The Biological Basis of Human Behavior

A Critical Review

Second Edition

Robert W. Sussman

Advances in Human Evolution Series

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Robert W. Sussman
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I dedicate this book to Linda Sussman, and to my two daughters, Katya and Diana, who are the wonderful products of genes, environment, and chance.

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Introduction

Why do we behave the way we do? Surely humans have been occupied with this question ever since they were first able to formulate it. With advances in our understanding of genetics, hormones, and neuropsychology, our accumulation of hominid fossils, and our growing knowledge of animal and especially primate behavior, there is a feeling by many that we now better understand the biological basis of human behavior. Furthermore, there is a tendency for many to emphasize and popularize the underlying biological factors that may determine this behavior. For example, titles of recent popular books and magazine articles have read: "Infidelity: It may be in our genes"; "The biology of violence"; "Race, genes and I.Q."; "Human nature: why do we do what we do?; "Demonic males: Apes and the origins of human violence." In this reader, I include articles in which the authors examine some of the current scientific evidence available on these subjects.

This book was developed for an undergraduate anthropology course entitled "The Biological Basis of Human Behavior." Since the popular media, as well as scientific books and articles on this subject, constantly bombard students, it is necessary for them to be able to evaluate this literature. Questions on human nature and the biological basis of human behavior, at least for the past century or so, have been the subject matter of anthropology. Yet, there are few anthropology courses at present that directly address this subject, a subject that is not new but has been resurfacing for generations. The biological basis of human nature and the ways in which human variation affects this nature (and vice versa) were topics of controversy over a hundred years ago when Charles Darwin wrote *The Decent of Man* and when Thomas Huxley wrote *Man's Place in Nature.*

The influence of environment versus biology over behavior has been hotly debated ever since. In fact, many of the "new" theories and explanations mirror theories and explanations that have come and gone over the past century. Explanations of behavioral differences between the races, such as those detailed recently by Murray and Herrnstein in "The Bell Curve" and by Rushton (see Chapters 29 and 31), are similar to those espoused by Hernstein, Jensen, and Shockley in the 1970s and by the eugenics movement of the first forty years of this century. The "new" fields of evolutionary psychology, Darwinian anthropology, and behavioral ecology have their roots directly in "sociobiology" of the 1970s, and before that in Social Darwinism of the turn of the century.

The subject matter of anthropology is human behavior and evolution. As anthropologists, we attempt to study the fossil record of humans; we also study the evolution and behavior of our nearest living relatives, the nonhuman primates; and anthropologists study human behavior and society in its broadest sense. Our studies are not confined to one culture, but instead, we try to learn about all aspects of human behavior in all cultures and subcultures.

Therefore, anthropologists are often in an excellent position to evaluate theories about human nature and so-called human universals, as well as the proposed biological bases of human behavior. But the extremely broad base that anthropology offers is not always appreciated by anthropologists, and anthropologists are not alone in understanding the problems that hound many of these theories. As many of the articles in this book will illustrate, scientists from many different disciplines are aware of the environmental and cultural influences on behavior in humans and other animals.

My hope is that after you read this book you will be able to give intelligent answers to questions like the following: Is infidelity programmed into our genes? Do males use infanticide as a strategy to enhance reproductive success? Are men biologically driven to hunt giraffes? Do women and blacks have lower average intelligence than white males? Is it natural for men to be violent? Are class and economic status biologically determined? Do

inner-city gangs have their natural roots in marauding all-male monkey groups? Is sexual harassment by some men just the natural outcome of economic success or high social status? If after reading this book, "NO" is not your answer to these questions, read the book again, and more carefully this time. I hope that the book serves as an antidote to such recent books as Robert Wright's *The Moral Animal: Why We Are the Way We Are,* Laura Betzig's *Human Nature: Why Do We Do What We Do?,* and Wrangham and Peterson's *Demonic Males.*

