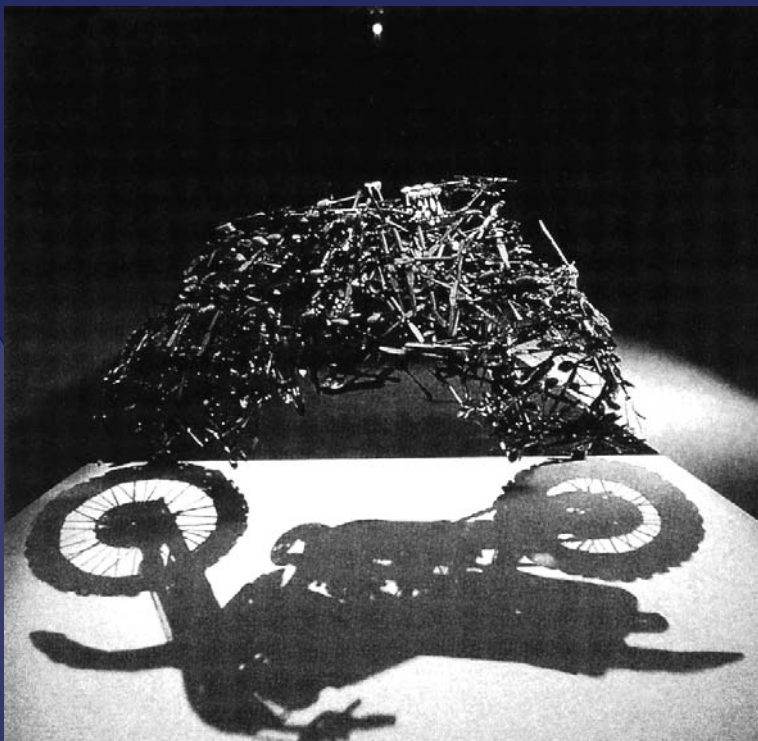


PETER LANG

Biology After the Sociobiology Debate



WHAT INTRODUCTORY TEXTBOOKS
SAY ABOUT THE NATURE
OF SCIENCE AND ORGANISMS

CARMEN JAMES SCHIFELLITE

This book analyzes the sociobiology debate and details a number of contested issues that have emerged. These issues focus on the interpretations and emphases that both sides have placed on the role of adaptation in evolution; the importance of evolution at the level of the gene versus at the level of organisms and populations; reductionism as a research method; simple Mendelianism versus more complex understandings of the relationship between genotype and phenotype; and ultimately, the nature of science itself.

The book includes textual analyses of a selection of university-level introductory biology textbooks written between 1990 and 2010, examining the ways these texts—with their photos, inserts, and various rhetorical devices—cover sociobiology specifically, and animal behavior in general; evolutionary theory; genetic theory; and the nature of science.

Biology After the Sociobiology Debate shows how, over the last two decades, sociobiology and the ensuing debates have influenced biological theory about the natures of science and the behavior of organisms, and how that influence is expressed in introductory textbooks. This book is important not just as a sociology of knowledge study, but also because of the ways in which continued biodeterminist discourses may influence debates and policy that are emerging around a new liberal or consumer-based eugenics movement.

“Carmen James Schiffellite has produced a remarkably suggestive study of the way(s) in which sociobiology, a newly christened field in 1975, became incorporated into mainstream college biology textbooks and curriculum. [He] has done a marvelous job of integrating a variety of issues surrounding sociobiology and its critics...A must read for all biologists, textbook authors, and educators.”—*Garland E. Allen, Professor of Biology, Washington University in St. Louis*

“An insightful account of the social construction of the increasingly popular and pervasive paradigm of sociobiology. Dr. Schiffellite’s critical analysis...should be read not only by biology teachers, but anyone concerned about misleadingly reductive explanations of human behavior.”—*D. W. Livingstone, Canada Research Chair in Lifelong Learning and Work; Professor Emeritus, Department of Sociology and Equity Studies OISE/UT, University of Toronto*

“How does a scientific field of study develop, establish legitimacy, defend its truth claims against those who would contest them, and change over time? And how are the complexities of these changing claims and contestations best translated into scientific textbooks? Carmen James Schiffellite engages these questions in his impressive account of the development of sociobiology and its successor sciences...This is a must read for anyone who cares about the quality of scientific debate and wishes to read or write scientific texts intelligently.”—*Susan McKinnon, Professor of Anthropology, University of Virginia*

