Notes and References

Caveat: *The Dangers of Behavioral Biology*

The contents of this book are known to be dangerous.

I do not mean that in the sense that all ideas are potentially dangerous. Specifically, ideas about the biological basis of behavior have encouraged political tendencies and movements later regretted by all decent people and condemned in school histories. Why, then, purvey such ideas?

Because some ideas in behavioral biology are true—among them, to the best of my knowledge, the ones in this book—and the truth is essential to wise action. But that does not mean that these ideas cannot be distorted, nor that evil acts cannot arise from them. I doubt, in fact, that what I say can prevent such distortion. Political and social movements arise from worldly causes, and then seize whatever congenial ideas are at hand. Nonetheless, I am not comfortable in the company of scientists who are content to search for the truth and let the consequences accumulate as they may. I therefore recount here a few passages in the dismal, indeed shameful history of the abuse of behavioral biology, in some of which scientists were willing participants.

The first episode is recounted in William Stanton's *The Leopard's Spots: Scientific Attitudes Toward Race in America, 1815–59* (Chicago: University of Chicago, 1960). Such names as Samuel George Morton, George Robins Gliddon, and Josiah Clark Nott mean little to present-day students of anthropology, but in the difficult decades between the death of Jefferson and the Civil War, they founded the American School of Anthropology. This movement dedicated itself to proving the inevitable separate status of the races and to placing white supremacy on a scientific foundation. They attempted to do this through the study of skulls and brain volume, combined with some "obvious" observable facts of behavior and custom—"niggerology," as one of them privately called it (Stanton, *The Leopard's Spots,* p. 161). In its more dignified public guise it was called "polygenism," a reference to the supposed separate evolutionary origins of various races. (This, incidentally, was a view that Jefferson and his intellectual circle had rejected.) Two of the three (Morton and Nott) were physicians, but their conjectures were based on so little and such silly "evidence" that it is puzzling how they succeeded.

Yet succeed they did. When they came on the scene in the early part of the nineteenth century, the views of Samuel Stanhope Smith, according to which humankind had a single origin and a single biological plan, held sway. It was the view taken by Thomas Jefferson and his circle (see Daniel Boorstin, *The Lost World of Thomas Jefferson,* Chicago: University of Chicago, 1981) and is universally accepted today. But thanks to the efforts of the American School, by the 1850s the unity of humankind was an idea

effectively dislodged from favor, linked to atavistic, religious, antiscientific sentimentalism. Miscegenation was viewed as a threat to civilization, and slavery as the logical lot of the Negro. Now no one would suppose the Civil War to have been caused by a handful of anthropologists; but they were highly respected and popular writers and lecturers, and it cannot be doubted that they deceived many. Meanwhile, their counterparts in Britain, France, and Germany laid a foundation for scientific racism that would stand firm for about a hundred years (Marvin Harris, *The Rise of Anthropological Theory*, New York: Thomas Y. Crowell, 1968, ch. 4).

The second episode involved Social Darwinism, some of which was in fact pre-Darwinian. It is recounted by George Stocking, in chapter 6, "The Dark-Skinned Savage: The Image of Primitive Man in Evolutionary Anthropology," of *Race, Culture and Evolution: Essays in the History of Anthropology* (New York: Free Press, 1968) and by Marvin Harris in chapter 5, "Spencerism," of *The Rise of Anthropological Theory.* In the latter part of the nineteenth century, most social theory was "evolutionary," but in nothing like the modern sense. Leaders of social and cultural anthropology, like Lewis Henry Morgan and Edward Tylor, although they greatly admired the "primitive" tribes and races they studied, nevertheless viewed them hierarchically, with the "less developed" or "less complex" groups as essentially frozen relics of past epochs. Marx and Engels took over this view from Morgan and made little attempt to conceal their own patronizing attitude toward pre-industrial, especially pre-state peoples.

Darwin (see Stocking, *Race, Culture and Evolution,* p. 113) and his evolutionist predecessor Charles Lyell (see Harris, *Rise of Anthropological Theory,* p. 113) both predicted the extermination of the "savage" races by the civilized ones, and did not seem to shed any tears over the process. This in an era when some of their readers were doubtless pursuing that very extermination. Morgan and Tylor's hierarchical arrangements of social and cultural forms went along with explicit presumptions of a corresponding hierarchy of mental capacity; the more complex the civilization, the greater the native intelligence of its members. Progress through improvement was the inexorable motive force, and the pinnacle of progress was the civilization of Victorian England.

How comforting these ideas must have been to the representatives of that and similar civilizations just then engaged in the difficult work of subduing, enslaving, or, where necessary, exterminating those "primitive" peoples. It is not surprising that they were easily convinced, despite the lack of evidence. Herbert Spencer, the leading exponent of social evolution, cuts a rather sad figure against this background. Always claiming to be a friend of the poor, abhorring war and the greedy rape of the underdeveloped world, Spencer was viewed by many contemporaries, as well as by later scholars, as an apologist for the worst that was going on. He, not Darwin, coined the phrase "survival of the fittest" and justified the exploitation of the weak by the strong, on the grounds that the inevitable march of progress is only held back by humane intervention in the struggle for existence. Spencer explicitly apologized for the most unrestrained capitalism, and opposed socialism and all forms of social welfare. It is not difficult to imagine his words in the minds of the Robber Barons or of the legislators who voted against child labor laws. The progress of human decency in the nineteenth century was no doubt a complex matter, but it is logical to suggest that ideas about the biology of behavior retarded that progress. (On evolutionary theories of social behavior and their consequences, see Stephan Chorover, *From Genesis to Genocide,* Cambridge: MIT, 1979, ch. 5).

The third episode took place on both sides of the Atlantic between the beginning of World War I and the end of World War II. The American side of the episode is recounted in Daniel Kevles's *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (New York: Alfred Knopf, 1985), and in the works by Kamin, Chorover, and Stocking cited

above. Although Alfred Binet, the French psychologist who originated IQ testing in 1905, had intended it as a device for identifying children who needed mental improvement through training, it began to be used a decade or so later in the United States for very different purposes. Under the auspices of Lewis Terman of Stanford and Robert Yerkes of Harvard—two leaders of American psychology—it was explicitly used to reduce immigration. Both these men believed that IQ was largely genetic, and they saw a chance to provide a much needed social service—giving the U.S. government a good excuse to stem the rising tide of immigration. Vast numbers of potential immigrants were labeled as retarded and sent away after taking intelligence tests in a language they did not understand.

Meanwhile, the behavior-genetic theories of the nineteenth century had crystallized in a clear eugenics movement in the United States. With the approval and encouragement of leading psychologists, compulsory sterilization laws were passed by the state legislatures of Pennsylvania, Indiana, New Jersey, Iowa, California, and Washington, providing for the "unsexing" of an impressive range of undesirables. In upholding the California law, the attorney general of California explicitly used the language of behavioral biology:

> Degeneracy means that certain areas of brain cells or nerve centers of the individual are more highly or imperfectly developed than the other brain cells, and this causes an unstable state of the nerve system, which may manifest itself in insanity, criminality, idiocy, sexual perversion, or inebriety.

He went on to include "many of the confirmed inebriates, prostitutes, tramps, and criminals, as well as habitual paupers" in this class, all of whose members were potentially eligible for legal castration. *The Harvard Law Review* of December 1912—by which time all these state laws had been passed—argued that they would be constitutional, but only in the case of "born criminals" (Kamin, *I.Q.*, pp. 11–12).

Retrospective criticism of these lawyers and officials has been justifiably great, but they were influenced by psychologists, biologists, and physicians who gave them a false account of the facts. These experts provided what seemed to be definitive statements in a context fraught with uncertainty. They held out false hopes for great improvements in human welfare through eugenics, and rang loud, false alarms of racial degeneracy and eugenic disaster in the event that their advice was not followed.

Given these remarkable intellectual and legal developments in the United States, the parallel movements in Germany and elsewhere in Europe seem a bit less astounding. The ideas of eugenics and racial hygiene (*Rassenhygiene*) became respectable and established in German academic and medical discourse while Hitler was still a child. In 1895 the physician Alfred Ploetz wrote *The Excellence of Our Race and the Protection of the Weak;* in 1903 Wilhelm Schallmeyer won a national prize (given by the Krupp armaments family) for his *Inheritance and Selection in the Life-History of Nationalities: A Sociopolitical Study Based upon the Newer Biology. Politisch-Anthropologische Revue* and *Archiv für Rassen und Gesellschaftsbiologie* (Archive for Racial and Social Biology), two important scholarly journals concerned with eugenics and racial purity, began publication in 1902 and 1904, respectively. In 1920 a distinguished jurist, Karl Binding, and a distinguished psychiatrist, Alfred Hoche, published *The Release and Destruction of Lives Devoid of Value*, advocating large-scale, eugenic euthanasia.

It is critical to realize how very respectable these ideas were. They had nothing to do with brown shirts, breaking glass, goose-step marches, or diabolically energized mass rallies. They had only to do with respectable scientists, physicians, and lawyers communicating soberly through the usual means of discourse. Long before the Nazi party was founded, it was widely agreed that discoveries in social biology constrained scholars to certain

beliefs. Civilization was the result of genetic determinants, and its future depended on racial purity and the relentless elimination of the unfit from the gene pool.

This was not a national but an international phenomenon. In 1923, a year before the publication of Hitler's *Mein Kampf,* a director of health in Zwickau wrote to the German minister of the interior urging the enactment of a program of eugenic sterilization: "What we racial hygienists promote is not at all new or unheard of. In a cultured nation of the first order, the United States of America, that which we strive toward was introduced and tested long ago." Still skeptical, the interior minister pursued the matter through the German Foreign Office, and after receiving an extensive report became convinced. Through the legal and judicial example set by the United States, eugenics became respectable government business in Weimar, Germany (Chorover, *Genesis,* p. 98).

Daniel Goldhagen's comprehensive and chilling account of the perpetrators, *Hitler's Willing Executioners: Ordinary Germans and the Holocaust* (New York: Vintage/Random House, 1996), shows how deeply German culture was steeped in anti-Semitism, not just in the folkview but in the highest intellectual circles. Yet ideas about the role of the Jews in what might be called "racial history" were also current in international discourse. The English historian Houston Stuart Chamberlain had argued, in such works as *Foundations of the Nineteenth Century* (originally published in German) and *Race and Nation,* that the fall and rise of nations could best be understood by reference to the introduction and removal of Jews respectively. Chamberlain's work was widely discussed among German students from the time it was first published. (See Lucy S. Dawidowicz, *The War Against the Jews, 1933–1945* [New York: Holt, Rinehart & Winston, 1975] for discussion and references.)