The book is divided into five sections. Part I, "Introductory Material: Evolution, Humans, and Primates," includes articles that review some of the subjects that might be covered in an introductory anthropology class. These include: the importance of genetic variation as one of the "functions" of sexual reproduction; the way in which one gene may affect many traits and one trait may be affected by many genes; human evolution and primate evolution and taxonomy. In Part II, "The Evolution of Human Behavior," I have included articles that focus on various interpretations of the early evolution of human behavior and hypotheses related to how this may have led to current human nature and human universals. Part III, "The Biological Basis of Race and Racism," deals with the new attempts to relate human physical variation to behavioral differences between peoples. As you will see, new racism is as easy to rebut scientifically as it was in the past, and many of the arguments and rebuttals have not changed. In Part IV, "The New Biological Determinism," the articles delve into the modern field of evolutionary psychology: How "biologically" fixed is our behavior? Did our genes really make us do it? Did evolution force us into fixed action patterns? How much free will do we really have? Well, don't give up yet, you may still have some free will! The final part, "The Brain, Hormones, and Human Behavior," focuses on the influences of hormones and the brain on behavior. Ultimately, is this the area from which answers about human nature and human universals will come?

At this point, I should emphasize that I do believe there is a biological basis to human behavior and there is something we can call "human nature." After all, humans generally behave more like each other than they do like gorillas or chimpanzees. And, for that matter, chimpanzees behave more like other chimps than they do like gorillas or humans. But at what level do these differences in nature take place? Different species seem to be playing different games on the same board (like playing checkers and chess on a checkerboard). Describing individual moves of the game may not help us a great deal in understanding the differences until we know the rules of the game. But where do we find these rules? Have we looked in the right places? I hope these readings will stimulate students to think about these age-old questions and to read, with a critical eye, those writers who believe that they have found simple and simplistic answers to these very complex problems.

I would like to acknowledge the assistance of the many students and teaching assistants who have assisted me in compiling this book. They have improved it greatly. I also would like to thank those authors who have contributed original work or substantial revisions to already published pieces, especially Garland Allen, Betsy Schumann, Zuleyma Tang-Martinez, Ian Tattersall, and Alan Templeton. Thad Bartlett, Jane Phillips-Conroy, Milt and Sondra Schlesinger, and Linda Sussman suggested articles that appear in the book. I appreciate the assistance of Terry Gleason in organizing and assembling the final collection of articles. Finally, Terry Brennan, Nancy Roberts, Marianne Hutchinson, and the people at Simon & Schuster and Pine Tree Composition, Inc., have been extremely helpful and efficient in getting this book into final form.

The following is an outline of the course for which this reader was developed.

The Biological Basis of Human Behavior

Part I. Introduction: Variability, Natural Selection, and Human Behavior.
- A. What is anthropology?
  1. Cultural, Linguistics, and archeology
  2. Physical anthropology
- B. Variability and evolutionary forces
  1. Hardy-Weinberg Equilibrium
  2. Mutation, selection, gene drive and gene flow
  3. Selection and modern humans

Part II. Evolutionary History: Vertebrates to the Primates: What Did We Inherit from Our Ancestors?
- A. Taxonomy and vertebrate evolution
  1. Taxonomy and systematics
  2. A brief review of the evolution of the vertebrates
- B. Primates taxonomy, evolution, and behavior
  1. What is a primate?
  2. Why did primates evolve?
  3. Some definitions

Part III. Evolutionary History: Evolution of Human Behavior
- A. Protohominid Behavior
  1. Overview of human evolution
  2. Australopithecines: Morphology and theories
  3. Why did we become bipedal?
  4. Man the hunter or man the dancer?
  5. Primate analogies for human behavior: Are we talking monkeys?
- B. Origins of modern humans
  1. Early modern types and dispersal
  2. Deception, self-awareness, and self-deception
  3. What is culture?

Part IV. Humans as a Biological Species
- A. Human variation
  1. Early human migrations
  2. Biological variations, races, ethnic groups, and populations
  3. History of racism and current racism
  4. Adaptation and human variation
- B. Human universals
  1. Evolutionary psychology, nature vs. nurture
  2. Sex and the family
  3. Violence and despair
  4. Biology, environment, and culture

Part V. The Brain, Hormones, and Behavior
1. Pinky and the brain
2. Hormones, behavior, and social context
3. The difference between humans and apes: The meaning of the question and is the question meaningful?

