for universal causes of sexual behavior and gender acquisition and instead learn more about (and from) individual difference. Second, we need to think harder about how to study sex and gender as part of a developmental system. Third, we need to become more imaginative and specific about we mean by the word *environment*. At the moment I think we are pretty clueless about the environmental components of human sexual development, but the idea provided by Fogel and others—that behaviors go through periods of instability (when they are more easily changed) and stability (when they seem fixed)—is helpful.

We do have some starting points. Since the mid-1980s, several groups of developmental psychologists have asked a set of interrelated questions about gender: What do children know about sex (the body parts), and when do they know it? Does such knowledge correlate with or affect gender-related behaviors such as differing patterns of play? A story outline has begun to emerge.[61] Psychologists have introduced the concept of a schema or schematic processing, which enable children to use rudimentary knowledge to make choices about "appropriate" play, peers, and behaviors. According to this line of thought, children adopt particular sex roles as they integrate their own sense of self with their developing gender schema, a process—like the developing smile—that takes several years. It is a reasonable (and testable) guess that during this time certain forms of bodily gender expression (such as "throwing like a girl") develop stability. But—also like the developing smile—stability need not suggest permanence, as observing top girl Little Leaguers would make quite clear.

Anybody who has observed a young child as he or she learns about the world has seen schema in operation. I remember, for example, when my toddler niece pointed at a clock with a schematic outline of an owl's face. "Owl," she proudly pronounced. I recall being amazed that she could recognize such a featureless representation when her storybooks all showed detailed drawings of these nocturnal birds. But she had internalized an owl schema, which enabled her to recognize this bird on the basis of minimal information. Beverly Fagot and her colleagues studied gender schema in children ranging in age from 1.75 to 3.25 years. They gave the kids a "gender task"—to correctly classify pictures of adults and children as "mommy," "daddy," "boy," or "girl." The younger children (those averaging about two years old) could not pass the test—that is, they apparently had no working concept of gender. The older children, however, (those averaging about 2.5 years), correctly classified both adults and children. Furthermore, those children who had developed boy-girl labels behaved differently from those who had not. The older kids, for example, preferred same-sex play groups, and girls who passed the labeling test were less aggressive.[62]

Fagot and Leinbach also observed 1.5-year-old kids at home. At this age they could neither pass gender-labeling tests nor engage in sex-typed play. By the time the children were 2.25 years old about half, called early labelers, could accurately label boys and girls. Two differences emerged between the early and late labelers. First, "parents of future early labelers gave more positive and negative responses to sex-typed toy play" and, by 2.25 years, "early labelers showed more traditional sex-typed behavior than late labelers."[63] By age 4, early and late labelers did not differ in preference for sex-stereotyped play. The early labelers maintained a greater awareness of sex stereotypes, however. Fagot and colleagues conclude that "the child's construction of a gender schema reflects back the behavioral, cognitive, and affective dimensions of the familial environment."[64]

I used to ride my bike to grade school, ruminating as I traveled the suburban New York landscape. For a time one problem in particular held my attention. I knew that boys had short hair, girls had long hair, and babies were born bald. How, I puzzled, did adults have the awesome power to declare immediately the sex of a newborn? I knew about genitalia, of course. I had an older brother, and we bathed together until I was four or five. Occasionally, also, I caught a glimpse of my father in the altogether. But I never connected such information to my puzzlement with birth announcements. Then, one day when I was about ten years old, biking home from school, the answer just

popped into my head. "So *that's* how they know," I thought. As I look back now, through feminist theory-fogged scrim, I realize that as a child, gender had been clear on my horizon many years before sex became visible.[65]

I was not alone in my confusion, just a bit slow to resolve it. In America, at least, small children seem to base their initial, rudimentary gender schema on cultural markers of gender, not knowledge of genital differences. In one study, the psychologist Sandra Bem showed 3-, 4- and 5-year-olds photographs of either a naked boy or a naked girl and then of the same child dressed either in girls' or boys' clothing. Children younger than three had a hard time labeling the naked children as a boy or a girl, but successfully used social clues—clothes and hairstyles—to classify the dressed ones.[66] About 40 percent of the 3-, 4- and 5-year-old children accurately identified sex in all the photos once they had knowledge of genitalia. The rest, however, had not yet acquired a notion of sex constancy—that is, they used gender signals such as hairstyle and clothing to decide who was a boy and who was a girl. This also meant that some of these children believed that they could become the opposite sex by dressing as one. Their own gender identity was not yet fixed.

