18

An Alternative Evolutionary Psychology?

Kim Sterelny

WHAT IS DEVELOPMENTAL SYSTEMS THEORY?

Developmental systems theory (DST) is an alternative view of evolution and evolutionary theory. I begin with a brief introduction to the central ideas of DST, then explore some of the consequences of these ideas for our view of human cognitive evolution. Developmental systems theorists offer an alternative to both the neo-Darwinian synthesis and the contemporary, gene–selectionist alternative to that synthesis. In doing so, they developed a package of ideas about development, evolution, and the interaction of those processes. First is *inheritance*. One central element of DST is an extended view of inheritance. The flow of genes from parent to offspring is by no means the only or even the most fundamental cause of cross-generational parent–offspring similarities. Organisms inherit a matrix of interacting resources that contribute to generation-by-generation similarity. This matrix includes not only genes but also cellular structures that modulate and control their expression; scaffolded and protected developmental environments (e.g., nests and burrows); sometimes symbiotic microorganisms; and/or culturally transmitted information. This view is radically at odds with much contemporary thought, which is often depicted by the Weismannian

diagram in Figure 18.1 (see, e.g., Maynard Smith, 1975/1993). Genes both generate the phenotype of one generation and flow to the next. There is no evolutionarily consequential causal influence of N generation phenotypes on generation $N + 1$.

Of course, parents have causal impacts on the phenotypes of their offspring. But according to received wisdom, those influences do not accumulate into evolutionary changes across the generations. They do not transmit or sustain heritable variation in similarity. However, defenders of DST point to a wide range of cross-generational causal influences that sustain intergenerational similarity (for a review, see Jablonka & Lamb, 2005).

A Master Molecule?

Developmental systems theorists decenter the role of genes in development, not just inheritance. They do not think of genes as orchestrating development. Rather, the genes an organism inherits are one element of the developmental matrix whose interaction over time produces an organism. Every view of development is moderately interactionist: Every theory recognizes that genetic and environmental contributions are necessary for the development of any trait. But DST is radically interactionist. Its defenders do not think phenotypic traits can be productively split into two kinds, namely, those whose development is under the control of internal resources, and those whose development is under the control of environmental factors (Gray, 2001; Griffiths & Gray, 2004).

Niche Construction

DST emphasizes the active role of the organism in organism–environment interactions. Selection is an important force in evolution, one that results in

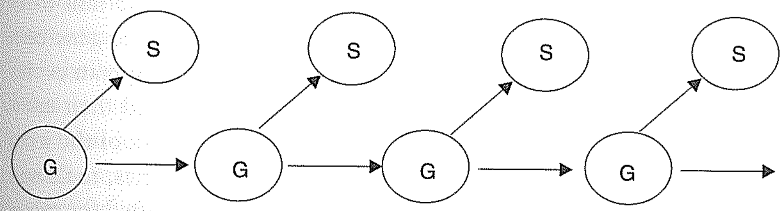

FIGURE 18.1. On the Weismannian view of inheritance, genetic information plays two roles: in constructing the phenotype (or soma[S]), and flowing to the next generation. In contrast, the phenotype of one generation has no selectable effect on the phenotype of the next generation.

lineages changing in important ways over time. But it is often wrong to think of lineages as passively accommodating to the demands of their environments. Evolving lineages often change their selective environment as they respond to selection. Termites, for example, do not merely *adapt to* their environment; they adapt their environment. Organisms, in part, construct their own niches (Lewontin, 1982; Odling-Smee, Laland, & Feldman, 2003).