“Carmen James Schiffellite deftly takes the reader below the surface of a scientific controversy so that a higher level of intellectual discourse can take place within and about biology textbooks and beyond. A remarkably rich theoretical and practical book for biologists, sociologists, and educators.”—*John Novak, Professor of Education, Graduate and Undergraduate Program, Faculty of Education, Brock University*

CARMEN JAMES SCHIFFELLITE is Assistant Professor in the Department of Sociology at Ryerson University in Toronto. His writing and research includes work in the sociology of knowledge, the sociology of science, science and technology studies, and science and engineering education.

Advance praise for BIOLOGY AFTER THE SOCIOBIOLOGY DEBATE

“Carmen James Schiffellite has produced a remarkably suggestive study of the way(s) in which sociobiology, a newly christened field in 1975, became incorporated into mainstream college biology textbooks and curriculum. Dr. Schiffellite has done a marvelous job of integrating a variety of issues surrounding sociobiology and its critics: a detailed examination of the conceptual claims made on behalf of the new science, its methodological foundation, criticisms launched by scientists and philosophers, the frequently one-sided (largely positive) way in which textbooks portrayed sociobiological ideas while deemphasizing the controversy that was involved, and the image of scientific process that was conveyed to students through exposure to this topic. A must read for all biologists, textbook authors, and educators.”

—Garland E. Allen, *Professor of Biology, Washington University in St. Louis*

“An insightful account of the social construction of the increasingly popular and pervasive paradigm of sociobiology. Dr. Schiffellite’s critical analysis of the presentations of this paradigm in current college biology textbooks should be read not only by biology teachers, but anyone concerned about misleadingly reductive explanations of human behavior.”

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Frankfurt • Berlin • Brussels • Vienna • Oxford

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*For
Marie, Claire, and Dominic Schifellite,
whose love and support got me started,
but who were not able to see this book completed*

Cover Illustration: This is an image of an installation created by the late Japanese designer and poster artist Shigeo Fukuda, entitled “Lunch with a Helmet on.” The core of the installation is a sculpture made from welded cutlery. When a light source is shone through the sculpture, it casts the shadow of a motorcycle. The interaction of light and sculpture creates an image that is, to me, a whimsical metaphor for the interplay of genes and environment in the creation of organisms. It is one of Fukuda’s many playful and clever illusions, and I am indebted to Shizuko Fukuda for permission to reproduce this work here.

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INTRODUCTION

In 1975, E. O. Wilson synthesized much of the then-current work on the biology of the behavior of organisms under the banner of “sociobiology” in his book *Sociobiology: The New Synthesis* (Wilson, 1975; see also Wilson, 1980, 2000). Wilson’s aim was to subsume under biology the things traditionally studied by disciplines such as ethology. The last chapter of his text was the most controversial, as it laid out the basis for applying this framework to human behavior and human society. Within this framework, those behaviors, cultures, social relations, and formations, which had been the sole purview of the social sciences, were given “genetic and evolutionary” explanations. His work generated a great deal of interest and controversy.

The most controversial elements within sociobiology have been the claims made about the relationship between genetics, evolution, and human behavior. Wilson claimed that this new paradigm could account for many complex human behaviors, and, to some extent, even the subsequent inequalities between people of different sexes, races, classes, and ethnic groups. This new paradigm also seemed able to naturalize these differences and structured inequalities and to transform them into simple biological and genetic evolutionary adaptations. Moreover, Wilson seemed as well to have had, as a general project, both the assertion of genetic and biological influences as the

ultimate controllers of many human behaviors, and the relegation of the social sciences to second-class status in the articulation of human nature and the motivations of human behavior.

Sociobiology has been a major force in the organization of a paradigmatic position that advocates a strong role for the influences of genes on human behaviors. Despite the numerous critiques and controversy surrounding it, human sociobiology and its derivations have attracted scholars and money. There has been a very long and sometimes acrimonious debate around the ideas presented, especially in human sociobiology. This debate changed the course of the development of sociobiology and influenced the development of parallel disciplines such as evolutionary psychology and behavioral ecology. Through this debate, some scholars and scientists moved beyond the polarizing positions of “nature vs. nurture” and instead moved toward more complex ideas about the nature of organisms and the nature of science itself.

