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Introduction

Culture and the Innate Mind

Humans are cultural creatures. From before birth to beyond death our culture provides an indispensable part of who we are, what we were, and who and what we will become. Humans are also biological animals, and our biological nature provides an equally indispensable element of our past, present, and future. Recognition and reconciliation of these facts has proved no easy task, and debate between those who defend a cultural understanding of our humanness and those who defend a biological understanding has been long and rancorous. Yet, as the twenty-first century begins to unfold, it is increasingly clear that both our cultural and our animal natures are necessary elements in any plausible account of what human beings are.

This volume is the second in a three-volume series aimed at giving a state-of-the-art overview of research in the nativist tradition. The first volume, *The Innate Mind: Structure and Contents* (Carruthers, Laurence, & Stich, 2005) explored what is known about the likely overall architecture of the innate mind and some of its specific features. In this volume, the focus is on the relations between culture and the innate mind. The essays that follow investigate such questions as: To what extent are mature cognitive capacities a reflection of particular cultures and to what extent are they a product of innate elements? How do innate elements interact with culture to achieve mature cognitive capacities? How do minds generate and shape cultures? How are cultures processed by minds? How, in sum, should we understand the relations between our cultural and our biological selves? In the final section of this introduction, we have assembled brief summaries of each of the essays here. Before getting to those, however, we will set out a bit of the historical background of the research traditions represented in this volume. We will then sketch, in broad strokes, some of the ways in which researchers in these traditions have attempted to exploit features of the innate mind to explain cultural phenomena. It goes without saying that there are substantive theoretical, empirical, and methodological differences among those who might take themselves to be sympathetic with broadly nativist approaches to these issues. What follows is not intended to summarize a set of views all such theorists would endorse, but rather to set out the

theoretical backdrop against which the current diversity of opinion among nativists, which is represented in the volume, has developed.

1 A Bit of History

For much of the twentieth century, the vast majority of psychologists and the vast majority of anthropologists would have expected a book exploring the relationships between culture and the innate mind to be a very slim volume indeed. From the 1920s until the mid-1960s, behaviorism, in one guise or another, was the dominant paradigm among psychologists, apart from those in the Freudian tradition. And behaviorists, like the empiricist philosophers who inspired them,[1] were disinclined to explain much of anything by appeal to innate properties of the mind. The reason is not that behaviorists did not believe in minds, though their rhetoric sometimes lent itself to that interpretation. Nor was it the case that behaviorists denied that the mind has any innate properties. Indeed, as the philosopher W. V. Quine noted, "the behaviorist is knowingly and cheerfully up to his neck in innate mechanisms of learning-readiness" (Quine, 1969). But those innate mechanisms are part of a general-purpose learning device designed to detect and utilize regularities in the environment, whatever those happen to be. So for behaviorists, as for other empiricists, the mind's innate mechanisms impose few constraints on what is learned, and contribute little or no content to the output of the learning process. Rather, what is learned depends entirely on the environment to which the learner is exposed. Since behaviorists, like other empiricists, deny that the mind starts out with much by way of unlearned innate content, they must, and happily do, attribute just about *all* the contents of the adult mind to the environment. Thus, for behaviorists, the innate mechanisms of the mind contribute nothing of substance to family patterns, social relationships, language, norms, religions, decorative and artistic activities, technological traditions, or other paradigmatic elements of culture.

In anthropology, during the middle decades of the twentieth century and beyond, the emphasis was also on the environment. Franz Boas, one of the founders of anthropology in America, took a strong stand against the nativist (or "hereditarian")—and in hindsight, blatantly racist—views that loomed large in the work of nineteenth-century social Darwinists like Herbert Spencer. Boas maintained that it was the environment, particularly the cultural environment, rather than biology or psychology, that determined the patterns of behavior that differed across groups and societies.

1. One of the central contrasts characterizing the divide between empiricist philosophers (Locke, Hume) and rationalist philosophers (Descartes, Leibniz) that emerged in the seventeenth and eighteenth centuries concerned their views on the extent to which the mind is innate. Empiricists claimed that a relatively small amount of simple, general-purpose, innate machinery would suffice—for example, simple mechanisms of perceptual processing and general-purpose principles of association. Rationalists, on the other hand, claimed that a relatively large amount of complex, special-purpose, innate machinery was required—for example, a large number of innate ideas, and special-purpose processing mechanisms associated with language, mathematics, and other cognitive faculties. Importantly, in the contemporary nativist/empiricist debate, the issue is not over whether empirical research bears on the study of the mind—both nativists and empiricists appeal to empirical work in support of their views.