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Contents

Part I

INTRODUCTORY MATERIAL: EVOLUTION, HUMANS, AND PRIMATES

In this section, I include articles that give the reader a background in some of the terms used throughout the remainder of the book. To some students this will be a review; to others, the material will be new. I have attempted to choose articles that are interesting and useful in either case.

The first two chapters are essays by Ernst Mayr written in the 1960s. Mayr, one of the most respected biologists and philosophers of biology of our time, provides a clear explanation of evolutionary theory and some of the questions that still remain in evolutionary biology. Chapter 3 is excerpted from a classic physical anthropology textbook by the late J. B. Birdsell, a human geneticist and ecologist who conducted field research on Australian aborigines. He outlines differences between asexual reproduction (mitosis) and sexual reproduction (meiosis) and explains how the latter leads to maximizing genetic variability. This variability is the raw material for evolution.

The article by Ralph Greenspan (Chapter 4), a professor of biology and neural science at New York University, is from a recent issue of *Scientific American.* Greenspan illustrates how, in most cases, genes do not stand alone. One gene may affect many behavioral or morphological traits (pleiotropism), and many genes may affect one trait (polygenic traits), even in fruit flies. This complexity of genetic interactions is a factor to keep in mind as you read through this book, and one that will be stressed in many of the articles throughout the volume.

In Chapter 5, I attempt to answer the question "What is a primate?" I approach this question in three ways: (1) taxonomically—how do humans and other primates fit into the general zoological classification system developed by Linneaus in the sixteenth century, and what animals are included in the primates? (2) morphologically—what morphological traits do primates share in common? (3) evolutionarily—what major adaptive shift led to primates? Why did they originally evolve? What evolutionary and ecological factors led to the origins of our earliest ancestors?

In answering these questions, we might better understand why primates are different from other mammals and what initially put them on their particular evolutionary path. Each evolutionary lineage represents a package of morphological and behavioral traits. By tracing the origins of these "packages" we begin to learn something about why each package or lineage evolved, why certain ones were better able to persist, and how they differed from competing lineages. In this book, I am especially interested in the origins of three packages—the primate package, the first human-like creature, and the first modern human (*Homo sapiens*). The more we learn about the behavior, morphology, and ecology of these original populations, the more we will understand about the biological basis of modern human behavior.

In Chapter 7, Ian Tattersall, Curator of Anthropology at the American Museum of Natural History in New York, outlines the major features of human evolution. Chapters 8 and 9, the former a popular press article and the latter by J. B. Birdsell, ask the question "Are humans still evolving?" In the former, the answer is "no" and in the latter it is "yes." Certainly there are factors of everyday modern life affecting survival of certain individuals as explained by Birdsell. For example, some people are more susceptible than others to certain types of cancer given environmental stresses, and some differences in susceptibility are genetically determined. Thus, modern humans are under the influence of natural selection and ultimately evolutionary forces. This should not be confused with speciation—the process, over time, of evolution and genetic isolation of two populations of the same species. We are certainly not speciating but we most likely are evolving (e.g., changing gene frequencies over time), and most certainly we are still under the influence

of natural selection. The final chapter in this section, by Stephen O'Brien of the National Cancer Institute, gives an excellent example of natural selection on modern populations.

There are three general trends in evolution that are worth keeping in mind as you read this book. (1) Genetic variability in individuals has increased since life first evolved. Whereas mitotic, asexual reproduction produces organisms that are identical, meiosis or sexual reproduction maximizes genetic variability and leads to an almost infinite variety of individual organisms. This variability appears to have been highly adaptive. (2) Throughout evolutionary history there seems to have been a trend from producing many offspring with little parental care to one of producing fewer offspring and giving each more care. (3) Finally, there is a general trend from animals depending mainly on innately programmed behaviors to those depending more on learning and having a greater ability to modify their behavior given different environmental circumstances.