This book is about the sociobiology debate that began with the publication of *Sociobiology: The New Synthesis* (Wilson, 1975). It is about the content of this debate and about the effect that this debate has had on biology. It also is about the ways in which this debate has influenced some of the content in selected introductory biology textbooks. Although I discuss some of the history around the debate in Chapters 1 and 2, this is not a formal historical account. Neither is it an attempt to add new material to the work developed by critics. Rather, this material is introduced and analyzed as a way of highlighting important themes that emerged from the debate. I am interested in highlighting the important issues that emerged from the mature debate around human sociobiology, as I believe they are still important in constructing and maintaining a non-reductive discourse on the relationship between human biology and human behavior.

The articulation of these themes is intended to help future researchers develop nondeterministic formulations and also is used to inform my textual analysis of the textbooks. I also am interested in the ways in which biology textbooks have presented sociobiology and the controversy it has generated. As well, I am interested in how changes in our understanding of the nature of science theory and practice have filtered into biology textbooks and how all of these issues can be used to help foster more critical and reflective thinking within science education as we approach the difficult issues embedded in emerging biotechnologies. As is evident in Part II of this book, this opportunity has begun to be taken up in the most recent textbooks I examine.

In this regard, throughout this book I use a number of terms to refer to sociobiology and related texts. If I am speaking specifically about Wilson's work, and to work that is similar to and sympathetic to Wilson's project, I use the term "sociobiology" or "human sociobiology." If I am referring to conceptualizations that may begin or take inspiration from Wilson's organizing texts but have proliferated now into many forms in many directions, I use the term "sociobiological discourse" or "Wilsonian sociobiological discourse."¹ When I am speaking more generally about the project of creating conceptualizations that embody a strong genetic program with respect to human behavior, I also use the terms "neurogenetic determinism," "genetic determinism," and "biodeeterminism."

Why the Sociobiology Debate Now?

One might ask why it is useful to study this debate, especially in light of Lewontin and Levins' (2007) observation that at this point, "sociobiology has become a term of some opprobrium in biology" (61). At the same time, developments in molecular and developmental biology have moved in unexpected directions. For example, E. Keller (2000) has indicated, with surprise, that as a critic of the Human Genome Project she had expected that

so exclusive a focus on sequence information was both misguided and misleading....Contrary to all expectations, instead of lending support to the familiar notions of genetic determinism that have acquired so powerful a grip on the popular imagination, these successes pose critical challenges to such notions. (5)

This same sentiment is reiterated by Fausto-Sterling, who has noted that as a consequence of knowledge gained in the past decade, "developmental biologists who study the role of genes in development are busily dethroning the gene" (Fausto-Sterling, 2000b, para. 1). She also notes that

the important story is that the search for genes that control development has shown us that our initial idea that genes control processes within an organism is wrong. Instead genes are one set of actors within a developmental system. The system itself contains all of the pre-existing contents of the cell, organ and organism....What the last decade of research on genes in development reveals is that...the system and its history control development. Genes are but one of many crucial components of the process. (para. 4)

This sentiment is upheld by Craig Venter and his colleagues, who successfully mapped the human genome and who warn that we must avoid the dual pitfalls of reductionism and determinism and the mistake of discussing human variability as we gain increasing knowledge of the human genome (Venter cited in Lerner, 2004, 4). This shift also has been accompanied by the call for more balanced conceptualizations of the relative influences of nature and nurture (Ridley, 2003).² Despite these developments and the fall from grace of the sociobiology name, many of the key ideas and the core of the human sociobiology project remain active. Although alternative conceptions have emerged, they are not yet dominant (Kaplan and Rogers, 2003, 5). Evidence for this comes from a number of areas.

In the late twentieth century there has been much support and interest in the academic world for the aims and ideas of human sociobiology, and support remains strong within a number of disciplines. Ruse has documented data taken from the *Science Citation Index* that indicates that between 1975 and 1995, Wilson's *Sociobiology: The New Synthesis* has been cited 2,040 times by authors (Ruse, 1999, 148). Likewise, Segerstråle's more recent search of the Wilson Index alone (as different from E. O. Wilson) yielded 13,000 entries under "sociobiology" (Segerstråle, 2000a, 314). In a survey of books in print in September 2000 using only the keyword "sociobiology," I found 150 titles published in the preceding nine years, and 80 of these had been newly published or republished in the preceding three years.³ The focus of these titles has been very wide-ranging. In the past twenty-five years people have written about the "biology of love," the "genomics of selfishness," "altruism," "desire," and "homosexuality," to name a few.