Alfred Rosenberg, Hitler's advisor during the early years of the Nazi movement, called Chamberlain's work "the strongest positive impulse in my youth," and prepared excerpts of *Foundations of the Nineteenth Century (Grundlage des Neunzehn Jahrhunderts)* for Hitler's easy study (Dawidowicz, *War,* p. 20). Heinrich Himmler, later and throughout the war the head of the SS and a key figure in all concentration and killing operations, read *Race and Nation (Rasse und Nation)* at the end of 1921, and wrote of it in his diary: "It is true and one has the impression that it is objective, not just hate-filled anti-Semitism. Because of this it has more effect. These terrible Jews . . ." (Dawidowicz, *War,* p. 95). The last sentence is almost poignant; it makes clear that reading Chamberlain gave Himmler an added measure of conviction.

Are the scribblings of intellectuals about behavioral biology really important in causing great and destructive social movements? We don't know in every case, but the truth is poorly served by a smug conviction that they are not. Certainly the Nazis relied heavily on racial "science," and on physicians who studied and practiced it, for the justification of their program. As shown by Robert N. Proctor, in *Racial Hygiene: Medicine Under the Nazis* (Cambridge: Harvard University, 1988), racial theories and "research," emanating from official medical and scientific institutes and journals, was of the utmost importance in giving Nazism credibility. Doctors and public health officials were a central part of the program from the beginning, and were numerically as well as intellectually the professionals most supportive of Hitler. In addition to Proctor's account, see Michael Kater's *Doctors Under Hitler,* (Chapel Hill: University of North Carolina, 1989) and Robert Jay Lifton's *The Nazi Doctors: Medicalized Killing and the Psychology of Genocide* (New York: Basic Books, 1986/2000).

Many people wonder why the Jews did not try to get out. Of course, they did, in much larger numbers than were able to do so. The rising tide of immigration to the United States after World War I was in part due to the recognition by Jews and other Europeans of ominous signs on the horizon. As mentioned above, American psychologists helped to stem

this tide. Terman, Yerkes, and others, referring to very poor research, involved themselves in the perpetration of falsehoods that laid the foundation for a much more restrictive immigration policy, formulated in the Immigration Act of 1924 and other laws. A much-quoted study was Henry Goddard's report about IQ testing of immigrants at Ellis Island, which claimed that 83 percent of the Jews, 80 percent of the Hungarians, 79 percent of the Italians, and 87 percent of the Russians were "feeble-minded" (Kamin, *I.Q.*, p. 16). These statistics were due primarily to sloppy testing and language barriers. Robert Yerkes published the results of similarly poor, "confirmatory" research, under the auspices of the United States National Academy of Sciences, in 1921.

The result in immigration policy was formidable for many ethnic groups, but for Jews it was deadly. Because of the views of American psychologists and other behavioral biologists about the genetics of mental competence, many Jews were trapped in Europe, later to become Nazi victims. Speeches and writings by respected Americans like Henry Ford and Charles Lindbergh echoed the vicious anti-Semitism pervasive in Germany, but they would have had less credibility without the assent of scientists. (The definitive work on the Holocaust remains Raul Hilberg, *The Destruction of the European Jews,* New York: Holmes & Meier, Inc., 1985. See also Hilberg's *Perpetrators, Victims, Bystanders: The Jewish Catastrophe 1933–1945,* New York: HarperCollins, 1992; Lucy Davidowicz's *The War Against the Jews* and Daniel Goldhagen's *Hitler's Willing Executioners,* cited above; and Martin Gilbert's *The Holocaust: A History of the Jews of Europe During the Second World War,* New York: Holt, Rinehart & Winston, 1985.)

Incidentally, after 1920 the role of American anthropology in these intellectual currents became a very different, rather heroic one. (See Stocking's *Race, Culture and Evolution,* ch. 11, for details.) Franz Boas had established a new and completely different "American School" of anthropology, the main thrust of which was to break decisively with the racist and evolutionist past. He and his students (among them Alfred Kroeber, Ruth Benedict, and Margaret Mead) rejected all notions of cultural hierarchy, and Boas's book *The Mind of Primitive Man* broke down the notion that mental function was correlated with civilizational complexity. Anthropologists of the Boas school placed the concepts of culture and cultural relativism at the center of the field, stressing the dignity and independent validity of all ways of life.

In the arguments over IQ, race, and eugenics that raged during the 1920s and 1930s, they opposed the psychological testers and eugenicists, stressing the mounting evidence for cultural conditioning in all dimensions of ethnicity and for the universality of human mental functions. They traveled everywhere on earth searching for evidence, sifting and organizing it into a new science of culture. As Stocking put it:

> In the long run, it was Boasian anthropology—rather than the racialist writers associated with the eugenics movement—which was able to speak to Americans as the voice of science on all matters of race, culture, and evolution—a fact whose significance for the recent history of the United States doubtless merits further exploration. (*Race, Culture and Evolution,* p. 307)

But the taint of scientific racism lingered. Konrad Lorenz, who shared the Nobel Prize in medicine and physiology in 1973 for his work in behavioral biology, and who remained an active and distinguished investigator well into the 1980s, provided an uncomfortable link with the past. As noted by Leon Eisenberg (in "The Human Nature of Human Nature," *Science* 176 [1972], pp. 123–128) and by Chorover (in *Genesis,* pp. 104–105), Lorenz wrote an article in a scholarly journal in 1940, decrying miscegenation and racial impurity as leading to degeneracy in the genetically determined aspects of

behavior and character. And he explicitly praised the Nazi state for its accomplishments against this danger. Lorenz deeply regretted and retracted these statements. He also paid a high personal price for his support of the Reich, spending years in a Soviet prison camp after his capture on the eastern front. Yet the watchword should not be "forgive and forget" but perhaps something more like "forgive and remember."

Statements made by Arthur Jensen, William Shockley, and other investigators in the late 1960s and early 1970s about race and IQ or social class and IQ rapidly passed into currency in policy discussions. Many of these statements were proved wrong, but they had already influenced some policymakers, and that influence is very difficult to recant. The sociobiology of the late 1970s was soon cited in support of neofascist movements. It must be said that there is nothing specific about these ideas that should be useful to neofascists; merely the highly visible statement that genes affect behavior, combined with an emphasis on the strict Darwinian sense of the word *fitness*. The National Socialist youth movement in Britain adopted a sort of sociobiological cant, quoting or referring to E. O. Wilson, Richard Dawkins, and others. To be sure, they had little understanding of what they read, yet they found it useful.

An early exchange of letters published in *Nature*—correspondence between Steven Rose and Dawkins, to this day English arch-rivals in the sociobiology controversy—is still of interest (S. Rose, *Nature* 289 [1981], p. 335; R. Dawkins, ibid., p. 528). Rose pointed smugly to the neofascist use of Dawkins's views, called on Dawkins to dissociate himself publicly from them, and said, almost explicitly, *I told you so.* Dawkins dissociated himself, and expressed amazement that anyone could have so misconstrued his views as to make use of them in a neofascist cause. He said explicitly that it never crossed his mind that this could happen. Now, Rose was ill-mannered, and one wonders whether he expects other scientists to conceal their findings when they turn out to be susceptible to misuse. But Dawkins's naive amazement was more distressing.

Early in the controversy, an article in *Time* magazine on sociobiology included a brief, innocuous quotation from me. I simply pointed out that not only bad human traits but also good ones such as altruism were part of our evolutionary endowment. I did not mention race or individual differences, and the rest of the article said little or nothing about either, focusing instead on universals of human nature. Yet I received a long, poignant letter from a woman who identified herself as African-American and who, despite being quite articulate, expressed thoughts and feelings that suggested mental illness. Among other things she wrote at length on the genetic and moral inferiority of African-Americans, attributing many of her own and her people's problems to this "theory." I had said nothing remotely related to the main theme of her letter, yet she had interpreted my little remark about altruism as support for her theory. She was writing in a strange spirit of collegiality and congratulation. Never since then have I underestimated the power of even a few words about behavioral biology.

What of the latest currents of thought? Are they likely to lead to, or at least encourage, further distortions of social policy? The indications are not all encouraging. Richard Herrnstein and Charles Murray published a book in 1994 clearly directed at policy, just as Jensen and others had in the 1960s and 1970s. *The Bell Curve: Intelligence and Class Structure in American Life* (New York: Free Press, 1994) teamed a psychologist with a conservative policy advocate to try to prove that both the class structure and the racial divide in the United States result from genetically determined differences in intelligence and ability. Their general assertions about genes and IQ were not very controversial, but their speculations on race were something else again.

Also in the 1990s, Phillipe Rushton has tried to couch racial differences in IQ in a theory drawn from evolutionary biology. This theory takes the concepts of *r* and *K* selec-

tion, crudely useful when applied to a vast range of living creatures considered on a continuum, and apply it to subtle differences in skull form, mental test results, and sexual behavior within our one species. This theory has no academic legitimacy and little relationship to real evolutionary theory, but it taints the whole Darwinian enterprise, strongly recalling the "scientific anthropology" of the era of slavery.

The reality is quite different. As argued by George Armelagos in his Presidential Address to the American Association of Physical Anthropologists ("Race, Reason and Rationale," *Evolutionary Anthropology* 4, 1995, pp. 103–109) race itself is a dubious concept for the human species. Obviously it is sociologically meaningful, but even in the social realm it is a constantly moving target with little or no core biological legitimacy.

The overwhelming genetic unity of our species becomes clearer all the time. We are, every one of the six billion of us, descended from a very small group of people who lived in Africa around 100,000 years ago. During almost all of that time, challenges to intelligence have been remarkably similar on every continent. There has been little or no opportunity for racial separation, and the physical variety that seems so obvious to us is just an intersection of geographic trend lines known as clines, each a gradient of variation along a particular dimension, such as nose shape, height, or skin color. You can point to any spot on earth, draw a circle around it, and call it a race, but all you will have done is arbitrarily label the local intersection of several of these clines.