In 1925, Boas sent his young student, Margaret Mead, to Samoa, where she spent nine months studying adolescence and sexual awakening among Samoan youth. The book she produced, *Coming of Age in Samoa*, quickly became (and probably still is) the most widely read anthropological study ever published. In it, Mead describes adolescence in Samoa as a time of carefree, guilt-free, and delightful sexual experimentation, facilitated by an easy-going social environment that is dramatically different from the one familiar to her readers in America and Europe.

> The Samoan background which makes growing up so easy, so simple a matter, is the general casualness of the whole society. For Samoa is a place where no one plays for very high stakes, no one pays very heavy prices, no one suffers for his convictions, or fights to the death for special ends. Disagreements between parents and child are settled by the child's moving across the street . . . between a husband and his wife's seducer by a few fine mats. . . . Love and hate, jealousy and revenge, sorrow and bereavement, are all matters of weeks. (Mead, 1928/1973, p. 198)

Throughout her long and enormously influential career, as Derek Freeman has documented in great detail, Mead insisted that the Samoans had

> no conviction of sin, regarded lovemaking as "the pastime *par excellence*," [and] made "a fine art of sex." . . . Samoan society, she reported, "works very smoothly as it is based on the general assumption that sex is play, permissible in all hetero- and homosexual expressions, with any sort of variation as an artistic addition." . . . The assumption that sex is play provides a cultural atmosphere in which "frigidity and psychic impotence do not occur and in which a satisfactory sex adjustment in marriage can always be established." (Freeman, 1983, pp. 91–2)

This was just the sort of powerful evidence that Boas had hoped Mead would find. If cultures can differ so radically and in such fundamental ways, Boas, Mead, and many of their followers maintained, surely biology imposes few interesting constraints.[2] "We are forced to conclude," Mead wrote, a decade after her visit to Samoa, "that human nature is almost unbelievably malleable, responding accurately and consistently to contrasting cultural conditions" (1935/1963, p. 280).[3]

The empiricist psychological theses that the mind is malleable and that its contents are determined by experience fit very comfortably with the anthropological theses, urged by Boas and Mead, that cultures differ dramatically in fundamental ways and that everything interesting about societies can be explained by the local cultural environment. The ideas in this package are the central components of what John Tooby and Leda Cosmides (1992) have called the "Standard Social Science Model." In the years after World War II, because of the role that nativist theories about the mind and cultures had played in propaganda designed to justify Nazi

2. We should note that not everyone believes that Mead ultimately endorsed the extreme form of cultural determinism that we ascribe to her in the text; but there is no doubt that many of her followers have interpreted her that way.

3. After almost a half century during which Mead's claims influenced everyone from Bertrand Russell to the readers of *National Geographic* and the *Readers' Digest*, Freeman (1983) published a book in which he makes a persuasive case that just about every major claim Mead made about Samoan culture was mistaken. The book was promptly denounced by the American Anthropological Association.

racist and eugenic policies, the cluster of views making up the standard social science model came to have considerable moral authority. Nativism, many people believed, is not merely false, it is evil.

During the last three decades of the twentieth century, all this began to change. Though the unraveling of the standard social science model was a complex process that is still far from complete, for our purposes, three strands of the story are central.[4] The first was the emergence of cognitivism in psychology and the decline of behaviorism. On cognitivist accounts, which were inspired by the metaphor of the mind as computer, minds contain large sets of representational states that are manipulated by one or more computational mechanisms. The job of the psychologist, or the cognitive scientist, is to discover the structure of these representations and the programs or algorithms that manipulate them. Early work on language by Chomsky and his followers, and on reasoning and problem solving by Newell and Simon, inspired a generation of investigators to apply this approach to a wide range of phenomena, including vision, memory, categorization, inductive reasoning, and a host of others, often with impressive results (see, for example, Pinker, 2002; for a useful history of the emergence of cognitivism, see Gardner, 1985).