Second, while the term "sociobiology" is in decline, the general project has been taken up by newer disciplines such as behavioral ecology and evolutionary psychology (Pinker, 2002). For example, as of August 2009, the online Human Behavioral Ecology Bibliography (HBEB) listed well over 1,000 books and articles published, in press or in process since 2000.⁴ Evolutionary psychology has become an important subdiscipline and, while many take pains to try to ensure that it is not a deterministic focus, critics insist that it is falling into the same paradigmatic positions as were present in the early human sociobiology formulations (McKinnon, 2005; Kaplan and Rogers, 2003). The proliferation shows no signs of abating. These contemporary formulations cross a wide spectrum. There are new directions and more balanced accounts of the interconnections between nature and nurture; nonetheless, there are more of the same old biodeterminist formulations. For those advocating a strong determin-

ist program, the talk may be about control by hormones or brain structures rather than by genes, but in the end these more recent formulations rely on conceptual underpinnings that are similar to Wilson's original work. One could say that the sociobiology debate is still ongoing, and, while in this book I confine myself primarily to discussions about sociobiology and related discourses that emerged around the same time, I do discuss some of the more recent developments and offshoots in Chapter 1.

A third reason to pay attention to the lessons of the sociobiology debate is that sociobiology and related determinist discourses also have had success in entering the popular imagination. A great deal of both popular and academic research and writing continues on and about sociobiology and the general issue of evolution, genetics, and human behavior. Most significantly, the resonances among determinist discourses, advancements in biotechnologies in the past twenty years, and the promises of future innovations sometimes act to reinforce and support determinist claims, especially in the popular imagination (Allen, G., 2002).

The advances in biotechnology began in the mid-twentieth century with the deciphering of the nucleic acid structures of genetic materials and with the first successful clones of amphibian organisms. This was followed in the 1970s and 1980s with early mapping of sites of significant genetic material in simple organisms and with the successful deciphering of some of the ways in which these sites operated in the production of specific proteins. In the past three decades, we have witnessed the continued technical development of genetic mapping techniques. This technical development has been coupled with research that has begun to reveal the connections between genotypes and specific diseases. Advances in the 1980s and 1990s in the deconstruction, mapping, and reconstruction of DNA led to the development of the Human Genome Project. The Human Genome Project proceeded faster than expected. It has led to discoveries of genetic markers that are implicated in diseases. Garland Allen (2002) talks about the influences of mechanistic materialism on our conception of the gene and about the influence of the Human Genome Project on reinforcing these reductionist and simplistic conceptions. Concurrent development in the biotech industry has spurred on all facets of genetic mapping and research. And, as well, pre-implantation genetics diagnosis has now begun to move toward the "engineering" of children.

We are increasingly immersed in a world in which references to genetics are being used to explain illness, health, well-being, and even behavior (Allen, 2001). Often, this is done by referencing intermediary factors such as brain mor-

phology or hormone action, but ultimately the final arbiter of control is usually put down to genetic influences. Lippman (1991) was one of the first to warn of this process of “geneticization” of society, and she sees it as

an ongoing process by which differences between individuals are reduced to their DNA codes, with more disorders, behaviors and physiological variations defined, at least in part, as genetic in origin. (19)

These developments in genetics, proteinomics, and the biotechnological applications of this work have contributed to the creation of a kind of “gene-talk” within many public and popular discourses today (Keller, E., 1995; 2000). In these discourses, genes and DNA are being given a preeminent status in the controlling of human biology and human behaviors (Hubbard and Wald, 1993). Lewontin (1991) talks about this phenomenon as the development of what he calls “The Doctrine of DNA.” Rifkin (1998b) considers this the development of the “sociology of the gene.” Nelkin and Lindee (1995) talk about the gene as having developed into a cultural icon.