The human genome project has draft-sequenced five people's genes, three women and two men, self-described as Hispanic, Asian, Caucasian, and African-American. Craig Venter, head of Celera Genomics and one of two main leaders of the project, said, "In the five Celera genomes there is no way to tell one ethnicity from another." (See chapter 17 for discussion and references.) Statistically, it has been repeatedly shown that the vast majority of human genetic variation occurs within, not between, ethnic groups (See Ryan Brown and George J. Armelagos, "Apportionment of Racial Diversity: A Review," *Evolutionary Anthropology* 10, 2001, pp. 15–20).

If this is so, why is there a persistent difference in IQ and school success among African-Americans and European-Americans? Here are a few of the reasons. Slavery was a devastating blow to African-Americans, destroying language and culture and gravely damaging family and identity. It lasted for almost three centuries, followed by another century of systematic deprivation. African slaves were virtually the only group of Americans not self-selected to come here. Twentieth-century immigrants from Africa and the Caribbean had the same racial background as the slaves but had an experience very similar to that of all other ethnic groups in U.S. history. This alone gives the lie to a genetic explanation of the problems of the descendants of former slaves.

Genetic explanations of group differences ignore the immense power of culture to govern motivation and performance. There is no culture-free test of intelligence, and mental tests have been constructed on which African-Americans outperform European-Americans. Studies have shown that even a hint of racial stereotyping in the setting of a test markedly diminishes the performance of those being stereotyped. Peer pressure is also powerful. Identifying test performance and school success as "White" has kept generations of African-Americans, especially boys, from doing well. If genes are the explanation for group differences, why do African-American girls do so much better than boys, while among European-Americans the sexes perform more similarly?

If genes are the explanation, why is there no correlation between the test performance of African-Americans and their degree of admixture of European genes? Because *sociologically* our racial designations are categorical, so that any noticeable degree of African ancestry—indeed, the label alone—exposes you to all the cultural risks associated with being Black. Why do African-American children adopted by Whites grow up performing as

well as Whites? Because they are given most of the advantages of the dominant culture. Why do the illegitimate children of Black and White American servicemen in Germany have comparable mental test scores? Because they are all brought up by German mothers, sharing most of the same cultural opportunities and disadvantages.

These are only a few of the counterarguments against ongoing, twenty-first-century racial determinism. Race is the least interesting and least significant of biological categories, yet it continues to compel the attention of many people. The most likely explanation for this is not the intrinsic merit of the subject. It is the desire to simplify the world, to justify unfair treatment of minorities, and to shore up a weak identity with a false sense of superiority. Human beings characteristically dichotomize the social world, and much of what is wrong with the world stems from this fact of human nature.

The need for vigilance continues. Anyone who investigates or writes about behavioral biology without recognizing the potential for grave misuse of it, proven many times in the last two centuries, is either a dangerous charlatan or a dangerous fool. Since the Enlightenment gave science a central place in our lives, scientific ideas have been abused. But to those who think these studies should stop, there is a clear answer: closing our eyes to biological influences cannot make them go away or prevent other people from distorting them. In fact, the distortions are made more likely by such suppression. Will there be further abuses? Of course. But can we ignore a subject so central to self-understanding? I don't think so.

Behavioral biology is a strong, dangerous physic, potentially healing if used appropriately, poisonous if not. For the great questions of race and social class, it has far more relevance to the behavior of the oppressors than it does to that of the victims. It does not show that the oppressed are inferior, but it does help explain why the oppressors are selfish, greedy, and violent. Yet other, false claims will be made for it—claims that echo the worst errors of the nineteenth and twentieth centuries. Hence, this caveat, a sort of package insert for the book, warning of the known dangers of improper use of this kind of knowledge. I would not purvey such medicine if I did not think that the human species is in a critically ill condition, needing every kind of knowledge it can get. But it would be far better for behavioral biology to disappear from view than to be applied as carelessly, as stupidly, and as destructively as it has been in the past.

A Prefatory Inquiry

p. xiii *"Unless we willfully close our eyes . . .":* Charles Darwin, *The Descent of Man, and Selection in Relation to Sex* (Princeton, N.J.: Princeton University, 1871/1981).

p. xiii "*We must recollect . . .*": Sigmund Freud, in *Collected papers,* Vol. 4, authorized translation under the supervision of Joan Riviere, ed. E. Jones (New York: Basic Books, 1959).

p. xiii *Fewer than one in ten Americans accept evolution:* Gallup, Gallup Organization Poll (November 21–23, 1991).

p. xvii *Original Tangled Wing:* Melvin J. Konner, *The Tangled Wing: Biological Constraints on the Human Spirit* (New York: Holt, Rinehart & Winston, 1982).

p. xvii *E. O. Wilson's Sociobiology:* E. O. Wilson, *Sociobiology: The New Synthesis* (Cambridge: Harvard University, 1975).

p. xvii *Critics in the 1980s:* Richard C. Lewontin, Steven P. Rose, and Leon J. Kamin, *Not in Our Genes. Biology, Ideology, and Human Nature,* 1st Ed. (New York: Pantheon, 1984); Philip Kitcher, *Vaulting Ambition: Sociobiology and the Quest for Human Nature* (Cambridge: MIT, 1985). I reviewed these two books in *Natural History* (August 1984) and in *The New York Times Book Review* (October 6, 1985), respectively. A recent collection, *Alas, Poor Darwin!* (see below) repeats many of

the same criticisms of sociobiology without taking account of fifteen years of further research. Stephen Jay Gould, one of the critics, is a gifted writer who for thirty years was a columnist for *Natural History.* If he had only read the rest of that magazine during those three decades, he would have realized that neodarwinian theory had become pervasive in natural history. The reason is simple: Young scientists by the thousands embraced it because it worked, and even when it didn't, it had tremendous heuristic power.

p. xviii *Critics appear increasingly shrill:* Hilary Rose and Steven Rose, *Alas, Poor Darwin!: Arguments Against Evolutionary Psychology* (New York: Harmony Books, 2001). This volume repeats tired criticisms, following the typical strategy of attacking the most extreme and vulnerable versions of sociobiological claims, with virtually no attention to the data. What is of interest in the book (for example, some pages on brain development) is largely irrelevant to the argument.

p. xviii *Sociobiology has triumphed:* John Alcock, *The Triumph of Sociobiology* (New York: Oxford University, 2001). This is the best brief account of how late-twentieth-century research has thoroughly vindicated this paradigm. For a serious historian's account of the controversy over the past quarter century, see Ullica Segerstråle, *Defenders of the Truth: The Battle for Science in the Sociobiology Debate and Beyond* (Oxford: Oxford University, 2000). See also Alison Jolly, "Battlefield Sociobiology: Review of 'Defenders of the Truth: The Battle for Science in the Sociobiology Debate and Beyond,'" *Science* 288 (2000), 2137.

p. xviii *Human cloning attempts have begun:* Margaret Talbot, "The Desire to Duplicate," *The New York Times Magazine* (February 4, 2001), 40–68; Nancy Gibbs, "Baby, It's You! And You, and You . . . ," *Time Magazine* (February 19, 2001), 46–57.

p. xix *Sterilization in China:* Elisabeth Rosenthal, "Scientists Debate China's Law on Sterilizing the Carriers of Genetic Defects," *The New York Times* (August 16, 1998), 10.

p. xx *The Life of Galileo:* B. Brecht, *Collected plays,* eds. R. Manheim and J. Willett (New York: Pantheon, 1972).

chapter one: *The Quest for the Natural*

This chapter uses the !Kung San as one example of the hunting-gathering adaptation that is known to have played a central role in human evolution. The best current reference on hunters and gatherers generally is Richard B. Lee and Richard Daly's *The Cambridge Encyclopedia of Hunters and Gatherers* (New York: Cambridge University, 1999). From it, myriad paths lead to a large and rich literature on this vital and once-central human adaptation. Accessible introductions to the !Kung may be found in Lorna Marshall's *Nyae Nyae !Kung: Beliefs and Rites* (Cambridge: Harvard University, 1999), Richard Lee's *The Dobe Ju/'hoansi (*New York: Harcourt Brace, 1993), and Marjorie Shostak's *Nisa: The Life and Words of a !Kung Woman* (Cambridge: Harvard University, 1982). Shostak's *Return to Nisa* (Cambridge: Harvard University, 2000) offers a personal account of their situation late in the twentieth century.

Excessive emphasis on the !Kung has been rightly criticized; many other hunting-gathering adaptations have existed or still exist, some quite different from the !Kung. Studies of the Hadza of Tanzania by James Woodburn, Kristen Hawkes, and Nicholas Blurton Jones, of the Efe Pygmies of Zaire by Robert Bailey and Nadine Peacock, of the Ache of Paraguay by Kim Hill and Magdelena Hurtado, and of the Netsilik Eskimo by Asen Balikci are among the outstanding modern investigations cited below. Critics would do well to follow these examples and do research on hunter-gatherers while they are still around to be studied. In addition to the *Cambridge Encyclopedia,* good sources on a range of hunter-gatherer societies include *Hunters and Gatherers: History, Evolution, and Social Change,*

edited by Tim Ingold, David Riches, and James Woodburn (London: Berg Publishers Limited, 1991) and *The Foraging Spectrum: Diversity in Hunter-Gatherer Lifeways,* by Robert L. Kelly (Washington, D.C.: Smithsonian Institution, 1995).

The chapter, focused on the !Kung, draws primarily on the works of Marshall *(The !Kung of Nyae Nyae* and *Nyae Nyae !Kung: Beliefs and Rites),* Lee and DeVore *(Kalahari Hunter-Gatherers),* Lee *(The !Kung San),* Howell *(Demography of the Dobe Area !Kung),* and Shostak *(Nisa: The Life and Words of a !Kung Woman* and *Return to Nisa),* as well as on my own experience and research. These and other works are cited fully in the notes.

No account of the !Kung can omit mention of their present situation. After centuries of oppression at the hands especially of whites but also of blacks in southern Africa, some now find themselves choosing either near serfdom on Bantu farms or dependency on reservations in Namibia (formerly South-West Africa), while others struggle to maintain independence. We who study them must not forget that they are in the throes of an ongoing historical crisis, now complicated by AIDS. For further information see Lee's *The !Kung San* and Edwin Wilmsen's *Land Filled with Flies,* cited in the notes. John Marshall's film *N!ai, The Story of a !Kung Woman,* shown several times on national public television, as well as his numerous other films (see *The Cinema of John Marshall,* Philadelphia: Harwood Academic, 1993, edited by Jay Ruby), vividly illustrate !Kung life. Marshall has devoted many years to helping the !Kung survive into the twenty-first century. Lee, who is professor of anthropology at the University of Toronto, and Polly Wiessner, at the University of Utah, keep up with current developments.