At the same time, behaviorism was subjected to critical scrutiny from within, and empirical work by John Garcia, Paul Rozin, and others argued against the view that all learning was general purpose. For example, Garcia and Koelling (1966) gave rats a saccharin-flavored water. When the rats began to drink, there was a repeated sound and flashing lights. After drinking, the rats in one group were exposed to an electric shock, whereas rats in a second group were exposed to x-rays that induced illness. All these rats developed an aversion to saccharin-flavored water presented with sounds and flashing lights. Garcia and Koelling then tested the rats under two new stimulus conditions. In one condition, rats from both groups were given saccharin-flavored water without the lights and sounds. In the other condition, they were given ordinary water with lights and sounds as in the original condition. Although the rats in the two groups (shock and x-rays) had both developed an aversion to the original stimulus conditions, they behaved very differently in the new test conditions. Rats that had been shocked drank the saccharin-flavored water, but did not drink the ordinary water. And rats that had been exposed to x-rays (and became ill) did just the opposite; they drank the ordinary water, but did not drink the saccharin-flavored water (Gleitman, 1991). What experiments like these suggest is that organisms have an innate "preparedness" for learning certain types of connections (e.g., between tastes and illness, and between sights and sounds and shocks). (For discussion, see Rozin, 1976.)

The second strand in the story was the rekindling of interest in nativist theories of the mind. As discussed in some detail in our introduction to the first volume in this series, Chomsky's work on language was the spark that ignited the fire. Beginning in the mid-1960s, Chomsky made an increasingly impressive case that the structure of natural languages was simply too rich to be acquired by an empiricist

4. For a much more detailed, though hardly nonpartisan, account of the decline of the standard social science model, see Pinker (2002).

learning mechanism on the basis of the evidence available to the child. Given the "poverty of the stimulus," Chomsky argued, the only plausible explanation for the linguistic knowledge that the child acquires is that a very substantial portion of that knowledge is innate. Since any normal child can learn any natural language, the innate knowledge, which Chomsky called *universal grammar* (UG), must be present in all normal humans and manifest in all natural languages.[5] How, then, are we to account for the obvious fact that unrelated languages seem *very* different from one another? Though other broadly nativist models of cultural variability exist, Chomsky's own answer to this question invoked two ideas that have cast a large shadow on nativist-friendly explanations of culture.

The first is that while all natural languages manifest the features specified in UG, those features are not obvious to casual inspection. Discovering the cross-linguistic regularities of UG, like discovering the regularities captured by Newton's laws or by just about any other sophisticated science, requires careful study of the phenomena aided by a theory that tells you what to observe or measure. The second idea is that some of the regularities are *disjunctive*. There are, for example, many logically possible ways in which a language might order the components of sentences that linguists call *heads* and *complements*. But almost all of the world's languages exhibit one of two patterns. So the regularity here is that heads and complements are ordered in one or the other of these ways. In order to determine which pattern prevails in the language that surrounds her, a child must, of course, be exposed to that language. But all she needs is a bit of information that will serve as a cue or "trigger" enabling her to adopt either pattern A or pattern B. She need not figure out all the complexities of those two patterns, since they are innately specified. Linguists describe this process in which the environment provides a cue triggering the adoption of one of several innately specified patterns as *parameter setting*, and many in the Chomskian tradition believe that a relatively small number of parameters will account for most of the variation in grammars found around the world (for example, see Baker, 2001).

A third idea inspired by Chomsky's work that has had an important impact on nativist explanations of culture is that both the psychological mechanisms underlying language processing and the those underlying language acquisition are special-purpose, innate devices that are built to do those jobs and nothing else. Chomsky often uses the term "language organ" to stress the analogies between the mental system underlying language processing and familiar biological organs like kidneys or the eyes. In the early 1980s, Jerry Fodor (1983) published a very influential book in which he proposed the term *module* for mental mechanisms like the language organ, and went on to offer a detailed characterization of the features of modules. Central among them was that modules (1) contain a substantial body of information relevant to the task they were designed to accomplish, where this information is *inaccessible* to other components of the mind, and (2) do their work while utilizing *only* that proprietary

5. These enormously influential ideas generated a great deal of controversy at the time, and continue to generate debate. For a recent contributions to this debate, see Cowie (1999), Laurence and Margolis (2001), and Crain and Pietroski (2001).

body of information, *encapsulated* from all other information held elsewhere in the mind. Fodor, who had earlier done much to clarify the basic assumptions of cognitivism, also assumes that modules are computational devices that manipulate representations in accordance with a program or algorithm.