The findings of scientific genetics—about human behavior, disease, personality and intelligence—have become a popular resource precisely because they conform to and complement existing cultural beliefs about identity, family, gender and race. The promises made by scientists reflect these beliefs. Such promises express the desire for prediction, the need for social boundaries, and the hope for the control of the human future. At the same time, scientists’ claims about the powers of the gene meet many social needs and expectations. Whether or not such claims are sustained in fact may be irrelevant; their public appeal and popular appropriation reflect their social, not their scientific, power. (197)

The story of Hamer’s work on the “gay gene” illustrates Nelkin and Lindee’s point. Kaplan and Rogers (2003) note that even though Hamer’s work on the “gay gene” has “not been sustainable, the social construct of the ‘gay gene’ has persisted” (212).

E. Keller (1995, 2000) identifies this “gene-talk” as first, early in the twentieth century, a discourse of “gene action” and then in the latter half of the century it became the discourse of the “genetic program.” This “gene talk,” sociobiological discourse and the sociobiology debate itself will become increasingly important in framing the influences and effects of this ongoing geneticization process. Advances in genetic mapping technology will continue to promote the process of geneticization outlined above. And, most importantly, the development of all these technologies herald that we may be on the verge of a new

eugenics movement (Allen, G., 2001). If so, we will all need to develop much more critical and evaluative capacities when negotiating these new eugenic technologies.

This new eugenics movement likely will be more consumer based than the previous movement, and it will possibly coalesce around two processes or factors. The first is an emergent trade in information about genetic traits/markers. This is the practice of selling information about traits as genetic markers through consultative processes. This is already beginning to happen (Goetz, 2007; Wallace, 2005). Trade can involve wellness counseling for the postnatal or genetic counseling for the prenatal. In this scenario, we as consumers pay for knowledge of our genetic predispositions so that we can take action to control potential disease processes and promote health and longevity.

The second process or factor is the development of an emergent trade in the sale of genetic material through a process that attempts to commodify biological traits as genetic markers. This form of commercialization has been termed “liberal eugenics” (Betta, 2006, 7). In this scenario, we as consumers would purchase traits or markers as ordered up in the creation of embryos. The idea of ordering up the color of your children’s eyes, for example, may sound like science fiction right now, but this is already beginning to happen. If one looks at the history of pre-implantation genetic diagnosis, we can see that it was created to allow parents to screen their future children for serious medical conditions. In addition to this use, however, parents from around the world have already begun to use this technology for sex selection of their unborn children in countries such as the U.S., where such practices are legal (Baruch et al., 2006, 5; Kilani and Hassan, 2001). As well, donor insemination now has been transformed from a semi-clandestine and secretive process designed to help infertile couples into an open and international business with a global trade in sperm and eggs (DiLascia, 2006; Zachary, 2000). It is now possible to take what are being called “in vitro fertilization vacations.”⁵

Prior to and accompanying these increases in more conscious and overt eugenic manipulations is a great deal of talk and conjecture about the influences of genes and hormones on complex human behaviors. At the same time, new technologies will increase our ability to practice eugenics—to attempt to select some of the traits of our future children (Schifellite, 2008). For example, on January 6, 2007, *The Washington Post* (Stein, 2007) reported that The Abraham Center of Life LLC, started by Jennalee Ryan, the founder of the largest adoption agency in the U.S., is producing “ready-made” embryos for purchase;

prospective buyers can review donor information such as race, education, appearance, and personality prior to purchase (Saletan, 2007). The ability to select eggs and sperm from donors has long been available to parents, but this is “the first time anyone has started turning out embryos as off-the-shelf products” (ibid). According to Robert P. George,

this is just more evidence that we haven’t been able to restrain this move towards treating human life like a commodity. This buying and selling of eggs and sperm and now embryos based on IQ points and PhDs and other traits really moves us in the direction of eugenics. (cited in Stein, 2007)

If this business flourishes, it will have profound effects on society. According to Ryan, the founder of The Abraham Center of Life LLC discussed above, there is “a demand for white babies,” and “three-quarters of the DNA in [the Center’s] first two batches comes from blue-eyed blondes” (Saletan, 2007). This means that consumer preference for specific physical and “behavioral” characteristics will drive the demand for donors and that consumer preference for specific physical and “behavioral” characteristics also will drive the price of the sperm and eggs that are procured. For example, Ryan is expecting that a tiered pricing system will come into effect for their embryos and that “[their] compensation is offered to those donors who have earned a post-graduate degree [or] have a unique skill, characteristic or trait” (cited in Saletan). As Saletan puts it, “PhD embryos will cost more than BA embryos.” These are not just the musings of journalists. Kalfoglou et al. report that clinicians running pre-implantation genetic diagnosis (PGD) centers are beginning to fear that PGD will become seen as a tool not just for sex selection but also for other non-medical traits such as eye color, physical appearance, intelligence, and sexual orientation (2005, 492–493).