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p. 6 *Ethic of sharing:* Wiessner, in Wiessner and Schiefenhövel, *Food and the Status Quest;* Wiessner, *!Kung Ethnography;* Polly Wiessner, "Risk, Reciprocity and Social Influences on !Kung San Economics," in *Politics and History in Band Societies*, eds. E. Leacock and Richard B. Lee (Cambridge: Cambridge University, 1982).

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p. 9 *Weight loss in shortages:* Wilmsen, *Land Filled with Flies.*
p. 9 *Childhood illness:* Howell, *Dobe Area !Kung.*
p. 9 *Hume quotation:* David Hume, *An Enquiry Concerning Human Understanding* (Indianapolis: Hackett, 1977), 55–56.
p. 9 *Montaigne quotation:* Michel de Montaigne, "Of Cannibals," in *Complete Essays of Montaigne.* Translated by Donald M. Frame (Stanford, Calif.: Stanford University, 1957), 153. In fairness, Montaigne's quote is used effectively in the essay as a counterpoint to Plato's *Republic*, which naïvely sees an idealized city as a natural society.
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p. 10 *Keeley's book:* Lawrence H. Keeley, *War Before Civilization: The Myth of the Peaceful Savage* (New York: Oxford University, 1996).
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chapter two: *Adaptation*

An easy-to-read popular account of adaptation theory is Richard Dawkins's *The Selfish Gene,* New Edition (New York: Oxford University, 1989), and Robert Wright's delightful *The Moral Animal: Evolutionary Psychology and Everyday Life* (New York: Pantheon, 1994) brings the theory to bear on humans—including Darwin himself. John Alcock's *The Triumph of Sociobiology* (New York: Oxford University, 2001) thoroughly justifies its title with a cogent summary of current research and controversy. James and Carol Gould's *Sexual Selection* (New York: W. H. Freeman/Scientific American Library, 1989) vividly introduces the natural history of this core theoretical problem. More advanced are two books by George Williams that have bracketed a long and distinguished career: *Adaptation and Natural Selection* and *Natural Selection: Domains, Levels, and Challenges.* Edward O. Wilson's *Sociobiology* (Cambridge: Harvard University, 1975) is the best-known comprehensive text. Though widely criticized and now a quarter-century old, it is still a vital foundation. Wilson's *Consilience: The Unity of Knowledge* (New York: Alfred A. Knopf, 1998) argues for using evolution to integrate the human sciences with the rest of scientific knowledge.

The best general introductory textbook of sociobiology remains Robert Trivers's *Social Evolution* (Menlo Park, Calif.: Benjamin Cummings, 1985). Current professional summaries of research in specific areas are collected in *Behavioral Ecology: An Evolutionary Approach,* 4th Ed., edited by John R. Krebs and Nicholas B. Davies (Oxford: Blackwell, 1997). No one should criticize a new scientific approach without reading the original papers that have convinced practitioners. They are collected in T. Clutton-Brock and P. Harvey (eds.), *Readings in Sociobiology* (San Francisco: W. H. Freeman, 1978). The papers of W. D. Hamilton and Robert L. Trivers are especially noteworthy. Applications of the theory to human behavior are collected in Laura Betzig's *Human Nature: A Critical Reader* (New York: Oxford University, 1997). Darwin's *On the Origin of Species* is perhaps the only major work of nineteenth-century science that continues to be essential reading. The edi-

tion introduced by Mayr (cited in the notes) is authoritative. A modern textbook worthy of Darwin's legacy is Mark Ridley's *Evolution* (New York: Oxford University, 1997).

For a widely cited critique of adaptationist approaches see Richard Lewontin, "Adaptation," *Scientific American* 239, September 1978, and Lewontin and Stephen Jay Gould's "The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Program," *Proceedings of the Royal Society of London*, 1979, 581–588. A quarter century of controversy is analyzed, and should be laid to rest, by Ullica Sagerstråle in *Defenders of the Truth: The Battle for Science in the Sociobiology Debate and Beyond* (Oxford: Oxford University, 2000).

The basic work on the interface between theories of adaptation and of learning is Martin Seligman and Joanne Hager's *Biological Boundaries of Learning* (New York: Meredith, 1972). Various writings of psychiatrist David A. Hamburg helped set the tone for a generation of interdisciplinary research in anthropology, psychiatry, and evolutionary biology, and helped inspire this book. The banner of evolutionary psychiatry has been taken up by Randolph Nesse, Michael McGuire, and others in works cited in the notes.

What Emotions Really Are, by Paul E. Griffiths, is the best account of the emotions in evolutionary perspective. The subdiscipline of adaptationist cognitive psychology was founded by Jerome Barkow, Leda Cosmides, and John Tooby in *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* (New York: Oxford, 1992). That of evolutionary social psychology is summarized in the book of that name, edited by Jeffrey A. Simpson and Douglas T. Kendrick (Mahwah, N.J.: Lawrence Erlbaum, 1997). For a classic account of the theory and methods of ethology, see Konrad Z. Lorenz, *Foundations of Ethology* (New York: Springer-Verlag, 1981).

p. 12 *"as simple and lifeless as a crystal":* Robert E. Pollack and Charles Darwin, *On the Origin of Species by Means of Natural Selection, or the Preservation of the Favored Races in the Struggle for Life* (Collector's Edition), quoted in *New England Journal of Medicine* 337 (1997), 137.

p. 12 *Organism a gene's way of making another gene:* Richard Dawkins, *The Selfish Gene* (Oxford: Oxford University, 1976).

p. 12 *Origin of Species:* Ernst Mayr, *The Origin of Species: A Facsimile of the First Edition* (Cambridge: Harvard University, 1966).

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p. 16 *"Whatever the cause . . .":* Darwin, *On the Origin of Species,* New American Library Ed., 135.

p. 16 *Adaptation as one-size-fits-all:* Richard C. Lewontin, "Adaptation," *Scientific American* 239 (3), 213–230 (September 1978); Stephen Jay Gould and Richard C. Lewontin, "The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Programme," *Proceedings of the Royal Society of London* 205 (1979), 581–598.

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p. 28 *Other clinical phobias:* LoLordo and Droungas, "Taste Aversions."

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chapter three: *The Crucible*

My favorite book on human evolution is by Donald Johanson and Blake Edgar, *From Lucy to Language* (New York: Simon & Schuster, 1996), a spectacular large-format assembly of life-size photographs of all the most important hominid fossils discovered up to the mid-nineties, accompanied by a brief authoritative text. For the later part of the story, Ian Tattersall's *The Last Neanderthal: The Rise, Success, and Mysterious Extinction of Our Closest Human Relatives*, Revised Edition (Boulder, Colo.: Westview, 1999) is a good choice. In *Lucy's Legacy: Sex and Intelligence in Human Evolution* (Cambridge: Harvard University, 1999), Alison Jolly redresses the male bias that has affected such studies for generations. For two brief, easily readable accounts by top fossil hunters, see Richard Leakey's *The Origins of Humankind* (New York: Basic Books, 1994) and Alan Walker and Pat Shipman's *The Wisdom of the Bones* (New York: Alfred A. Knopf, 1996). In exploring the role of hunting in human experience, Matt Cartmill's *A View to Death in the Morning* (Cambridge: Harvard University, 1993) is subtle and insightful. Craig Stanford's *The Hunting Apes: Meat Eating and the Origins of Human Behavior* (Princeton, N.J.: Princeton University, 1999) has persuasively revived a central role for hunting in our evolution.

Robert Sapolsky's *A Primate's Memoir: A Neuroscientist's Unconventional Life Among the Baboons* (New York: Scribner's, 2001) is a funny paean to a quarter century of fieldwork on the African plains, combined with some of the most insightful observations ever made on wild monkeys. Karen Strier's *Primate Behavioral Ecology* (Boston: Allyn & Bacon, 2000) is a superb, brief, theoretically sophisticated introduction to our closest relatives and their significance for our evolution. The strange and varied roles of males among those animals is detailed in *Primate Males: Causes and Consequences of Variation in Group Composition* (Cambridge: Cambridge University, 2000). Frans DeWaal's *Good Natured: The Origins of Right and Wrong in Humans and Other Animals* (Cambridge: Harvard University, 1996) reviews a neglected and important positive aspect of primate life.

An excellent advanced text on human evolution is Richard Klein's *The Human Career*, 2d Ed. (Chicago: University of Chicago, 1999), and the great modern account of the background to human evolution is Robert D. Martin's *Primate Origins and Evolution* (Princeton, N.J.: Princeton University, 1990). For the latter part of human evolution, especially the Neanderthals, there are books by Erik Trinkhaus and Pat Shipman, by Christopher Stringer and Clive Gamble, and by Ian Tattersall, cited in the notes. The oldest known paintings, discovered in the 1990s, are beautifully displayed and explained in *Dawn of Art: The Chauvet Cave*, by Jean-Marie Chauvet and colleagues (New York: Harry N. Abrams, 1996). John E. Pfeiffer's *The Emergence of Culture* (New York: Harper & Row, 1982), on the great advances of the late Paleolithic, remains a valuable and original synthesis. The serious student should also consult *The Cambridge Encyclopedia of Human Evolution*, published by Cambridge University Press in 1992.

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chapter four: *The Fabric of Meaning*

Books on the brain fill libraries, and I can only mention a few. Excellent starting points are Jean-Pierre Changeux's *Neuronal Man*, 2d Ed. (Princeton, N.J.: Princeton University, 1997), a developmental approach, and John Allman's *Evolving Brains* (New York: W. H. Freeman, 1999), an evolutionary one. *The Human Brain Coloring Book*, by Marian Diamond, Arnold Scheibel, and Lawrence Elson (New York: HarperPerennial, 1985), is a wonderful exercise for the learner. Walle Nauta and Michael Feirtag's *Fundamental Neuroanatomy* (New York: W. H. Freeman, 1986) is a classic introduction to structure; Gordon Shepherd's *The Synaptic Organization of the Brain* (New York: Oxford University, 1990), a cogent account of nerve cell and circuit function; and Jack R. Cooper, Floyd E. Bloom, and Robert H. Roth's *The Biochemical Basis of Neuropharmacology* (New York: Oxford University, 1996) is the best introduction to brain chemistry. Other books are more technical. There is no shortcut to the nervous system, but it is perfectly accessible to anyone willing to invest a few hundred hours. The standard comprehensive text is *Principles of Neural Science*, by Eric Kandel, James Schwartz, and Thomas Jessell (New York: McGraw-Hill, 2000). For visual learners, the beautifully illustrated and brilliantly designed *Human Brain*, 4th Ed., by John Nolte (St. Louis: Mosby, 1999), is a feast for eye and mind. And for higher-brain functions, the indispensable collection is Michael Gazzaniga's *The New Cognitive Neurosciences* (Cambridge: MIT, 2000).