Thus, developmental systems theorists think that (1) genes are just one element of inherited developmental resources; (2) they are but one critical element in the developmental matrix responsible for ontogeny; and (3) organisms in part construct their world, as well as adapt to it. That being said, a caution is in order. The defenders of DST are not a tightly integrated cadre, but rather a loose and evolving alliance from developmental psychology, developmental biology, evolutionary theory, and philosophy of biology—an alliance whose members only partially agree. Richard Lewontin, for example, would concur with (2) and (3), but perhaps not (1). DST is often dated from Lehrman's famous critique (1953) of Konrad Lorenz, which is radically interactionist, denying a principled distinction between internally driven and externally driven developmental sequences. The nearest thing the defenders of DST have to a manifesto is an edited collection, and even that contains plenty of disagreement (Oyama, Griffiths, & Gray, 2001).

DST AND HUMAN EVOLUTION

Arguably, DST is more plausible as a view of the evolutionary mechanisms that explain human evolution than as a general theory of evolutionary biology. Genetic inheritance is evolutionarily fundamental, even if it is not the only mechanism responsible for parent–offspring similarity. The gene centrism of standard evolutionary theory reflects a deep and important truth about evolution (Sterelny, 2004). But even the most enthusiastic gene centrist believes that cultural inheritance has been important in human evolution (Dawkins, 2003). Moreover, humans have surely changed their environments as much as they have accommodated to them. Think of the ways in which the invention of fire and cooking, shelters and clothes, tools and weapons, language, and agriculture and husbandry have modified the selective forces acting on human populations. Human evolutionary response is a response to a world we have partly created. Finally, the long and unproductive history of nature–nurture disputes suggests that there is something

seriously wrong with the distinction between internally and environmentally dependent cognitive capacities (Bateson & Martin, 1999).

AGENT AND ENVIRONMENT

The evolutionary psychology of Barkow, Cosmides, and Tooby's celebrated collection (1992) is, as the title indicates, unashamedly adaptationist. Modular nativists expect the most central features of human cognitive organization to be adaptations, cognitive specializations built by natural selection for specific purposes (Barkow et al., 1992). But it is not just adaptationist. Their picture presupposes that selection shapes organisms to fit their niche. The relation between lineage and environment is *asymmetric*. This is a deeply implausible view of the relation between humans and our environments. We modify and reconstruct our world; each human generation inherits an environment that its predecessors have changed, and they often leave to their descendants a world that they have further changed. Sustained foraging, for example, depletes target species, leading to selection to extend the range of resources exploited and to harvest preferred prey species more efficiently. These foraging changes have social consequences for specialization and the division of labor. There are signals of such feedback loops in the paleoanthropological record (McBrearty & Brooks, 2000).

The active, world-transforming relation between humans and their environments has profound consequences for the types of adaptations we can expect to find in the human mind. The Cosmides–Pinker–Tooby picture presupposes that human selective environments have been stable. They have often written of the adaptation of our minds to an environment of Pleistocene foraging. Selection can build an innately structured module, wiring in much of the information an agent will need, only if environmental domains are stable. Even setting aside human influences on the environment, this assumption is questionable. Forager lifestyles vary enormously. The challenges facing Inuit seal hunters are very different from those of tribes in central Australia. Humans are geographically widespread, and have been so for a long time. Moreover, we evolved in a period of increasing climatic instability (Potts, 1996). Human niche construction increases both the instability and diversity of human environments. It leads to variation in physical, biological, and social environments. The social challenges in a hierarchical social world with stratification and a division of labor are very different from those in smaller, more egalitarian societies. Human minds are selected for adaptive responses to unpredictable, heterogeneous environments rather than the environments of a typical Pleistocene forager.