At this point, what is being offered is only a crude kind of eugenics, but soon the technology offered may claim to also offer germ-line genetic manipulation. Prospective parents will be confronted with offers to provide eugenic enhancements to zygotes or germ-cell genetic material. Some of these enhancements will likely be marketed to them as behavioral enhancements or “upgrades” for their unborn children. Prospective parents may find themselves presented with the seeming ability to create children in whom traits such as particular personality types or intelligences have been selected for. Imagine being told that you could select for attractive extroverts with high intelligence and a low likelihood of developing addictive and/or criminal behaviors. Some likely will be willing to take the chance. Some will reject these kinds of interventions out-

right as violating some moral, ethical, or religious principles. Still others will object to such a simplistic and deterministic linking of genetic material with complex human behaviors. This debate will happen against a backdrop in which researchers attempt to track homosexuality genes and “empathy” chromosomes and look for cognitive frameworks that support the genetic and evolutionary roots of complex human behaviors such as altruism and female mate-selection.

To be sure, many ethicists and social scientists have raised the alarm and argue against allowing such eugenic manipulation (Solberg, 2005; Rifkin, 1998b; Maranto, 1996). It may not be possible, however, to stop the development of a “positive” eugenics that is used in attempts to modify the intelligence, personality, physical appearance, or sexual orientation of our own offspring (Dahl, 2003; Baker, 2000; Gardner, W., 1995). We have lived through the past fifty years in which there has been an intense debate and many vocal proponents and opponents of the idea that it is even possible to manipulate complex human behavior and performance by manipulations at the genetic level. Those promoting the possibility of eugenic technologies will find an important ally in a popular imagination that has been influenced by the context of geneticization discussed above. Also, continued successes in discovering the connections between genotype and disease will help legitimize more reductionist formulations about the relationship between genes, cells, systems, organisms, and environment. These successes have emboldened and will continue to embolden some to make dubious, but popular, proclamations about the role of genes in producing personality, criminality, sexual orientation, altruism, selfishness, aggression, etc.

Ordinary citizens and politicians already are being asked to debate questions on a variety of subjects not confronted before by human societies. In the future, we likely will be called upon to make decisions about selecting the traits of our future children, to make decisions about what kinds of medical treatment we will receive, and to make judgments about the use of social resources. We will be asked to make these judgments based upon what biological and genetic “theories” tell us about the potential “natures” of groups of people. Questions will arise around the appropriateness of genetic screening for predispositions to what have been considered complex human behaviors such as mental illness, personality traits, and intelligence (Paul, 1994).

How will we make these decisions? What should we allow? Are these claims even possible? In all these examples and in a host of others yet to emerge, citizens and politicians will be asked, based upon the advice of

“experts,” to create policies that are informed by controversial claims about our natures, diseases, and potentials. Implicit in the marketing of this kind of technology will be the assumption that there are genetically controlled biological processes that determine, in a relatively straightforward way, complex human behaviors. Developments in biotechnology, eugenics technologies, and the apparent success of the Human Genome Project have increased legitimacy for a paradigmatic shift in the debate over what influences human behavior.

The Focus of This Book

It is important that these technological changes happen within a discourse that debates not just the ethical issues created by these choices but also within a discourse that continues to render problematic the whole relationship between genetics and human behavior. This discourse needs to continue to challenge the idea that we will be able to select for not just physical characteristics, but also for characteristics or complex behaviors such as intelligence, personality, and sexual orientation. This is a discourse that emerged out of the sociobiology debate, and it is important to make available and to continue to develop the arguments and issues that have arisen as the debate has proceeded and positions have been clarified.