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p. 59 *". . . a sinful orchid, beautiful and guilty":* This was a personal communication to the author in 1978 at the Yakovlev Collection, Armed Forces Institute of Pathology, Washington, D.C., but Dr. Yakovlev said it to others on other occasions. During several visits that year, he was, at eighty-six, spending his days (and many evenings) with the collection he had created, over a quarter million serial sections of whole human brains. The world's largest and most complete collection of its kind, it con-

tinues to stimulate discovery. In his last years Yakovlev was fascinated by brain aging, but he was very generous to the young.

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p. 63 *Molecular sleight-of-hand:* Gerald M. Edelman and F. S. Jones, "Gene Regulation of Cell Adhesion Molecules in Neural Morphogenesis," *Acta Paediatrica* 422 (1997), 12–19; Gerald M. Edelman and F. S. Jones, "Gene Regulation of Cell Adhesion: A Key Step in Neural Morphogenesis," *Brain Research Review* 26 (1998), 337–352.

p. 64 *How does the growing axon move?:* This first question was answered in a series of experiments and an elegant theoretical model by Dennis Bray, of Cambridge University. He focused on the growth cone, a complex microscopic structure at the tip of the outgrowing axon, and discovered that growth-cone extension is basically similar to cell movement itself. This can involve actual new growth of the cell on one side, with absorption of the old cell structures on the other; a seemingly inefficient, yet successful way to move. For the process to change from movement to extension, all that is needed is for the absorption to take place just behind the growth cone, at a slower rate than the growth going on at the tip. The difference is made up by the cell body itself, providing energy and materials for construction and sending them down the axon to the growth cone. Some of the materials are vesicles—little globular structures within the cell that have surfaces similar to cell membranes. These are pulled along the inside of the cell membrane by a process not unlike the sliding of complex proteins that is the basis of muscle contraction. When the vesicles reach the growing tip, they merge with its membrane and lengthen it. The axon is slowly built at the tip, like a railroad: Dennis Bray, "Model for Membrane Movements in the Neural Growth Cone," *Nature* 244 (1973), 93–96.

p. 64 *Older mechanical view:* Marcus Jacobson, *Developmental Neurobiology* (New York: Plenum, 1978).

p. 64 *Chemospecificity:* Roger W. Sperry, "Chemoaffinity in the Orderly Growth of Nerve Fiber Patterns and Connections," *Proceedings of the National Academy of Sciences* 50 (1963), 703–710; ed. M. Edds, Jr., "Specificity and Plasticity of Retinotectal Connections," *Neuroscience Research Program Bulletin* 17:2 (1979). It must be said that chemospecificity is not on a one-to-one cell-by-cell basis. Extensions of Sperry's experiments over a period of months rather than weeks showed, for example, that if half the retina is removed in these animals the remaining half will eventually fan out its connections to take over the central brain territory vacated by the missing half. Some of these are wrong connections in Sperry's strict sense. See Edds, Jr., "Specificity and Plasticity," 245–359.

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Growth Factor," *Science* 206 (1979), 1079–1080. Such regeneration experiments do not, of course, prove that axons find their way in the normal developing embryo in the same manner. In fact, it is possible that circuits initially connect mechanically, but then influence one another chemically, so that when severed they find each other by referring back to that initial chemical handshake. But studies in cell culture show chemical gradients playing a key role even at early stages. Nerve growth factor (NGF), long known to increase the growth rate of nerves, has a chemotaxic effect as well. If all nerve cells in a culture are given a background level of NGF, and then more of it is applied to one part of the field, all cell processes will send growth cones forward at about the same rate, but those near the extra NGF turn toward it.

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chapter five: *The Several Humours*

Behavior genetics has found wide acceptance only recently. The definitive scientific summary (for now) is *Genetic Influences on Neural and Behavioral Functions,* edited by Donald Pfaff and colleagues (New York: CRC, 2000). Complementary introductions in lively prose include *Living with Our Genes,* by Dean Hamer and Peter Copeland (New York: Doubleday, 1998), and *Galen's Prophecy: Temperament in Human Nature,* by Jerome Kagan (New York: Basic Books, 1994). Central to our understanding of both human individuality and universality is the five-factor model of Paul Costa and Robert McCrae, presented mainly in articles (cited in the notes) rather than books. Other valuable accounts are David C. Rowe's *The Limits of Family Influence: Genes, Experience, and Behavior* (New York: Guilford, 1994) and *Behavioral Genetics,* 3d Ed., by Robert Plomin, John C. DeFries, Gerald E. McLearn, and Michael Rutter (New York: W. H. Freeman, 1997).

Three papers by Sandra Scarr, all in the journal *Child Development* (the first with Kathleen McCartney), are central: "How People Make Their Own Environments" (54 [1983], 424–435); "Developmental Theories for the 1990s" (63 [1992], 1–19); and "Biological and Cultural Diversity: The Legacy of Darwin for Development" (64 [1993], 1333–1353). *Schizophrenia Genesis: The Origins of Madness,* by Irving Gottesman (New York: W. H. Freeman, 1991), set a standard of how to think about these things. The field's intellectual pitfalls are cogently summarized by Richard C. Lewontin, in "Genetic Aspects of Intelligence" (*Annual Review of Genetics* 9 [1975], 387–405). Its ethical aspects, related to but separable from its intellectual accomplishments and pitfalls, are discussed in chapter 17 and in the section of the notes entitled "Caveat: The Dangers of Behavioral Biology."

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p. 90 *". . . what moves us is moods":* Walle Nauta lecturing in Neuroanatomy, Harvard-MIT Joint Program in Health Sciences and Technology, Fall 1974; from the author's notes.

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chapter sIx: *The Beast with Two Backs*

The best treatment of the behavioral differences is Eleanor Maccoby's *The Two Sexes: Growing Up Apart, Coming Together* (Cambridge: Harvard University, 1998). Worthy counterparts in psychological anthropology are by Beatrice Blyth Whiting and Carolyn Pope Edwards, *Children of Different Worlds: The Formation of Social Behavior* (Cambridge: Harvard University, 1988), and by Alice Schlegel and Herbert Barry III, *Adolescence: An Anthropological Inquiry* (New York: W. H. Freeman, 1991). Deborah Tannen, in *Gender and Discourse* (New York: Oxford University, 1994), collects some of her writings on male-female differences in discourse.

The evolutionary background to gender roles was greatly advanced by Sarah Blaffer Hrdy in *The Woman That Never Evolved* (Cambridge: Harvard University, 1981). Her themes of the centrality and flexibility of female roles in nonhuman primates were taken up by many investigators, as summarized by Shirley Strum and Linda Fedigan in their chapter of *The New Physical Anthropology: Science, Humanism, and Critical Reflection* (Upper Saddle River, N.J.: Prentice-Hall, 1999), edited by Strum, Donald Lindburg, and David Hamburg. Hrdy's 1999 book, *Mother Nature: A History of Mothers, Infants, and Natural Selection* (New York: Pantheon, 1999), is of the greatest importance in our understanding of women's reproductive roles. Two other major works on the evolutionary background of sex roles are Alison Jolly's *Lucy's Legacy: Sex and Intelligence in Human Evolution* (Cambridge: Harvard University, 1999) and Bobbi S. Low's *Why Sex Matters: A Darwinian Look at Human Behavior* (Princeton, N.J.: Princeton University, 2000). *Sexual Selection*, by James Gould and Carol Grant Gould (New York: Scientific American Library, 1989), is a graceful and beautifully illustrated account of the relevant evolutionary principles.

Biological constraints notwithstanding, little in anthropology's history is more important than its ongoing challenge to narrow views of sex roles. Margaret Mead's *Male and Female: A Study of the Sexes in a Changing World* (New York: William Morrow, 1949, 1967) remains an important document, along with later work on women cross-culturally: eds. Michelle Rosaldo and Louise Lamphere, *Woman, Culture and Society* (Stanford, Calif.: Stanford University, 1974); ed. Rayna Reiter, *Toward an Anthropology of Women* (New York: Monthly Review, 1975); Naomi Quinn, "Anthropological Studies on Women's Status," *Annual Review of Anthropology* 6 (1977), 181–225; and Carol Ember, "A Cross-Cultural Perspective on Sex Differences" in *The Handbook of Cross-Cultural Development*, eds. R. L. Monroe, R. H. Monroe, and B. Whiting (New York: Garland, 1981). Ember integrates cross-cultural findings with the psychobiology of sex differences. An illuminating account of how women in many cultures come into their own after menopause is Judith K.

Brown's "Cross-Cultural Perspectives on Middle-Aged Women," *Current Anthropology* 23 (1982), 143–156. A recent essay on sex roles in seven cultures is Serena Nanda's *Gender Diversity: Cross-Cultural Variations* (Prospect Heights, Ill.: Waveland, 2000).

Interesting anthropological collections include *Beyond the Second Sex: New Directions in the Biology of Gender,* eds. Peggy Reeves Sanday and Ruth Gallagher Goodenough (Philadelphia: University of Pennsylvania, 1990); *The Other Fifty Percent: Multicultural Perspectives on Gender Relations,* eds. Mari Womack and Judith Marti (Prospect Heights, Ill.: Waveland, 1993); *Gender at the Crossroads of Knowledge,* ed. Micaela di Leonardo (Berkeley: University of California, 1991); and *Naturalizing Power: Essays in Feminist Cultural Analysis,* eds. Sylvia Yanagisako and Carol Delany (New York: Routledge, 1995). Unfortunately, the real knowledge about sex roles in this material tends to get buried in postmodernist rhetoric.