Children's understanding of anatomical constancy didn't seem to affect sex role preferences. Instead, early gender schema proved critical. "First, children learned to label the sexes, and only later did they show strong sex-typed toy and peer preferences and knowledge about sex differences in toys and clothing." Even though children did not need a concept of sex stability to develop sex-stereotyped preferences, having such knowledge strengthened the level of such preferences. It may be that "children who can label the sexes but do not understand anatomical stability are not yet confident that they will always remain in one gender group."[67] In keeping with the above findings, older children (aged 6 to 10 years) make more extreme stereotypic gender judgments than do younger ones. Not surprisingly, they first learn to associate characteristics relevant to their own sex and only later stabilize their expectations of the other sex (see figure 9.3).[68]

FROM INDIVIDUALS TO INSTITUTIONS AND BACK AGAIN

By the time children become accomplished members of the grade and middle school social scenes, they know that they are either a boy or a girl, and they expect to remain so. How do gender-aware children "do gender"? In her important study, *Gender Play: Girls and Boys in School*, the sociologist Barrie Thorne builds an essential methodological framework for studying older children. She became increasingly unhappy, she writes, "with the frameworks of 'gender socialization' and 'gender development'" in use for work on gender in children's lives. Thorne complains that traditional ideas about gender so-

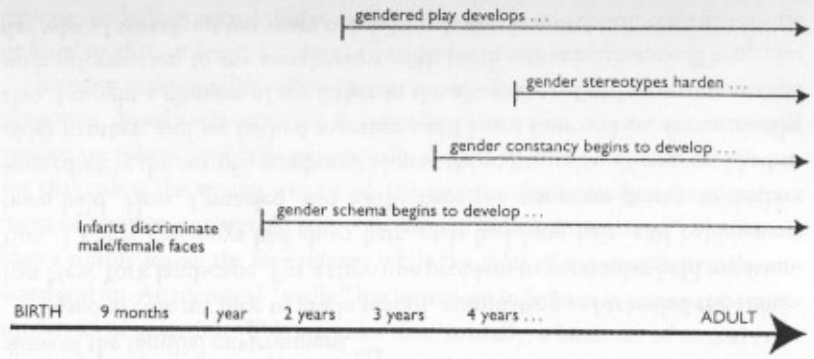

FIGURE 9.3: Stages in the development of gender specificity. (Source: Erica Warp, for the author)

cialization presume a one-way interaction from strong (the powerful adult) to weak (the passive, accepting child), and that even when granting some agency to children, social scientists have defined them as recipients, bodies acted upon by adults and the surrounding culture. Adults have "the status of full social actors," while children are "incomplete, adults-in-the-making." Thorne argues that social scientists would do better to see "children not as the next generation's adults, but as social actors in a range of institutions." Finally, and most important, traditional frameworks of gender socialization focus on the unfolding of individuals. In her work, Thorne chose to begin instead with "group life—with social relations, the organization and meanings of social situations, the collective practices through which children and adults create and recreate gender in their daily interactions"—that is, with a system and its process.[69]

By focusing on how social context and daily practice—of both children and adults—generate meaning, Thorne moves away from the question "Are girls and boys different?" and asks instead how children actively create and challenge gender structures and meanings.[70] She urges us to turn gender into a complex of concepts having to do with both individual and social structure. Furthermore, she finds it important to understand that "gender relations are not fixed . . . but vary by context" (including race, class, and ethnicity). As a feminist, Thorne's goal is to promote equity in education and beyond. Applying her approaches to the study of boys and girls, she feels, can help accomplish such ends. In a similar vein, the psychologist Cynthia García-Coll and her colleagues propose to integrate studies of gender in children with studies of race, ethnicity, and social class.[71]