We shall see in the later sections of this book that some modern biologists and anthropologists have virtually turned these trends upside down. They seem to be proposing that (1) genes try to replicate themselves and that this is a major factor in behavior and evolution—this trend, if successful, would lead to less genetic variability (more genetic homozygosity), and in fact, under these conditions, wouldn't asexual reproduction be the ideal system? (2) Some propose that an individual's success in evolutionary terms is equivalent to "maximizing" reproduction, which, in turn, often translates into mating more and producing the most offspring. But much of the behavior of vertebrates is focused on ensuring the survival of fewer offspring. Thus, the behavior of the individual and long-term survival of his or her progeny is not directly related to individual mating success or maximizing reproduction *per se.* Finally, biological reductionists constantly try to describe more and more complex behaviors as being genetically inherited traits. Thus, we have scenarios describing the genes for alcoholism, petty criminality, infanticide, the propensity for violence, and so on.

As stated above, there has been a tendency to increase genetic variability, decrease the number of offspring, and to increase behavioral flexibility at the expense of genetically programmed behavioral patterns. All three of the above simplistic explanations of behavior actually run counter to these general evolutionary trends.

Chapter 1

Basic Concepts of Evolutionary Biology

Ernst Mayr

That evolution is a fact and that the astonishing diversity of animals and plants evolved gradually was accepted quite universally soon after 1859. But how this evolution proceeded, particularly the nature of its moving force, has been a source of controversy from the very beginning.

Among specialists, almost complete agreement has been reached in recent decades. Whether they are botanists or zoologists, paleontologists or geneticists, all of them interpret the results of the evolutionary process in the same manner and find the same causal connections. With the nonspecialists the situation is different; whether biologists or not, they often remain unconvinced. Again and again some colleague has told me: "The story you present sounds quite logical and irrefutable, but I still can't get rid of the feeling that something isn't quite right." When I insist on being told what it is that is not right, it turns out that the doubter either has an altogether insufficient knowledge of basic facts or suffers from certain conceptual misunderstandings. In order to preclude this possibility, I shall begin by (1) stating the essential aspects of the modern interpretation of the causality of evolution in a few simple sentences; and then (2) attempt to explain the conceptual, indeed the philosophical, foundations of the evolutionary theory as it is now generally accepted.

The Modern Theory of Evolution

How does the modern biologist see the process of evolution? Most of the earlier theories of evolution based their explanation on a single factor, such as mutation, environment, or isolation; it was Darwin's genius to have proposed a two-factor explanation. The first factor, genetic variability, is entirely a matter of chance, whether it is produced by mutation, recombination, or by whatever other mechanism. Precisely the opposite is true of the second factor, natural selection, which is decidedly an "anti-chance" factor. Among the millions of individuals that are produced in every generation, selection always favors certain ones, whose advantageous attributes are due to specific genetic combinations. It must be emphasized once more that the most important component of Darwin's achievement was pointing out the duality of the evolutionary process. It is precisely this combination of chance and anti-chance that gives evolution both its great flexibility and its goal-directedness (Mayr 1963).

Darwin's explanation of evolution, in a sense, is dualistic. Dualism, however, is a word that has a bad reputation among biologists because for centuries they have suffered under the dualism of body and mind that Descartes brought back into philosophy. Biologists reject this dualism quite emphatically for reasons Bernhard Rensch has perceptively presented (Rensch 1968). Admittedly, there are quite a number of dualisms in biology, but they usually are not "either-or" dualisms but rather "first-then" dualisms, which we perhaps could designate as tandem dualisms. Mutation-selection is such a tandem dualism. Another dualism equally important for the understanding of evolution is the dualism of genotype-phenotype. We must fully understand this particular dualism before we can hope to understand the process of evolution.

The genotype is the totality of the genetic endowment that an individual received from his or her parents at conception (formation of the original zygote). The phenotype is the totality of the characteristics (the appearance) of an individual resulting from the interaction of the genotype (genetic program) with the environment during ontogeny.

But why is this duality of genotype and phenotype so important for the evolutionist? Embryologists have al-

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ways silently assumed that the fertilized egg cell, including its nucleus, participates completely and directly in the development of the embryo. The only one who, for theoretical reasons, did not agree with this assumption was August Weismann, who was ahead of his time by several decades in this as in so many other ways. Weismann's solution, a separation of soma and germ line, was not validated. But his basic idea was nevertheless right. The ultimate solution of Weismann's problem was provided only recently by molecular genetics: The genetic material (DNA) does not participate itself in the development of the embryo but functions only as a blueprint. The instructions of the DNA are translated (with the help of RNA) into polypeptides and proteins, and it is only these that participate directly in the development of the embryo. The genetic material itself, the DNA, remains unchanged during this entire process.