Good antidotes include Christina Hoff Summers's *Who Stole Feminism?* (New York: Simon & Schuster, 1994) and Warren Farrell's *The Myth of Male Power* (New York: Simon & Schuster, 1993). Camille Paglia's *Sexual Personae: Art and Decadence from Nefertiti to Emily Dickinson* (New Haven, Conn.: Yale University, 1990) is a powerful account of gender as depicted in Western art and literature. Lionel Tiger's *Men in Groups,* 2d Ed. (New York: Marian Boyars, 1984) and *The Decline of Males* (New York: Golden, 1999), summarize decades of his research. Two books about sex roles in the kibbutz—one by Tiger with Joseph Shepher, entitled *Women in the Kibbutz* (New York: Harcourt Brace, 1975), and one by Melford Spiro, called *Gender and Culture: Kibbutz Women Revisited* (New Brunswick, N.J.: Transaction, 1979)—raise questions about the extent to which sex roles can be engineered. David Gilmore's *Manhood in the Making* (New Haven, Conn.: Yale University, 1990) reviews masculinity in different cultures, and Gilbert Herdt's collection, *Third Sex, Third Gender: Beyond Dimorphism in Culture and History* (New York: Zone/MIT, 1994), displays the stunning variety of transgender roles in cultures throughout the world.

An excellent brief introduction to the biology of gender is Simon LeVay's *The Sexual Brain* (Cambridge: MIT, 1993). Other sources include *Behavioral Neuroendocrinology,* eds. Jill Becker, Marc Breedlove, and David Crews (Cambridge: MIT, 1992), and Randy J. Nelson's *An Introduction to Behavioral Endocrinology* (Sunderland, Mass.: Sinauer, 1995). How the sexes diverge as childhood ends is summarized in *Adolescence and Puberty* (New York: Oxford University, 1990), edited by John Bancroft and June Machover Reinisch, both former directors of the Kinsey Institute. A skeptical account is Anne Fausto-Sterling's *Myths of Gender* (New York: Basic Books, 1985), but its claims become more difficult to sustain as time goes by.

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p. 93 *Study of 122 societies:* Roy D'Andrade, "Sex Differences and Cultural Institutions," in *The Development of Sex Differences,* ed. Eleanor E. Maccoby (Stanford, Calif: Stanford University, 1966), 178, 179, 198.

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p. 95 *Differences in cognitive abilities:* Maccoby and Jacklin, *Psychology of Sex Differences.*

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chapter seven: *The Well of Feeling*

The way we think about emotions and the brain has been permanently changed by Antonio Damasio's *Descartes' Error: Emotion, Reason, and the Human Brain* (New York: Putnam, 1994), at once an eloquent plea for the centrality of emotion in mind and a persuasive account of how it plays its role, extended and completed by his 1999 book, *The Feeling of What Happens* (New York: Harcourt Brace). Still, for an evolutionary account the only place to start is Charles Darwin's 1872 *Expression of the Emotions in Man and Animals,* annotated by Paul Ekman (New York: Oxford University, 1998). Ekman's annotations, introduction, and afterword make this great work absolutely current. Paul Griffiths's *What*

Emotions Really Are (Chicago: University of Chicago, 1997) establishes the philosophy of emotion on firm scientific ground, and Aaron Ben-Ze'ev's *The Subtlety of the Emotions* (Cambridge: MIT, 2000) gives a fine, broad overview. Michael Lewis and Jeannette Haviland's *Handbook of Emotions,* 2d Ed. (New York: Guilford, 2000), is a standard reference for psychological research.

The first comprehensive neurobiology of the emotions is Jaak Panksepp's magisterial *Affective Neuroscience: The Foundations of Human and Animal Emotions* (New York: Oxford University, 1998). *The Neuropsychiatry of Limbic and Subcortical Disorders,* by Stephen Salloway, Paul Molloy, and Jeffrey L. Cummings (Washington, D.C.: American Psychiatric Association, 1997), is a more specialized attempt to establish psychiatry on a new neurological foundation.

Joseph LeDoux's *The Emotional Brain* (New York: Simon & Schuster, 1996) reviews his important research on fear and the amygdala and gives a clear idea of how brain scientists think about emotion. Karl H. Pribram, ed., *Brain and Behavior,* Vol. 4: *Adaptation* (Baltimore: Penguin, 1969), collects many of the classic papers mentioned in this chapter. Further classic accounts by neuroanatomists are Walle Nauta and Michael Feirtag, *Fundamental Neuroanatomy* (New York: W. H. Freeman, 1986), and Paul D. MacLean, *The Triune Brain in Evolution* (New York: Plenum, 1990).

For insight into the anthropology of the emotions, the most impressive scientific study is Karl Heider's *Landscapes of Emotion: Mapping Three Cultures of Emotion in Indonesia* (New York: Cambridge University, 1991). Theoretical integrations by anthropologists include Melford Spiro's *Culture and Human Nature* (New Brunswick, N.J.: Transaction, 1994) and Gerald Erchak's *The Anthropology of Self and Behavior* (New Brunswick, N.J.: Rutgers University, 1992). Humanistic approaches, deeply individual yet compelling in their evidence of universality, include Lila Abu-Lughod's *Veiled Sentiments: Honor and Poetry in a Bedouin Society* (Berkeley: University of California, 1986), Unni Wikam's *Managing Turbulent Hearts: A Balinese Formula for Living* (Chicago: University of Chicago, 1990), and Marjorie Shostak's two books, *Nisa: The Life and Words of a !Kung Woman* (Cambridge: Harvard University, 1981) and *Return to Nisa* (Cambridge: Harvard University, 2000).

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chapter eight: *Logos*

A graceful and lucid book on the nature of language is *Lingua ex Machina: Reconciling Darwin and Chomsky with the Human Brain,* by William Calvin and Derek Bickerton (Cambridge: MIT, 2000), an exchange of letters and collaboration between a brain scientist and a linguist that attempts with some success to locate language in the brain. Steven Pinker's *The Language Instinct* (New York: Morrow, 1994) is a classic account of the universals of language, how language develops, and how it may have evolved. Equally influential for my thinking have been Eric Lenneberg's *Biological Foundations of Language* (New York: John Wiley & Sons, 1967), the first comprehensive statement of the biological approach, Terence Deacon's *The Symbolic Species: The Co-Evolution of Language and the Brain* (New York: W. W. Norton, 1997), and Sue Savage-Rumbaugh and Roger Lewin's account of ape language, *Kanzi: The Ape at the Brink of the Human Mind* (New York: John Wiley & Sons, 1994). Norman Geschwind's "Language and the Brain," *Scientific American* 226 (1972, pp. 76–83), remains a concise, readable statement of the anatomical essentials. For comprehensive and current treatment of the brain functions involved, see Brian Kolb and Ian Q. Whishaw, *Fundamentals of Human Neuropsychology* (New York: W. H. Freeman, 1996).

Roger Brown's *A First Language: The Early Stages* (Cambridge: Harvard University, 1973) is a classic account of language acquisition, and John Locke's *The Child's Path to Spo-*

ken Language (Cambridge: Harvard University, 1993) contextualizes the process in the intensity of early relationships. *Language Socialization Across Cultures*, edited by Bambi B. Schieffelin and Elinor Ochs (Cambridge: Cambridge University, 1986), reviews child language in varied anthropological settings. The four-volume *Universals of Human Language*, edited by Joseph Greenberg, Charles A. Ferguson, and Edith A. Moravcik (Stanford, Calif.: Stanford University, 1978), is a monument to the common regularities of language throughout the world. Bernard Comrie's work, exemplified by *Language Universals and Linguistic Typology* (Chicago: University of Chicago, 1989), reviews and extends this research.

Noam Chomsky helped create modern thinking about language, and his most accessible account is *Language and Problems of Knowledge: The Managua Lectures* (Cambridge: MIT, 1988). An exchange of immense interest is *Language and Learning: The Debate Between Jean Piaget and Noam Chomsky*, edited by Massimo Piattelli-Palmarini (Cambridge: Harvard University, 1980). It includes views by Jerry Fodor, Hillary Putnam, Marvin Minsky, Jean-Pierre Changeux, and other leading theorists of mind, all commenting (civilly, no less) on one another's views. Charles Hockett's accessible article "The Origin of Speech," *Scientific American* 203:3 (1960, pp. 88–111), has influenced the outlook of most anthropologists. For a still valuable traditional presentation of the viewpoint of anthropological linguistics see Edward Sapir, *Language* (New York: Harcourt, Brace & World, 1949). An excellent current text is Alessandro Duranti's *Linguistic Anthropology* (Cambridge: Cambridge University, 1997).

The old nineteenth-century ban notwithstanding, worthwhile theories of the evolution of language include Bickerton's *Language and Species* (Chicago: University of Chicago, 1990) and Merlin Donald's *Origins of the Modern Mind* (Cambridge: Harvard University, 1991). Attempts to model language evolution anatomically include Patricia Greenfield's "Language, Tools, and Brain: The Ontogeny and Phylogeny of Hierarchically Organized Sequential Behavior," *Behavioral and Brain Sciences* 14 (1991, pp. 536–595) and Calvin and Bickerton's *Lingua ex Machina*, cited above. Finally, Irene Pepperberg's *The Alex Studies: Cognitive and Communicative Abilities of Grey Parrots* (Cambridge: Harvard University, 1999) provides the intellectually bracing, indeed humbling experience of trying to figure out how a creature far removed from the primates, with a very different brain, can achieve a flexible grasp of words and concepts and use them in conversations.

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chapter nine: *Rage*

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Good collections with varied emphases include *Human Aggression,* edited by Russell G. Geen and Edward Donnerstein (New York: Academic, 1998), *Rage, Power, and Aggression,* edited by Robert A. Glick and Stephen P. Roose (New Haven, Conn.: Yale University, 1993), and *Family Violence,* edited by Lloyd Ohlin and Michael Tonry (Chicago: University of Chicago, 1989)—although the latter precedes the important work of Daly and Wilson. *The Anthropology of War: A Bibliography,* by Brian Ferguson and Leslie Farragher (New York: Harry Frank Guggenheim Foundation, 1988), is a good place to begin research on that subject, but the essential facts are set forth in Lawrence H. Keeley's *War Before Civilization: The Myth of the Peaceful Savage* (New York: Oxford University, 1996), a convincing plea for honesty about the archaeological record. R. Brian Ferguson's *War in the Tribal Zone: Expanding States and Indigenous Warfare* (Santa Fe, N.M.: School of American Research, 1992) deals with traditional warfare in tribes becoming states. *Sick Societies,* by Robert Edgerton (New York: Free Press, 1992), is an extended, empirical critique of Rousseau's naïve view of primitive cultures, and it should lay that view permanently to rest. Irenäus Eibl-Eibesfeldt's *The Biology of Peace and War* (London: Thames & Hudson, 1979) remains a valuable reference and is particularly good on the German ethnographic literature often ignored in English-language treatments.