Dynamic systems theorists such as Alan Fogel suggest, in principle, how

gender can move from outside to inside the body, while developmental psychologists and sociologists such as Thorne, Fagot, Bem, García-Coll, and others show how institutional gender, as well as attributes such as race and social class, might become part of individual systems of behavior. Indeed, gender is represented both within social institutions and within individuals. The sociologist Judith Lorber provides a European-American roadmap for such distinctions (see table 9.1). The institutional components of gender feed back on individual aspects; individuals interpret sexual physiology in the context of institutional and individual gender. The subjective sexual self always emerges in this complex system of gender. Lorber argues (and I agree), that "as a social institution, gender is a process of creating distinguishable social statuses for the assignment of rights and responsibilities. . . . As a *process*, gender creates the social differences that define 'woman' and 'man.' . . . Gendered patterns of interaction acquire additional layers of gendered sexuality, parenting, and work behaviors in childhood, adolescence and adulthood."[72] Thus Lorber, as well as other feminist sociologists and psychologists,[73] points out that concern with our subjective selves is not "merely" about human psychology and physiology. Rather, gendered individuals exist in social institutions strongly marked by a variety of power inequities.[74]

Although Lorber correlates institutional with individual gender, it was not her goal to show how the individual physically imbibes the institutional. But the work of sociologists and historians can provide helpful roadmaps for future work.[75] Consider the work of survey sociologists such as Kinsey and others who have followed in his footsteps. Surveying populations to learn more about human sexuality is a tricky business. On the one hand, population surveys provide us with information about gender and sexuality that can be very important in the formulation of policy issues ranging from poverty to public health.[76] On the other hand, when we create the categories that enable us to count, we bring into being new types of people.[77]

Consider the seemingly simple question: How many homosexual men and women are there in the United States? To answer it, we must first decide who is homosexual and who is heterosexual. Do we base our decision on identity? If so, we would count only those who will say, at least to themselves, "I am a homosexual" or "I am a heterosexual." Or should we count men who consider themselves fully heterosexual, but who once or twice a year get drunk, go to a gay bar, and have sex with several men— later indicating that since their urge to have such sex is so easily satisfied by such irregular encounters, they see no need to tell their wives or to apply the label "homosexual"?[78] Should we create a separate category for bisexuals, and how shall we define the true bisexual?[79] Is a man who in his early adolescence experimented once or twice

TABLE 9.1 *Lorber's Subdivision of Gender*

AS A *SOCIAL INSTITUTION*, GENDER IS COMPOSED OF:	FOR AN *INDIVIDUAL*, GENDER IS COMPOSED OF:
Gender statuses: socially recognized genders and expectations for their enactment behaviorally, gesturally, linguistically, emotionally, and physically	*Sex category:* individual assigned prenatally, at birth, or following reconstructive surgery
Gendered division of labor	*Gender identity:* the individual's sense of gendered self as a worker and family member
Gendered kinship: the family rights and responsibilities for each gender status	*Gendered marital and procreative status:* fulfillment or nonfulfillment of allowed or disallowed mating, impregnation, childbearing, and/or kinship roles
Gendered sexual scripts: the normative patterns of sexual desire and sexual behavior as prescribed for different gender statuses	*Gendered sexual orientation:* socially and individually patterned sexual desires, feelings, practices, and identifications
Gendered personalities: combinations of traits patterned by gendered behavioral norms for different gender statuses	*Gendered personality:* internalized patterns of socially normative emotions as organized by family structure and parenting
Gendered social control: the formal and informal approval and reward of conforming behavior and stigmatization and medicalization of nonconforming behavior	*Gendered processes:* "doing gender"—the social practices of learning and enacting gender-appropriate behaviors, i.e., of developing a gender identity
Gender ideology: the justification of gender statuses, often by invoking arguments about natural (biological) difference	*Gender beliefs:* incorporation of, or resistance to, gender ideology
Gender imagery: the cultural representations of gender in symbolic language and artistic productions	*Gender display:* presentation of self as a kind of gendered person through dress, cosmetics, adornments, and permanent and reversible body markers