The final strand in our story of the events that led to the unraveling of the standard social science model was the emergence of sociobiology, which had its beginnings in the research tradition of ethology stemming from the work of Konrad Lorenz and Niko Tinbergen. This tradition provided an empirically grounded alternative to behaviorism. Important aspects of animal behavior were seen to be the product of innate mechanisms that were evolutionary adaptations. However, from Darwin's time onward, evolutionary theorists had found certain social behaviors in animals to be very difficult to explain in terms of adaptations. Perhaps most puzzling were "altruistic" behaviors that threatened the survival or reproductive prospects of the animal exhibiting the behavior while increasing the likelihood that some other animal would survive and reproduce. How could animals disposed to behave like that evolve? Starting in the mid-1960s, a group of biologists that included George Williams, W. D. Hamilton, John Maynard Smith, Robert Trivers, and Richard Dawkins began to make major advances in answering that question. One crucial idea, proposed by Williams and Hamilton and popularized by Dawkins in his book *The Selfish Gene* (1976), was that we should not focus on the number of offspring an organism produces but rather on the number of copies of its genes that are passed on to the next generation. That made it clear how a gene that made altruistic behavior more likely could spread through a population, provided that the recipients of the altruism were kin who carried a copy of the gene. Theories invoking reciprocal altruism, parental investment, sexual selection, and the idea of an evolutionarily stable strategy yielded plausible accounts of how other behavioral dispositions might evolve. (For an overview of these ideas and more, see Trivers, 1985). In 1975, Harvard biologist E. O. Wilson published *Sociobiology: The New Synthesis*, a massive survey of the literature on animal social behavior and of attempts to explain how this behavior might have evolved. In the last chapter of that book, Wilson turned his attention to humans. He offered hypotheses aimed at explaining how a variety of human social behaviors and cultural phenomena might have evolved, including religion, ritual, artistic activity, male dominance, and warfare. This was, of course, a clear challenge to the standard social science model, since if Wilson's explanations were correct, then the behaviors in question must, to some extent at least, be influenced by genes, and those genes must have been favored by natural selection. The reaction was fast and furious—indeed so furious that for some years after the publication of *Sociobiology*, public talks by Wilson and other sociobiologists were often met with organized and aggressive heckling. (For a detailed history see Segerstråle, 2000.)

While sociobiology and the closely allied field of human behavioral ecology pose a clear challenge to the standard social science model, they do not speak directly to the topic that is the central focus of this book, the links between culture and the innate mind. The reason they don't is that both sociobiology and human behavioral ecology are largely *a*psychological—they don't say much about the mind *at all*. Rather, they focus on *behavior*. Their central concern is to explain

how a given pattern of behavior evolved, and their usual strategy is to argue that that pattern of behavior is *adaptive*, that is, that it increases the chance that copies of the genes of organisms displaying the behavior will be present in subsequent generations. All of this changed with the advent of evolutionary psychology, where we find theories that attempt to explain cultural phenomena that clearly invoke features of the innate mind.

2 Evolutionary Psychology's Strategies for Explaining Culture

Though the terminology, like much else in this area, is contested, we will use "evolutionary psychology" as a label for the work of a group of researchers who, starting in the mid-1980s, attempted to integrate the burgeoning nativist research tradition with the evolutionary approach to culture urged by sociobiologists. While many thinkers have played a role in developing evolutionary psychology, the most influential figures have been the anthropologist John Tooby, the psychologist Leda Cosmides, and, more recently, the psychologist Steven Pinker. Though they are broadly sympathetic with the sociobiologists' attempts to give evolutionary explanations of cultural phenomena, evolutionary psychologists maintain that sociobiology's focus on behavior and its neglect of psychology are misguided. When genes influence behavior, they argue, they do so by building brains with a bevy of specialized mental modules. Behavior is the result of the interaction between these mental modules and the environment. During the Pleistocene, when modern humans were evolving, natural selection shaped these mental modules to produce behavior that would be adaptive in the Pleistocene environment. But over the roughly 10,000 years since the invention of agriculture, the environment in which humans live has been radically altered by human activity. Thus it is a mistake to assume, as sociobiologists typically do, that the behavior of modern humans is generally adaptive, since it is produced by minds that were designed by natural selection to produce adaptive behavior in a very different environment.