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comparative overview. David Hamburg, a psychiatrist whose papers are cited in the notes, pioneered the serious study of the evolution of human aggression. Joseph Popp and Irven DeVore provided an early sociobiological perspective in "Aggressive Competition and Social Dominance Theory," in *The Great Apes,* edited by David A. Hamburg and Elizabeth R. McCown (Reading, Mass.: Benjamin Cummings, 1979). Monkey and ape reconciliation behavior is summarized in Frans de Waal's *Peacemaking Among Primates* (Cambridge: Harvard University, 1989) and in his *Good Natured: The Origins of Right and Wrong in Humans and Other Animals* (Cambridge: Harvard University, 1996). Although not the viewpoint taken here, the thesis that human aggression is purely learned is defended by Ashley Montagu in *The Nature of Human Aggression* (New York: Oxford University, 1976) and by a group using the invented name John Klama, in *Aggression: Conflict in Animals and Humans Reconsidered* (New York: John Wiley & Sons, 1988). But as an antidote, see my review in *Nature* 333, June 2, 1998 (p. 405).

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chapter ten: *Fear*

Joseph LeDoux's *The Emotional Brain* (New York: Touchstone, 1996) summarizes elegant experiments on the role of the amygdala in learned fear, and extends them to form a current account of the physiology of this and other emotions. Jeffrey A. Gray's *The Neuropsychology of Anxiety* (New York: Oxford University, 2000) is a more advanced account. A classic treatment of this subject is Gray's earlier book, *The Psychology of Fear and Stress* (New York: McGraw-Hill, 1987). It is outdated in some concepts of evolutionary biology but has the virtue of attempting a synthesis of all aspects of science pertinent to fear. *Fears, Phobias, and Rituals,* by Isaac Marks (New York: Oxford University, 1987), is a good introduction to the clinical phenomena, informed by evolutionary ideas.

Freud's short book *The Problem of Anxiety* (New York: W. W. Norton, 1963; also published as *Inhibitions, Symptoms, and Anxiety*) remains vitally illuminating, as does Donald O. Hebb's classic essay "On the Nature of Fear," published in *Psychological Review* (53, pp. 259–276) in 1946. One classic account of the fears of childhood is included in John Bowlby's *Attachment and Loss,* 3 Vols. (New York: Basic Books, 1970–1980). Modern psychiatric views of anxiety and its disorders are given by Donald Goodwin in *Anxiety* (New York: Oxford University, 1986) and by Aaron Beck, Gary Emery, and Ruth L. Greenberg in *Anxiety Disorders and Phobias* (New York: Basic Books, 1985).

Jerome Kagan's two decades of research on children's timidity has transformed our understanding of the genetics and development of this trait and its opposite, boldness. His *Galen's Prophecy: Temperament and Human Nature* (New York: Basic Books, 1994) summarized much of this work. Ned Kalin's 1993 precis, "The Neurobiology of Fear" (*Scientific American* 268:5, 94–101), takes a different experimental approach using nonhuman primates. Randolph Nesse, an evolutionary psychiatrist, has done interesting theoretical work on the adaptive functions of anxiety and phobia, cited in the notes, and Michael McGuire and Alfonso Troisi treat the same subject very effectively in their *Darwinian Psychiatry* (New York: Oxford University, 1998).

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chapter eleven: *Joy*

Joy remains the most poorly studied human emotion, being as elusive for investigators as for everyone else. The burgeoning new field of positive psychology was the subject of a special issue of the *American Psychologist,* 55:1 (January 2000), edited by Martin Seligman and Mihaly Csikszentmihalyi. The most original modern work is Csikszentmihalyi's *Flow: The Psychology of Optimal Experience* (New York: HarperCollins, 1990). An excellent and comprehensive set of psychological papers, including summaries of the relevant brain science, is *Well-Being: The Foundations of Hedonic Psychology,* edited by Daniel Kahneman, Ed Diener, and Norbert Schwarz (New York: Russell Sage Foundation, 1999). A companion volume, by Ed Diener and Eunkook M. Suh entitled *Culture and Subjective Well-Being* (Cambridge: MIT, 2000), presents the cross-cultural evidence. These books will greatly advance the field. A good collection focused on psychodynamics is *Pleasure Beyond the Pleasure Principle,* edited by Robert A. Glick and Stanley Bone (New Haven, Conn.: Yale University, 1990).

The indispensable book about human play is Brian Sutton-Smith's *The Ambiguity of Play* (Cambridge: Harvard University, 1997), although, as the title implies, play is not always joyful. Robert Fagen's superb evolutionary overview, *Animal Play Behavior* (New York: Oxford University, 1981), is a classic and still vital source, and Mark Bekoff and John Byers's collection, *Animal Play* (Cambridge: Cambridge University, 1998), updates it by two decades. Modern psychology has gone far in explaining the neurology of joy through brain-reward systems; James Olds's classic summary is cited in the notes along with recent studies.

Barbara Fredrickson's "broaden and build" model is developed in "What Are Positive Emotions Good For?" in the *Review of General Psychology* 2 (1998). A more specifically Darwinian view is Jerome Barkow's "Happiness in Evolutionary Perspective," cited in the notes. Important reflections on the functional value of even misguided positive emotions are found in Lionel Tiger's *Optimism: The Biology of Hope* (New York: Simon & Schuster, 1979) and Shelley Taylor's *Positive Illusions: Creative Self-Deception and the Healthy Mind* (New York: Basic Books, 1989). George Vaillant's books, *Adaptation to Life* (Boston: Little, Brown, 1977) and *The Wisdom of the Ego* (Cambridge: Harvard University, 1993), teach us by example that our power to make our lives happier and better, in spite of pain and stress, can be far more than mere illusion.

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chapter twelve: *Lust*

Lust and its behaviors have proved surprisingly accessible to scientific study. Simon LeVay's *The Sexual Brain* (Cambridge: MIT, 1993) makes a graceful, excellent starting point for the neuroscience, but the definitive book on mechanism is Donald Pfaff's *Drive: Neurobiological and Molecular Mechanisms of Sexual Motivation* (Cambridge: MIT, 1999). *Behavioral Endocrinology*, edited by Jill Becker, Marc Breedlove, and David Crews, (Cambridge: MIT, 1992) and *Reproduction in Context: Social and Environmental Influences on Reproduction*, by Kim Wallen and Jill Schneider (Cambridge: MIT, 2000) broaden the perspective.

A fine collection of studies on the effects of age and culture is *Sexuality Across the Life Course*, edited by Alice Rossi (Chicago: University of Chicago, 1994). The classic introduction to the evolutionary dimensions of the subject is Donald Symons's *Evolution of Human Sexuality* (New York: Oxford University, 1979). David Buss's *Evolution of Desire: Strategies of Human Mating* (New York: Basic Books, 1994) shows just how prescient Symons was. Any doubt about the applicability of Darwinian sexual-selection theory to human beings should be dispelled by the papers in two collections: *Human Reproductive Behavior: A Darwinian Perspective*, edited by Laura Betzig, Monique Borgerhoff Mulder, and Paul Turke (Cambridge: Cambridge University, 1988); and *Human Nature: A Critical Reader*, edited by Betzig (New York: Oxford University, 1997). Engaging evolutionary overviews are Natalie Angier's *Woman: An Intimate Geography* (New York: Anchor/Random House, 1999) and Jared Diamond's *Why Is Sex Fun? The Evolution of Human Sexuality* (New York: Basic Books, 1997).

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classic accounts, but we now at last have a worthy modern counterpart: *The Social Organization of Sexuality: Sexual Practices in the United States*, by Edward Laumann et al. (Chicago: University of Chicago, 1944). This work was summarized briefly and with clearer charts in *Sex in America: A Definitive Survey*, by Robert Michael et al. (New York: Little, Brown, 1994). Philip Blumstein and Pepper Schwartz's *American Couples: Money, Work, and Sex* (New York: William Morrow, 1983) remains a superb account of the real lives of hetero- and homosexual couples. The best general overviews of sexual orientation are Simon LeVay's *Queer Science: The Use and Abuse of Research into Homosexuality* (Cambridge: MIT, 1997) and *Being Homosexual: Gay Men and Their Development*, by Richard Isay (New York: Farrar, Straus, & Giroux, 1989).

The most interesting six pages I have read on the emergence of sexual interest is "Rethinking Puberty: The Development of Sexual Attraction," by Martha McClintock and Gilbert Herdt, in *Current Directions in Psychological Science* 5 (1996, pp. 178–183). Herdt's collection, *The Third Sex*, cited in Chapter 6, is the definitive account of transgender roles cross-culturally. Nancy Etcoff's *Survival of the Prettiest: The Science of Beauty* (New York: Doubleday, 1999) is the best overview of this fascinating and increasingly rigorous field. The honest but often unsuccessful effort of Catholic priests to suppress their sexual instincts is detailed in Richard Sipe's remarkable book *A Secret World: Sexuality and the Search for Celibacy* (New York: Brunner/Mazel, 1990). Last but not least, no one with a serious interest in sex should fail to read William H. Masters and Virginia E. Johnson's *Human Sexual Response* (Boston: Little, Brown, 1966), a source of crucial information and a turning point in the history of sex research.

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chapter thirteen: *Love*

The near-definitive work on the evolution of motherhood is Sarah Blaffer Hrdy's *Mother Nature: A History of Mothers, Infants, and Natural Selection* (New York: Pantheon, 1999). It complements John Bowlby's enduring three-volume classic, *Attachment and Loss* (New York: Basic Books, 1970–1980), which successfully integrated animal and human attachment in an evolutionary context for the first time. *The Handbook of Attachment*, edited by Jude Cassidy and Philip Shaver (New York: Guilford, 1999), brings the subject up to date. Important contributions to our grasp of attachment in animals have come from Konrad Lorenz, Harry F. Harlow, Robert Hinde, Patrick Bateson, Peter Klopfer, Leonard Rosenblum, and Stephen Suomi, whose papers are cited in the notes and described in the text. Harry Harlow's short book *Learning to Love* (San Francisco: Albion, 1971) is a brief overview of his lifetime of discoveries about attachment in infant monkeys. Two accounts of human infants' relationships that focus on interaction rather than attachment are Daniel Stern's superb treatise, *The Interpersonal World of the Infant* (New York: Basic Books, 1985), and Philippe Rochat's fine collection, *Early Social Cognition* (Mahwah, N.J.: Lawrence Erlbaum, 1999). These form a counterpoint to the notion that love is all you need.