I will not discuss further the highly interesting consequences for embryonic development that result from this functional separation of the DNA and the proteins. Instead, I want to point out the importance of this separation for certain evolutionary problems. First of all, it is now perfectly evident why a direct influence of the environment on the genetic material is impossible, an influence postulated by the majority of the Lamarckians. The way from the DNA (via the RNA) to the proteins is a one-way street. The environment can influence the developmental process but it cannot affect the blueprint that controls it. Changes in the proteins cannot be translated back into nucleic acids.

The second consequence is perhaps equally important. The complete separation of the DNA genotype from the protein phenotype has the result that much of the potential of the genotype of a given individual is not translated into the phenotype at all and thus is not exposed to selection. This is shown by the great number of recessive genes in diploid organisms and by the suppressor genes in epistatic systems. Such potentials can be mobilized in later generations through recombination. This method of reacting to fluctuations in the environment is clearly superior to a process of direct environmental induction as postulated by many Lamarckians. For instance, suppose we submit a cold-adapted experimental stock to increasingly higher temperatures over five generations and then suddenly expose it to cold temperatures. If this stock had been uniformly induced to great heat tolerance during the preceding five generations, it would surely be exterminated by the sudden cold shock. On the other hand, if the phenotype is not the direct product of the environment, then recombination can develop a whole population of new reaction norms in every generation, some of which—with great probability—will be preadapted to highly aberrant environmental conditions. The rapidity with which insects have developed DDT-resistant populations is evidence for the type of preadaptation that is stored in the blueprint of the DNA. In the ensuing discussion I shall return to the enormous importance of this difference in the roles of the genotype and the phenotype.

Philosophical Considerations

Darwinism has a well-defined philosophical basis, an understanding of which is a prerequisite for the understanding of the evolutionary process. It has long been a puzzle for the historian of biology why the key to the solution of the problem of evolution was found in England rather than on the European continent. No other country in the world had such a shining galaxy of famous biologists in the middle of the last century as the Germany of Rudolphi, Ehrenberg, Karl E. von Baer, Schleiden, Leuckart, Siebold, Koelliker, Johannes Müller, Virchow, and Leydig, and yet the solution to the problem of evolution was found by two English amateurs, Darwin and Wallace, neither of whom had had thorough zoological training. How can one explain this? My answer is that philosophical thinking on the continent was dominated at the time by essentialism. This philosophy, as was shown by Reiser (1958), is quite incompatible with the assumption of gradual evolution. Essentialism had its roots in Plato's concept of the *eidos.* We all know Plato's famous allegory, according to which we see reality only indirectly like shadows on a cave wall, while the real nature of things, the *essence* of the scholastics, can be inferred only indirectly. Owing to the central importance of *essence* for this school of philosophy, it has been designated essentialism by Karl Popper (1950). By contrast, a very different kind of thinking, strongly supported by empiricism, had developed in England: the so-called population thinking, for which gradual evolution poses no difficulties. Population thinking is based on assumptions opposite to those of essentialism. It claims that only individual phenomena have reality and that every endeavor to infer from them an essence is a process of abstraction. Population thinking thus turns the dogma of essentialism upside down. The replacement of typological (essentialistic) thinking by population thinking was perhaps the most important conceptual revolution in the history of biology.

It is possible to make the philosophical problems even clearer by discussing some of the objections that are frequently raised against the Darwinian interpretation. I have heard, for instance, the statement "I cannot believe that so perfect an organ as the eye could have been produced by accidental mutations." The evolutionist entirely agrees with this. Accidental mutations alone, quite obviously, could not have done this. All a mutation does is to enrich the genetic variability of the gene pool. Mutation has nothing to do with adaptation. Selection is what achieves that. It is therefore also a misrepresentation of the situation to say that this or that product of evolution was the result of mutation pressure. There is no such thing as mutation pressure. Unfortunately, there