These arguments and issues signal conceptual areas that must be addressed both within science education and by the lay public as a new eugenics movement develops. It is crucial to begin to foster education and debate among teachers, students, scientists, and the lay public about this issue. It is important that biology teachers and scientists have the necessary background knowledge about the issues so that they can effectively convey the issues to students and the lay public. We all must become conversant enough in this debate to be able to make informed judgments about the theories and claims that will continue to surround us and about the eugenic “products” that may be marketed to us. These judgments require that we develop evaluative skills at many levels. As such, this work utilizes theory developed within the sociology of science and also relies on theory developed in hegemony studies, discourse theory, and textual analysis.

In coming to grips with the sociobiology controversy, teachers and textbook authors also must engage the questions that arise around the nature of science knowledge and method. As I discuss in Chapter 3, numerous authors have begun to do work on this topic within science education, and continued focus

within science education that questions our assumptions about the nature of science can only improve our abilities to critically evaluate positions that arise from scientific controversy. All of this will not be easy, however. Critics of Wilsonian sociobiological discourse must be able to engage the debate at the levels of genetic theory, evolutionary theory, and theory about the nature of science as well as at the level of sociobiological formulations.⁶ It is my hope that this book will make a contribution to the ways we think about this issue and to the ways we understand the underlying theories that legitimize and underpin the linking of genetics and human behavior. It is my aim that this work will help to improve and clarify the debate around the relationship between biology and behavior for teachers, students, and the lay public in general.

This book is divided into two parts. In Part I, I describe and analyze the central issues that have emerged from the sociobiology debate. In Chapter 1, I examine the development of human sociobiology, its basic tenets, and its related disciplines. In addition, I chronicle the major issues that critics raised in the first fifteen years of the debate, and I examine recent developments in human sociobiology and related fields and the work of recent critics. In this chapter, I also examine the recent emergence of alternative and non-reductive formulations that take into account the many biological, psychological, and social determinants of human behavior. These are complex debates that are ongoing and unsettled.

In Chapter 2, I cover what I think are the most important points of difference that separate those advocating a strong biological determinism from their critics. I also examine the ways in which both sides understand key concepts such as reductionism and biological traits and the ways in which these understandings also influence how both sides conceptualize organisms as their objects of study and the nature of the life and social sciences themselves. In effect, sociobiology has been part of a larger debate that has proceeded within the life sciences and within science studies. In Chapter 2, I also examine the ways in which Wilson and others constructed legitimacy for sociobiology and the areas of contention that emerged as the debate matured. In conjunction with this analysis of the construction of the legitimacy of this discourse, I also examine the obstacles that critics face in attempting to undermine the legitimacy of simple and reductive presentations about how biology, in general, and genes, in particular, influence human behavior, and I examine the ways in which the critique against these kinds of formulations can be sharpened. A number of questions follow from this line of investigation. For example, "Why has a strong genetic model maintained prominence in the popular imagination?" And

“How can a nuanced and mediated position that takes both the biological and the social into account in any talk of the relationship between biology and human performance and behavior be strengthened?” In Chapter 3, I examine the way in which the nature of science itself is conceptualized. In this chapter, I cover some of the debates that have developed in science studies and within science-education literature. Also in Chapter 3, I look at the way in which one’s thinking about the nature of science and epistemology in general relates to one’s position on sociobiology.

In Part II of this book, I look at representations of sociobiology in university-level introductory biology textbooks (see Chapter 4 for the complete list). In Chapter 4, I introduce my method of analysis, the textbooks that I chose, and the reasons for these choices. I could not examine every introductory biology textbook in print in the depth that I needed to for this study. Instead, I chose six texts for this analysis. Four were published in the mid-1990s and two are later editions of two of the original texts I selected. These latter two texts were published in 2005 and 2008. In this way, I have been able to present a picture of these textbook representations and the observable changes in these representations that occurred over two decades.