COGNITION, CULTURE, AND INHERITANCE

Language, culture, and cultural learning are central to the DST view of human cognitive evolution, for cultural transmission is an enormously important inheritance mechanism, one that accelerates both adaptation and diversification. It is less central to modular nativist evolutionary psychologists, especially those who accept an "evoked culture" model of the association between cognition and culture (Tooby & Cosmides, 1992, p. 116). For modular nativists, language is a template: It is a paradigm of a competence that is crucial, universal, and informationally demanding. Steven Pinker generalizes the case for a modular and nativist view of language to many other human competences. There is something correct about thinking of language as typical of human competences. Humans are "informavores." One achievement of cognitive psychology has been to show that ordinary human competences depend on our access to, and use of, significant amounts of information. How do we access the information we need? In stable environments, there is selection to build that information into our genome, avoiding the costs and risks of learning. Thus, there is something wrong with using language as a template for other competences, too. The fundamental structural features of language may be persistent enough for selection to have largely decoupled language acquisition from experience. I have just sketched the DST case for believing that, in this respect, language is atypical. In environments that change over a few generations, selection favors social learning. Parental information will not be out of date, so the costs of trial-and-error learning can be avoided. Many aspects of human environments do change at rates that should select for social learning, thus setting up a feedback loop, for accurate social learning has enabled humans to accumulate cognitive capital. The information and skill base of generation N is transmitted accurately enough to generation $N + 1$ for it to be available for further improvement and transmission. Ramping up the human skill base should also increase human capacities to change their environments. The effects of social learning select for enhanced social learning (Sterelny, 2003; Tomasello, 1999). It is no surprise, then, that members of generation $N + 1$ resemble members of generation N in part because of the culturally mediated flow of information from N to $N + 1$ (see Richerson & Boyd, 2005; Shennan, 2002).

NATIVISM

Defenders of DST are profoundly sceptical of nativist views of the mind. In part, this scepticism is empirical. They think nativist views of mind and behavior exaggerate the extent to which development is buffered against variation in environmental inputs. They are fond of citing studies that show subtle and unexpected environmental effects (e.g., the effects of prenatal experience and practice; Gottlieb, 1997). But it is also theoretical. Defenders of DST argue that the very concept of innateness is confused. It lumps together species typicality, adaptation, and developmental canalization in various forms. It is reasonable to ask whether the acquisition of theory of mind competence depends on learning. But if it does not, it does not thereby follow that it is an adaptation, buffered against environmental variation, genetically caused, and species-typical. The extent to which these characteristics travel together is an open and important empirical question, a fact that is obscured by using one construct for all these characteristics (Mameli & Bateson, 2006). Moreover, nativism often generates the illusion of an explanation where none really exists. Suppose that we show that the development of a trait is robust; its developmental trajectory is insensitive to variation in experience. Suppose it turned out that our capacity to recognize and respond to the attentional focus of other agents was robust in this way. That discovery would not in itself *explain* the development of joint attention. Informational metaphors in developmental psychology obscure this fact. Talk of human genomes as programs that direct the development of mind-reading capacities, or as coding information about the minds of other agents, can make it seem that one has an explanation of the development of our mind-reading abilities. Without an account of the nature of information and how it is used, that appearance is an illusion. Yet there is no account of how genes carry semantic information, or how semantic information is used in development (Griffiths, 2001).

CONCLUSION

Humans evolved in a world that was variable within and across time. Our lives depended on cognitively demanding interactions with our social, physical, and biological environments. Moreover, many human tasks are *interface tasks*. Collaborative hunting, for example, involves action that is simultaneously sensitive to its social, physical, and biological circumstances. Thus, humans have been selected for adaptive plasticity. But adaptive plasticity is not enough: Evolutionary psychologists have been correct to point to the developmental robustness of central human competences. Adaptive plasticity is supported by niche construction. We have responded to the informational demands imposed by human lifeways by learning to modify our environments informationally, as well as physically. We are both informational and physical engineers. Human developmental environments are informationally engineered to make the transmission of situation-specific skills robust and accurate. We did not need to wait for gene technology to engineer our own inheritance systems; it is as ancient as teaching (Sterelny, 2003, in press).

REFERENCES

Barkow, J. H., Cosmides, L., & Tooby, J. (Eds.). (1992). *The adapted mind: Evolutionary psychology and the generation of culture.* Oxford UK: Oxford University Press.