On the subject of romantic attachment, there is no more beautiful or illuminating work than Ethel Spector Person's *Dreams of Love and Fateful Encounters: The Power of Romantic Passion* (New York: W. W. Norton, 1988), which combines a common-sense psychoanalytic approach with a remarkable literary and humane sensibility. Diane Ackerman's *A Natural History of Love* (New York: Random House, 1994) is more history than natural history, but it gives a good account of the annals of love in the West. For real natural history, a good place to start is Helen Fisher's *The Anatomy of Love: The Natural History of Monogamy, Adultery, and Divorce* (New York: W. W. Norton, 1992). Great strides in our understanding of the physiology of love and the pair bond have been made by Daniel Lehrman, Sue Carter, Stephen Porges, and especially Thomas Insel, in works cited in the notes.

Evolutionary theory has helped to explain altruism and cooperation in a relentlessly competitive universe. The applicability of this kind of theory to human life is best appreciated through Laura Betzig's fine collection, *Human Nature: A Critical Reader* (New York: Oxford, 1997). The original theoretical contribution was by W. D. Hamilton, "The Genet-

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chapter fourteen: *Grief*

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The definitive account of the relationship between mood swings and creativity is *Touched with Fire: Manic-Depressive Illness and the Artistic Temperament* (New York: Free Press, 1993) by Kay Redfield Jamison. An excellent overview of grief in the literal sense is John Archer's *The Nature of Grief: The Evolution and Psychology of Reactions to Loss* (London: Routledge, 1999). It brings the loss part of John Bowlby's *Attachment and Loss* (New York: Basic Books, 1970–1980) up to date through the 1990s, in both evolutionary and psychological terms. Ernest Becker's classic, *The Denial of Death* (New York: Macmillan, 1973), is a psychoanalytic and existential account of the pervasive effect of our knowledge of death on the way we live our lives. To understand the sad reality of dying itself, read *How We Die* (New York: Knopf, 1994), an unflinching yet eloquent account by surgeon Sherwin Nuland; it isn't pretty. A. Alvarez, in *The Savage God* (New York: Random House, 1970), provides an exceptionally literate, eloquent, and sensitive view of suicide.

On the nature of divorce and separation, one cannot do better than Diane Vaughan's *Uncoupling: Turning Points in Intimate Relationships* (New York: Oxford University, 1986), a common-sense, systematic, largely positive view of this increasingly common loss. The demographic benchmark is Andrew Cherlin's *Marriage, Divorce, Remarriage* (Cambridge: Harvard University, 1992). *Solitude: A Return to the Self* (New York: Free Press, 1988) is Anthony Storr's graceful demonstration of the therapeutic value of solitude, a state entirely different from loneliness.

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Chapter 15: *Gluttony*

Gerard P. Smith's collection, *Satiation: From Gut to Brain* (New York: Oxford University, 1998), is a good place to start for the science of what ends eating—or fails to. Several major papers on the physiology of hunger and satiety appeared in the journal *Science* 280:5368 (May 29, 1998). "Neuroendocrine Responses to Starvation and Weight Loss," by Michael W. Schwartz and Randy J. Seeley (*New England Journal of Medicine* 336, 1302–1311), is an elegant overview of how the body foils efforts to starve it. A brief account of what makes an animal (or person) stop eating is provided by Gerard Smith, "The Direct and Indirect Control of Meal Size," in *Neuroscience and Biobehavioral Reviews* 20 (1996), 41–46.

A classic account of the psychology of obesity is *Obese Humans and Rats*, edited by Stanley Schachter and Judith Rodin (Potomac, Md.: Lawrence Erlbaum, 1974). Medical aspects of the problem are reviewed in Derek Chadwick and Gain Cardew, eds., *The Origins and Consequences of Obesity* (New York: John Wiley & Sons, 1996). Insights into "nervous eating" are given by Josephine Wilson and Michael Cantor in "An Animal Model of Excessive Eating," *Journal of the Experimental Analysis of Behavior* 47 (1987), 335–346. At the other end of the spectrum, Joan Jacobs Brumberg's *Fasting Girls: The History of*

Anorexia Nervosa (Cambridge: Harvard University, 1988) provides an absorbing history of what is mainly a twentieth-century disorder. Félix Larocca's collection, *Eating Disorders* (San Francisco: Jossey-Bass, 1986), remains a good, concise introduction to the clinical issues.

Food and the Status Quest, edited by Polly Wiessner and Wulf Schiefenhövel (Providence/Oxford: Berghahn Books, 1996), is a highly original collection showing how people and apes use food to create relationships and exert control. Hunter-gatherers are central to our understanding of the human relationship to accumulation, and the foundation for modern studies was laid by Richard Lee and Irven DeVore in *Man the Hunter* (Chicago: Aldine de Gruyter, 1968). The field was advanced by Bruce Winterhalder and Eric Alden Smith in *Hunter-Gatherer Foraging Strategies: Ethnographic and Archeological Analyses* (Chicago: University of Chicago, 1981) and Francis Dahlberg's *Woman the Gatherer* (New Haven, Conn.: Yale University, 1981). The culmination of twentieth-century research is Richard Lee and Richard Daly's *Cambridge Encyclopedia of Hunters and Gatherers* (Cambridge: Cambridge University, 1999). For a view of life in societies where maximizing wealth is not the principal goal, see Marshall Sahlins, *Stone Age Economics* (Chicago: Aldine de Gruyter, 1972); a more balanced view is Stuart Plattner's *Economic Anthropology* (Stanford, Calif.: Stanford University, 1989).

For a view of childhood in a culture in which maximizing wealth *is* the principal goal, see Robert Coles's *Privileged Ones: The Well-Off and the Rich in America* (Boston: Atlantic-Little, Brown, 1977). Robert Frank's *Luxury Fever: Why Money Fails to Satisfy in an Era of Excess* (New York: Free Press, 1999) analyzes the background and human consequences of out-of-control consumption and conspicuous display of wealth in contemporary America. John Kenneth Galbraith's writings have, for over half a century, gently and gracefully called our attention to the excesses of corporate capitalism and the people it leaves behind—most recently, *The Culture of Contentment* (New York: Houghton Mifflin, 1993) and *The Good Society: The Humane Agenda* (New York: Houghton Mifflin, 1997).

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Chapter 16: *Change*

Laws of learning persist intact, although research on them is no longer popular. For a basic account of those laws and the facts that support them, I like Michael Domjan's *Essentials of Conditioning and Learning* (Pacific Grove, Calif.: Brooks Cole, 1996). An approach through major theorists is B. R. Hergenhahn and Matthew H. Olson's *Introduction to Theories of Learning* (Englewood Cliffs, N.J.: Prentice-Hall, 1993). On learning in children, the classic by Albert Bandura and R. H. Walters, *Social Learning and Personality Development* (New York: Holt, Rinehart & Winston, 1963), is still worth reading. Another landmark work is *Biological Boundaries of Learning*, edited by Martin Seligman and Joanne Hager (New York: Meredith, 1972). Recent emphasis on cognition, linguistics, evolution, and genetics has led to a decreased emphasis on traditional studies of learning, partly due to past excessive claims for the power of learning theory. Perhaps fruitless controversy will now give way to a more synthetic approach.

Ulric Neisser's *Memory Observed* (San Francisco: W. H. Freeman, 1982) is a classic on the natural history of memory, and Charles A. Nelson's collection, *Memory, Affect, and Development* (Hillsdale, N.J.: Lawrence Erlbaum, 1993) introduces important perspectives on childhood memory and its role in identity formation. To some extent the effects of early experience are separate from traditional learning theory. Victor H. Denenberg's *The Development of Behavior* (Stamford, Conn.: Sinauer, 1972) is a collection of key papers in this field, introduced by a leading practitioner. For the contributions of anthropology to the effects of experience on development, see the *Handbook of Cross-Cultural Development*, edited by Ruth H. Monroe, Robert L. Monroe, and Beatrice B. Whiting (New York: Garland, 1981).

Work in the late 1990s promises to lead cultural anthropology out of its dark night of wandering in the postmodern wilderness. The best recent theoretical books are Dan Sperber's *Explaining Culture: A Naturalistic Approach* (Oxford: Blackwell, 1996) and Bradd Shore's *Culture in Mind* (New York: Oxford University, 1996). In *Culture: The Anthropologist's Account* (Cambridge: Harvard University, 1999), Adam Kuper offers the most cogent explanation of the concept by tracing its modern history. The definitive work on cultural evolution is William Durham's *Coevolution: Genes, Culture, and Human Diversity* (Stanford, Calif.: Stanford University, 1991).

Studies of the physiology of learning and memory abound. The advanced reader should consult sections on plasticity and memory in Michael Gazzaniga's collection, *The New Cognitive Neurosciences*, 2d Ed. (Cambridge: MIT, 2000). An accessible account of the modern science of memory is Daniel Schacter's *Searching for Memory: The Brain, the Mind, and the Past* (New York: HarperCollins, 1997). For a wisely skeptical summary of the effects of early experience in children, see John T. Bruer's *The Myth of the First Three Years* (New York: Free Press, 1999).

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Chapter 17: *The Invisible Galaxy*

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There are many graceful, intelligent books about the fate of the earth and its inhabitants, but my favorites are Edward O. Wilson's *Biophilia* (Cambridge: Harvard University, 1986), James Gustafson and Frederick Blumer's *A Sense of the Divine: The Natural Environment from a Theocentric Perspective* (Cleveland: Pilgrim, 1994), and Ursula Goodenough's *The Sacred Depths of Nature* (New York: Oxford University, 1998). *An Essay on Population*, by Thomas Malthus (New York: Penguin, 1985, orig. 1798), remains a compelling read more than two centuries after its publication, easily justifying Darwin's admiration. Paul Ehrlich's *Human Natures* (Washington, D.C./Covelo, Calif.: Island Press, 2000) and Ed Ayres's *God's Last Offer: Negotiating for a Sustainable Future* (New York: Four Walls Eight Windows, 1999) are good antidotes to twenty-first-century population complacency. The science of the biosphere is gracefully explained in Vaclav Smil's *Cycles of Life: Civilization and the Biosphere* (New York: Scientific American Library, 2001).

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