In Chapters 5 through 8, I examine these introductory biology textbooks in detail to see if and how they cover sociobiology and its offshoots, and how they cover the sociobiology controversy and some of the themes that developed in the mature debate. In this regard, in this textual analysis, I do more than examine how the textbooks portray sociobiology. I also examine their presentations of themes that emerged in the sociobiology debate that are controversial issues in genetic theory, evolutionary theory, and the nature of science itself. This analysis has helped me to understand the ways in which sociobiology, genetics, and evolutionary theory are structured in biology textbooks and the importance of presenting issues around the nature of science in these textbooks. This analysis has also given me a way both to gauge the influence of human and nonhuman sociobiological discourse and to gauge the ways in which critical thinking and controversy are handled by the texts. Finally, in Chapter 9, I summarize my findings on these textbook representations. I also discuss the implications of my findings in both parts of this book, for science educators and for all those who oppose strong biologically determinist formulations of human behavior and support the development of more balanced and more biologically and epistemologically modest formulations. I am not a historian or a philosopher and I do not claim in this book to have written definitively in either of these areas. I am a sociologist and educator, and as such this work is sociology

of knowledge focused on the sociobiology debate and also a form of sociology of knowledge as textual analysis involving particular introductory biology textbooks. As such, it contains both the strengths and weaknesses of such an undertaking.

Last, I would like to add that, while I am critical of some of the ways specific material is presented in some of these introductory biology texts, I have the utmost respect for the huge task that all these authors have taken upon themselves. These introductory texts are massive books of more than one thousand pages each, and they cover the very vast knowledge base that we call “biology.” All of these authors put in great effort to support the best aims and aspirations embodied in scientific practice and to make biology exciting and fascinating for students. They all succeed at this, and I thoroughly enjoyed the considerable time that I spent examining them in detail.

Notes

1. This notion of “Wilsonian discourse” is similar to Keller’s (1995) notion of discourse that she borrows from Hacking and to Laclau and Mouffe’s (1985) notion of a hegemonic discourse. In all cases, the basic concept is of a set of ideas and practices that limit and define the boundaries of reality and the boundaries of conceptualization for the given subject. I discuss this in more detail in Chapter 2. And, although I use the name Wilsonian discourse, others and especially Dawkins (1976, 1979, 1982, 1986, 1995) also have contributed to this discourse.

Nonetheless, this is not a monolithic conception. In Chapter 1, I also discuss the various branches and directions, which, to me, have been both positive and negative, that have developed in the past three decades. In the latter half of the 1980s and into the 1990s the critiques moved away from more personal and overtly political attacks and began to focus on some of the core issues that were dividing the camps. There are the Wilsonians who envisioned the possibility of a human sociobiology with what I would call a strong genetic program. There are also those who see the possibility of integrating investigations in the life and social sciences in ways that allowed for the uniqueness of each level of analysis and the uniqueness of organisms (especially human) without the need for an over-determining geneticism.

2. For more discussion on this point, see the subsection on “alternative positions” in Chapter 2.
3. This list has included *The Darwinian Heritage and Sociobiology* (Smillie, van der Dennen, and Wilson, 1999); *Sociobiology and Bioeconomics* (Koslowski, 1999); *Sociobiology and the Arts* (Bedaux and Cooke, 1999); *Marx and Sociobiology* (Huaco, 1999); *Marxism and Human Sociobiology* (Chang, 1994); *The Biology of Love* (Janov, 2000); *Human/Nature: Biology, Culture and Environmental History* (J.P. Herron and Kirk, 1999); *Living with Our Genes* (Hamer and Copeland, 1998); *The Moral Animal* (Wright, 1994); *Crisis in Sociology*:

The Need for Darwin (Lopreato and Crippen, 1999); *The Science of Desire: The Search for the Gay Gene and the Biology of Behavior* (Hamer and Copeland, 1994); *Why Sex Matters: A Darwinian Look at Human Behavior* (Low, 2000); *Evolutionary Psychology: The New Science of the Mind* (Buss, 1998); *The Darwin Wars* (A. Brown, 1999); *Defenders of the Truth: The Battle for Science in the Sociobiology Debate and Beyond* (Segerstråle, 2000a).

4. This bibliography is maintained by Kermyt G. Anderson at the University of Oklahoma and can be found at <http://faculty-staff.ou.edu/A/Kermyt.G.Anderson-1/HBE/index.html#2008>.
5. A quick Internet search will reveal a number of businesses selling this service. Two sites I found were ivfvacation.com and MedicalTourismCo.com. It also is being discussed in various forums and blogs on the Internet.
6. A PhD dissertation by Macdonald (2000) provides disturbing evidence that about two-thirds of pre-service science teachers he tested had a poor understanding of basic evolutionary concepts.