Bateson, P. P. G., & Martin, P. (1999). *Design for a life: How behavior and personality develop.* London: Jonathan Cape.

Dawkins, R. (2003). *A devil's chaplain: Reflections on hope, lies, science, and love.* Boston: Houghton Mifflin.

Gottlieb, G. (1997). *Synthesizing nature–nurture: Prenatal roots of instinctive behavior.* Hillsdale, NJ: Erlbaum.

Gray, R. (2001). Selfish genes or developmental systems?: Evolution without replicators and vehicles. In R. Singh, K. Krimbas, D. Paul, & J. Beatty (Eds.), *Thinking about evolution: Historical, philosophical and political perspectives: Festschrift for Richard Lewontin* (pp. 184–207). Cambridge, UK: Cambridge University Press.

Griffiths, P. E. (2001). Genetic information: A metaphor in search of a theory. *Philosophy of Science, 68*(3), 394–412.

Griffiths, P. E., & Gray, R. D. (2004). The developmental systems perspective: Organism–environment systems as units of evolution. In M. Pigliucci & K. Preston. *The evolutionary biology of complex phenotypes* (419–431). Chicago, University of Chicago Press.

Jablonka, E., & Lamb, M. (2005). *Evolution in four dimensions.* Cambridge, MA: MIT Press.

Lehrman, D. S. (1953). Critique of Konrad Lorenz's theory of instinctive behaviour. *Quarterly Review of Biology, 28*(4), 337–363.

Lewontin, R. C. (1982). Organism and environment. In H. C. Plotkin (ED.), *Learning, development and culture* (pp. 151–170). New York: Wiley.

Mameli, M., & Bateson, P. (2006). Innateness and the sciences. *Biology and Philosophy, 21*(2), 155–188.

Maynard Smith, J. (1993). *The theory of evolution.* Cambridge, UK: Cambridge University Press. (Original work published 1975)

McBrearty, S., & Brooks, A. (2000). The revolution that wasn't: A new interpretation of

the origin of modern human behavior. *Journal of Human Evolution, 39*(5), 453–563.

Odling-Smee, F. J., Laland, K. N., & Feldman, M. W. (2003). *Niche construction: The neglected process in evolution.* Princeton, NJ: Princeton University Press.

Oyama, S., Griffiths, P. E., & Gray, R. D., (Eds.). (2001). *Cycles of contingency: Developmental systems and evolution.* Cambridge, MA: MIT Press.

Pinker, S. (1997). *How the mind works.* New York: Norton.

Potts, R. (1996). *Humanity's descent: The consequences of ecological instability.* New York: Avon.

Richerson, P. J., & Boyd, R. (2005). *Not by genes alone: How culture transformed human evolution.* Chicago: University of Chicago Press.

Shennan, S. (2002). *Genes, memes and human history: Darwinian archaeology and cultural evolution.* London: Thames & Hudson.

Sterelny, K. (2003). *Thought in a hostile world.* New York: Blackwell.

Sterelny, K. (2004). Symbiosis, evolvability and modularity. In G. Schlosser & G. Wagner (Eds.), *Modularity in development and evolution* (pp. 490–516). Chicago: University of Chicago Press.

Sterelny, K. (in press). Cognitive load and human decision, or, three ways of rolling the rock up hill. In S. Stich, S. Laurence, & P. Carruthers (Eds.), *The innate mind: Culture and cognition.* Cambridge, UK: Cambridge University Press.

Tomasello, M. (1999). The human adaptation for culture. *Annual Review of Anthropology, 28*, 509–529.

Tooby, J., & Cosmides, L. (1992). The psychological foundations of culture. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 19–136). New York: Oxford University Press.

The Evolution of Mind

Fundamental Questions and Controversies

Edited by
STEVEN W. GANGESTAD
JEFFRY A. SIMPSON

THE GUILFORD PRESS
New York London

A Division of Guilford Publications, Inc.
72 Spring Street, New York, NY 10012
www.guilford.com

Printed in the United States of America

This book is printed on acid-free paper.