Rather than attempting to show how contemporary social behavior and the cultural institutions that it generates are adaptive, the research program of evolutionary psychology proposes that we learn as much as possible about the persistent adaptive problems that our ancestors confronted during the period when modern humans were evolving. According to evolutionary psychologists, we should then hypothesize that for most of these adaptive problems, natural selection produced a mental module that was well designed to solve it, and that those modules persist largely unchanged in modern minds. These hypotheses about contemporary minds can then be tested using the methods of contemporary cognitive science. The mental modules posited by evolutionary psychologists do not share all of the features of Fodor's modules, and there is considerable debate about which features they retain (Carruthers, 2005, chapter 12 here). However, it is clear that evolutionary psychologists take modules to be special-purpose computational devices, and since these devices have been shaped by natural selection, they often use the term "Darwinian algorithms" to characterize their programs.

There is much here that is controversial, including the pivotal assumption that there will be at least a rough pairing between adaptive problems faced by our

ancestors in the Pleistocene and mental modules designed to solve those problems (Samuels, 2000; Boyd & Richerson, chapter 2 here). But in addition to their theoretical arguments in support of this claim, evolutionary psychologists maintain that the assumption has been amply vindicated by contemporary cognitive science, particularly those parts of cognitive science that have taken nativism seriously. According to Tooby and Cosmides, this research has shown that

> our cognitive architecture resembles a confederation of hundreds or thousands of functionally dedicated computers (often called modules) designed to solve adaptive problems endemic to our hunter-gatherer ancestors. Each of these devices has its own agenda and imposes its own exotic organization on different fragments of the world. There are specialized systems for grammar induction, for face recognition, for dead reckoning, for construing objects and for recognizing emotions from the face. There are mechanisms to detect animacy, eye direction, and cheating. There is a "theory of mind" module and a multitude of other elegant machines. (Tooby & Cosmides, 1995, p. xiv)

All of this cognitive architecture, evolutionary psychologists maintain, is part of our human endowment and is shared by people in all cultures. How, then, do evolutionary psychologists propose to explain the apparently limitless variety of cultural differences that have been described by anthropologists who followed in the footsteps of Boas and Mead?

One important theme in evolutionary psychologists' response to this question is to challenge the assumption of all-but-limitless cultural variability. While not denying that cultures vary in many ways, evolutionary psychologists also insist that there are many cultural universals—features all cultures share—though, like Chomsky's linguistic universals, they are sometimes not obvious unless one has a theory that suggests where to look. Here is how Tooby and Cosmides make the point:

> Anthropological orthodoxy to the contrary, human life is full of structure that recurs from culture to culture, just as the rest of the world is. (Or, if one prefers, there are innumerable frames of reference within which meaningful cross-cultural uniformities appear, and many of these statistical uniformities and structural regularities could potentially have been used to solve adaptive problems.) . . . Such statistical and structural regularities concerning humans and human social life are an immensely and indefinitely large class (D. E. Brown, 1991): adults have children; humans have a species-typical body form; humans have characteristic emotions: humans move through a life history cued by observable body changes; humans come in two sexes; they eat food and are motivated to seek it when they lack it; humans are born and eventually die; they are related through sexual reproduction and through chains of descent; they turn their eyes toward objects and events that tend to be informative about adaptively consequential issues; they often compete, contend, or fight over limited social or subsistence resources; they express fear and avoidance of dangers; they preferentially associate with mates, children, and other kin; they create and maintain enduring, mutually beneficial individuated relationships with nonrelatives; they speak; they create and participate in coalitions; they desire, plan, deceive, love, gaze, envy, get ill, have sex, play, can be injured, are satiated; and on and on. Our immensely elaborate species-typical physiological and psychological architectures not only constitute regularities in themselves but they

> impose within and across cultures all kinds of regularities on human life, as do the common features of the environments we inhabit. (1992, pp. 88–9)

Tooby and Cosmides sometimes describe these universals as constituting "a single human metaculture" (p. 91).