Source: Adapted from Lorber 1994, pp. 30–31.

with another male but ever since has had sex only with women bisexual? Are people who are homosexual in prison but not on the street bisexual?[80]

By answering such questions, survey sociologists create the categories by which we organize sexual experience. As sociologists create "objective" information about human sexuality, they provide individually useful categories. The "Kinsey 6," for example, is now part of the national culture and contributes to the structuring of the psyche of some individuals, while the man who gets drunk and has homosexual sex once a year need not conceptualize himself as a homosexual because he does not have a "preference" or an "orientation" toward men.[81] None of this is to suggest that survey sociologists should close up shop. Indeed, the information they create is deeply important. But we should always hold in view the fact that surveys necessarily incorporate past ideas about gender and sexuality while at the same time creating new categories that are bound to carry both institutional and individual weight.

Historians as well as sociologists contribute to both the structure and understanding of institutional and individual gender. The psychologist George Elder, Jr., writes: "Human lives are socially embedded in specific historical times and places that shape their content, pattern, and direction. . . . Types of historical change are experienced differentially by people of different ages and roles."[82] The historian Jeffrey Weeks applies this idea to the study of human sexuality by suggesting that we study five aspects of the social production of systems of sexual expression.[83] *Kinship and family* systems and *economic and social changes* (such as urbanization, the increasing economic independence of women, and the growth of a consumer economy)[84] both organize and contribute to changing forms of human sexual expression. So, too, do new types of *social regulation*, which may be expressed through religion or the law. What Weeks calls *the political moment*, that is, "the political context in which decisions are made—to legislate or not, to prosecute or ignore—can be important in promoting shifts in the sexual regime," also profoundly contributes to individual sexual expression.[85] Finally, Weeks invokes what he calls *cultures of resistance*. Stonewall, for example, where the symbolic founding event of the gay rights movement took place, was, after all, a bar where gay men gathered for social rather than political purposes. Although, ultimately, self-identified homosexuals took to conventional political means—voting, lobbying, and political action committees—the prior existence of private spaces in which a gay subculture developed enabled such activities by making visible the potential allies with whom one might join to exact political change, while at the same time modifying individual embodiment of what came to be known as gay sexuality.[86]

Understanding the history of technology is also key to understanding the individual embodiment of contemporary gender systems. Think, for example, about the category of the transsexual. In the nineteenth century transsexuals did not exist. To be sure, men passed as women, and vice versa.[87] But the modern-day transsexual, a person who uses surgery and hormones to transform his or her birth genitals, could not have existed without the necessary medical technology.[88] The transsexual emerged as an identity or type of human, when, in exchange for medical recognition and access to hormones and surgery, transsexuals convinced their doctors that they had become the most stereotypical members of their sex-to-be.[89] Only then would physicians agree to create a medical category that transsexuals could apply in order to obtain surgical treatment.

Russian Dolls

Is there some easy way to envision the double-sided process that connects the production of gendered knowledge about the body on the one surface to the materialization of gender within the body on the other?[90] While no metaphor is perfect, Russian nesting dolls have always fascinated me. As I take apart each outer doll, I wait expectantly to see if there is yet a smaller one within. As the dolls get tinier and tinier, I marvel at the delicacy of the craft that produces successively smaller dolls. But displaying them is a dilemma. Should I leave each doll separate but visible, lined up in an ever-diminishing row? Such a display is pleasing, because it shows each component of the largest doll, but dissatisfying, because each individual doll, while visible, is empty. The complexity of the nesting is gone and, with it, the pleasure, craft, and beauty of the assembled structure. Understanding the system of nesting dolls comes not from seeing each separate doll, but from the process of assembly and disassembly.

I find the Russian nesting doll useful for envisioning the various layers of human sexuality, from the cellular to the social and historical (figure 9.4).[91] Academics can take the system apart for display or to study one of the dolls in more detail. But an individual doll is hollow. Only the complete assembly makes sense. Unlike its wooden counterpart, the human nesting doll changes shape with time. Change can happen in any of the layers, but since the entire assembly has to fit together, altering one of the component dolls requires the interlinked system—from the cellular to the institutional—to change.