Last digit is print number: 9 8 7 6 5 4 3 2 1

Library of Congress Cataloging-in-Publication Data

The evolution of mind : fundamental questions and controversies / edited by Steven W. Gangestad, Jeffry A. Simpson.
p. cm.
Includes bibliographical references and index.
ISBN-10: 1-59385-408-0 ISBN-13: 978-1-59385-408-9 (hardcover)
1. Evolutionary psychology. 2. Human evolution. I. Gangestad, Steven W. II. Simpson, Jeffry A.
BF698.95.E955 2007
155.7—dc22

2006026955

About the Editors

Steven W. Gangestad, PhD, is Distinguished Professor of Psychology at the University of New Mexico. His research has covered a variety of topics in evolutionary behavioral science, including the determinants of sexual attraction, changes in women's sexual psychology across the ovarian cycle, the effects of genetic compatibility between mates on relationship qualities, individual variation in developmental precision and its manifestations in neuropsychology, and influences of men's testosterone levels.

Jeffry A. Simpson, PhD, is Professor of Psychology and Director of the Doctoral Minor in Interpersonal Relationships at the University of Minnesota. His research interests include adult attachment processes, human mating, idealization in relationships, empathic accuracy in relationships, and dyadic social influence. Dr. Simpson is a fellow of the American Psychological Association and the Association for Psychological Science. He serves as Associate Editor for the *Journal of Personality and Social Psychology: Interpersonal Relations and Group Processes*.

An Introduction to *The Evolution of Mind*

Why We Developed This Book

STEVEN W. GANGESTAD
JEFFRY A. SIMPSON

In the history of ideas, Darwin's theory of evolution through natural selection stands as one of most awe inspiring. His ideas profoundly changed the way scientists understand and appreciate the biological world. As Theodosius Dobzhansky (1973) once quipped, ever since Darwin, "nothing in biology makes sense except in the light of evolution" (p. 125). Just as influential, however, have been the theory's implications for how we, as human beings, understand ourselves. According to modern evolutionary biology, modern-day *Homo sapiens* represent merely a pixel of a present-day snapshot of the recurrent stream of replication, variation, and selection that began over 3 billion years ago. This stream, which all humans are a part of, operates according to certain principles. And these principles can divulge a great deal about who we are.

Despite being a formative influence on the emerging science of psychology in the late 1800s, evolutionary biology did little to shape the social and behavioral sciences for nearly a century after Darwin's death. The ethologists Tinbergen, Lorenz, and von Frisch, of course, reminded psychologists that animals, including humans, were shaped by selection pressures to adapt to their natural environments and that, accordingly, much can be learned via careful observation of behavior in natural habitats. But ethological theory itself was not deeply informed by evolutionary biology at that point in time.

This fact was largely a reflection of the state of affairs within biology, not within psychology. For the first half of the 20th century, the major theoretical task in evolutionary biology was to complete the grand synthesis of Darwinism and Mendelism. Evolutionary genetics, in fact, enjoyed great progress during this period. With a few notable exceptions (e.g., Cole, 1954; Lack, 1966), however, evolutionary biologists had not turned their attention to developing broad theories of how selection might have shaped the phenotypes of organisms, including how organisms evolved to interact with both their physical environments and with one another.

When theorists eventually turned their attention to this task in the 1960s and 1970s, they discovered that many of the phenotypes of interest happened to be behavioral in nature. Examples included how organisms are shaped to relate to kin, how they are shaped to reproduce; the general nature of their lifecourses, how the sexes relate to one another, and how cooperation can evolve and be sustained. The optimality and game theoretic approaches developed during these decades quickly generated a multitude of new theories that remain foundational in evolutionary biology today, such as life history theory, parental investment theory, parent–offspring conflict theory, sperm competition theory, the concept of reciprocal altruism, optimal foraging theory, and sex allocation theory. In 1975, Edward O. Wilson's *Sociobiology* promised a "new synthesis" of the life and social sciences based on some of these new principles. Debates over precisely how these principles could be applied to understand human behavior quickly ensued. Within a decade, several promising alternative approaches were founded, including human behavioral ecology (e.g., Chagnon & Irons, 1979), gene–culture coevolutionary approaches (e.g., Boyd & Richerson, 1985), and evolutionary psychology (Tooby & Cosmides, 1989).

During the last two decades, the study of the evolutionary foundations of human nature has grown at an exponential rate. In fact, it is now a booming interdisciplinary scientific enterprise, one that sits at the cutting edge of the social and behavioral sciences.

Textbooks and handbooks often chronicle the emergence of new fields. Although not one textbook on evolutionary psychology was on the market a decade ago, today textbooks on human evolution abound. Within the past 10 years, a dozen new textbooks touting different evolutionary perspectives have appeared, including Buss's *Evolutionary Psychology: The New Science of the Mind* (1999), Gaulin and McBurney's *Psychology: An Evolutionary Approach* (2001), Cartwright's *Evolution and Human Behavior* (2000), Barrett, Dunbar, and Lycett's *Human Evolutionary Psychology* (2002), and Palmer and Palmer's *Evolutionary Psychology: The Ultimate Origins of Human Behavior* (2002), to name a few. These textbooks provide excellent introductions to the field and the major topics within it. In addition, several major handbooks have been or will soon be published, including edited volumes by Buss (2005), Crawford and Krebs (1998), and Dunbar and Barrett (2007).

Precisely because of the profound implications that evolutionary biology holds for understanding human nature, the new evolutionary behavioral sciences have also inspired popular press books. Authors such as Steven Pinker (*The Language Instinct*, 1994; *How the Mind Works*, 1997; *The Blank Slate*, 2003), Robert Wright (*The Moral Animal*, 1994), Frank Sulloway (*Born to Rebel*, 1996), Sarah Hrdy (*Mother Nature*, 1999), Geoffrey Miller (*The Mating Mind*, 2000), and Matt Ridley (*The Red Queen*, 1993; *The Origins of Virtue*, 1996; *Nature via Nurture*, 2003) have all written influential works. Moreover, Dawkin's *The Selfish Gene* (1976) and Dennett's *Darwin's Dangerous Idea* (1995) remain among the most widely read treatises on the foundations of evolutionary biology.

Needless to say, evolutionary approaches to understanding human behavior have also been criticized. Wilson's *Sociobiology* (1975), for example, was castigated by some evolutionary biologists, most notably Stephen Jay Gould and Richard Lewontin (1979). Evolutionary psychology has also been criticized for similar reasons. Some criticism expresses fear that evolutionary approaches serve right-wing agendas. Other criticism has been directed at the adaptationist approach in evolutionary biology (see Gould & Lewontin, 1979). The former criticisms hold little water; many evolutionary theorists, such as John Maynard Smith and Robert Trivers, publicly endorse liberal social and political views. Many of the latter criticisms regarding the adaptationist approach have been addressed (see Alcock, 2001, for a review). Thus, although human evolutionary behavioral science has hardly won over all critics, many behavioral scientists are open to hearing and learning more about the insights into human nature that evolutionary biology has to offer. As a result, the most important debates today do not center on *whether* evolutionary approaches can offer deeper insights into human nature and behavior, but on *which* approaches might offer the most significant insights. One purpose of this book is to foster effective clarification and resolution of the most important debates and controversies.

THEORETICAL APPROACHES IN HUMAN EVOLUTIONARY BEHAVIORAL SCIENCE

Four main perspectives can be identified in human evolutionary behavioral science (Laland & Brown, 2002). They include human sociobiology and three counterreactions to sociobiology that address genetic evolution—human evolutionary ecology, evolutionary psychology, and gene–culture coevolution. We briefly describe, compare, and contrast the major tenets of each approach below.