While social and comparative historians write about the past to help us understand why we frame the present in particular ways (the outermost doll),

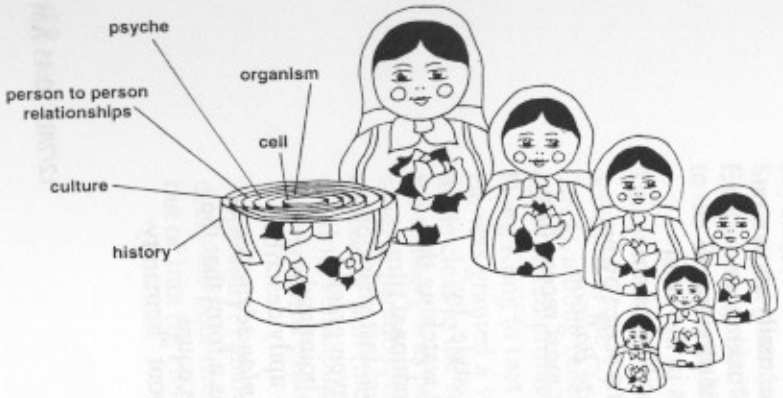

FIGURE 9.4: The organism as represented by a system of Russian stacking dolls. (Source: Erica Warp, for the author)

analysts of popular culture, literary critics, anthropologists, and some sociologists tell us about our current culture (the second largest doll). They analyze our aggregate behaviors, think about how individuals and institutions interact, and chronicle social change. Other sociologists and psychologists think about individual relationships and individual development (the third largest doll), while some psychologists write about the mind or psyche (the fourth doll in). As the location (or, as some would prefer, activity) that links events that occur outside the body to those that occur inside the organism (the second smallest doll),[92] the mind plays an important and peculiar function. The brain is a key organ in the transfer of information from outside the body in and back again, and neuroscientists of many stripes try not only to understand how the brain works as an integrated organ but also how its individual cells function. Indeed, cells compare the final, tiny doll found within the organism.[93] In different organs, cells specialize for a variety of functions. They also work as systems, their history and immediate surroundings stimulating signals for particular genes—to contribute (or not) to cellular activities.

Using Russian nesting dolls as a framework suggests that history, culture, relationships, psyche, organism, and cell are each appropriate locations from which to study the formation and meanings of sexuality and gender. Developmental systems theory, whether applied to the assembled doll or to its subunits, provides the scaffolding for thought and experiment. Assembling the smaller dolls into a single large one requires the integration of knowledge derived from very different levels of biological and social organization. The cell, the individual, groups of individuals organized in families, peer groups, cultures, and nations and their histories all provide sources of knowledge about human sexuality. We cannot understand it well unless we consider all of these components. To accomplish such a task, scholars would do well to work in interdisciplinary groups. And while it is not reasonable, for example, to ask all biologists to become proficient in feminist theory or all feminist theorists to be proficient in cell biology, it *is* reasonable to ask each group of scholars to understand the limitations of knowledge obtained from working within a single discipline. Only nonhierarchical, multidisciplinary teams can devise more complete (or what Sandra Harding calls "less false")[94] knowledge about human sexuality.

I do not naively believe that tomorrow everyone will rush out and join interdisciplinary research teams while revising their belief systems about the nature of scientific knowledge. But public controversies about sex differences and sexuality will continue to break out. Can homosexuals change? Were we born that way? Can girls do high-level mathematics and compete well in the physical sciences? Whenever these or related quandaries boil to the surface, I hope that readers can return to this book to find new and better ways to conceptualize the problems at hand.

The feminist theorist Donna Haraway has written that biology is politics by other means.[95] This book provides an extended argument for the truth of that claim. We will, I am sure, continue to fight our politics through arguments about biology. I want us never, in the process, to lose sight of the fact that our debates about the body's biology are always simultaneously moral, ethical, and political debates about social and political equality and the possibilities for change. Nothing less is at stake.