Human Sociobiology

Wilson's *Sociobiology* (1975) brought together many breakthroughs in evolutionary theory that occurred in the 1960s and 1970s, especially Hamilton's (1964) notion of inclusive fitness, the gene's-eye view championed by Hamilton (1964) and Williams (1966), life-history theory, four major theories introduced by Trivers (1971, 1972, 1974; Trivers & Willard, 1973), and the evolutionary economic strategy of modeling selection pressures on phenotypes through analysis of their fitness benefits and costs. The first six chapters of *Sociobiology* laid out these ideas. The remainder of the book applied them to the behavior of organisms within various taxa—with the final chapter focusing on humans. Shortly thereafter, Wilson (1978) published *On Human Nature*, which expanded the ideas sketched out in that final chapter on humans.

Perhaps the most lasting influence of *Sociobiology* was Wilson's (1975) declaration that a new evolutionary perspective on the behavior of animals had emerged, one that was based on the new "gene's-eye view" and rigorous modeling of selection pressures on behavioral phenotypes. The ideas presented in his first six chapters, followed by additional theoretical developments rooted in kindred evolutionary economic modeling (e.g., optimal foraging theory, sex allocation theory, evolutionary game theory) soon transformed the way biologists thought about and studied animal behavior. The focus of ethologists on naturalistic observation and the identification of behavioral "fixed action patterns" was replaced by the focus of behavioral ecologists on behavioral function in response to selection pressures, the approach that currently defines the study of animal behavior (see Krebs & Davies, 1997). With an intellectual heritage indebted to the ideas and perspective captured in Wilson's 1975 book, some current animal behavioral ecologists still refer to themselves as sociobiologists (e.g., Alcock, 2001), and a leading journal in the field is entitled *Behavioral Ecology and Sociobiology*.

Wilson's (1978) writings on human behavior, however, spawned few direct intellectual descendants of his approach. Most of his ideas were highly speculative and not well documented, especially with respect to humans. Much of his evidence was anecdotal, and he neglected to review and incorporate relevant theory and data from various fields in the social and behavioral sciences. To complicate matters, Wilson adopted a hereditarian stance; that is, he wrote of genes "for" particular behaviors, implying that behavior itself is inherited and relatively insensitive to environmental influences. For these reasons, most major approaches in human evolutionary behavioral science today fashion themselves as reactions largely *against* sociobiology.

Human Behavioral Ecology

By the 1970s, several anthropologists had become attracted to new adaptationist ideas in evolutionary biology. In addition to primatologists such as Irven DeVore (who worked at Harvard with Wilson and Trivers) and Jane Lancaster, the individuals included Napoleon Chagnon, William Irons, and Kristen Hawkes. Anthropologists were struck by the variability of behavior across cultures. People in different groups eat different foods, spend differing amounts of time hunting or fishing, have different customs involving sexual relations and marriage, divide tasks between men and women differently, and raise children differently. Wilson's hereditarian sociobiological approach failed to offer sufficient explanations for this variability. The emerging animal behavioral ecology approach did, however. Behavioral ecologists wanted to understand differences in behavior across species as different adaptive solutions to problems posed by the varying ecologies in which different species reside. They did so by modeling and measuring selection on phenotypes imposed by particular local ecologies. Human behavioral ecologists (also known as evolutionary or Darwinian anthropologists) began to apply this approach to account for variation within and between human populations. In different ecological settings, different behavioral strategies for tasks such as foraging, mating, parental investment, and childrearing were found to optimize reproductive success (e.g., Smith & Winterhalder, 1992). Accordingly, behavioral ecologists wanted to know whether actual variations in these domains both within and between different cultures reflected variations in optimal strategies.

To address these questions, human behavioral ecologists developed theoretical tools and research strategies similar to those used by animal behavioral ecologists. Specifically, they developed quantitative models to