But even if it is granted that there is a rich human metaculture that has been largely neglected by anthropologists, there is still a great deal of cultural diversity that needs to be explained. One strategy that evolutionary psychologists use to explain this diversity parallels Chomsky's parameter-setting strategy for explaining grammatical diversity. If our ancestors had to solve persistent adaptive problems in several quite different environments, we should expect that some of the Darwinian algorithms that evolved to deal with those problems would be *disjunctive*, with cues from the physical or social environmental serving to activate the appropriate branch of the algorithm. As in the case of Chomskian parameters, the information required to deal with the problem at hand is innate, and the environment serves only to trigger the appropriate package of information. Cosmides and Tooby use the term "evoked culture" for aspects of culture that are produced in this way (Cosmides & Tooby, 1992). The food-sharing practices within modest-size "band-level" groups are among the phenomena that evolutionary psychologists have attempted to explain by appealing to the idea of evoked culture. The core idea is that some sorts of foraging depend heavily on luck, and in those cases, band-wide food sharing serves as an insurance policy that buffers the day-to-day variance. But when skill and individual effort rather than luck are the major determinants of success, individuals will maximize their fitness if they are inclined to share only with kin. And these patterns have indeed been reported in a number of studies. To explain these patterns, Cosmides and Tooby posit innate evolved mechanisms that are toggled by cues indicating the extent to which success in a given foraging activity depends on chance:

> Because foraging and sharing are complex adaptive problems with a long evolutionary history, it is difficult to see how humans could have escaped evolving highly structured domain-specific psychological mechanisms that are well designed for solving them. These mechanisms should be sensitive to local informational input, such as information regarding variance in the food supply. This input can act as a switch, turning on and off different modes of activation of the appropriate domain-specific mechanisms. The experience of high variance in foraging success should activate rules of inference, memory retrieval cues, attentional mechanisms, and motivational mechanisms. These should not only allow band-wide sharing to occur, but should make it seem fair and appealing. The experience of low variance in foraging success should activate . . . mechanisms that make within-family sharing possible and appealing but that make band-wide sharing seem unattractive and unjust. (1992, p. 215)

There is yet another way in which evolutionary psychologists invoke evolved modules to explain cultural variation. It is a truism that cultures—or more accurately individuals within cultures—are great sources of locally useful information. What plants are edible, what animals are dangerous, what paths are safe, all this and much more is conveyed from one individual to another. When this culturally transmitted information is relevant to solving adaptive problems that were

frequently encountered in the Pleistocene, evolutionary psychologists maintain, mental mechanisms may have evolved that seek it out and make use of it in predetermined ways. As an example, Barrett (2005a) has argued that children have an innate "dangerous animal" category embedded in a mental mechanism that leads them to seek out and retain information about local animal predators, and to have appropriate emotional and behavioral responses to such animals.

3 The Epidemiological Strategy for Explaining Culture

In the previous section, we sketched the three strategies for explaining cultural phenomena that evolutionary psychologists have most actively explored: metaculture, evoked culture, and use of culturally transmitted information by modules designed to exploit it. All three strategies are aimed at explaining aspects of culture that are clearly adaptive, or that were adaptive in ancestral environments. But there are many cultural phenomena, including aspects of religion, taboos, and etiquette rules, that appear to serve no adaptive function either now or in the past. Does the innate mind have anything to tell us about these? Researchers who have adopted the epidemiological approach to culture pioneered by Dan Sperber (1996) argue that it does. The starting point of this approach is the observation that while it is undoubtedly true that lots of information is transmitted from one member of a culture to another, this information transfer is almost always mediated by a variety of innate mechanisms. In order to imitate a dance or a hunting technique, internalize a norm, or learn a folk tale, the learner (or "cultural child" as he or she is sometimes called) must observe more knowledgeable members of the culture ("cultural parents"), infer or reconstruct the mental representations that underlie their behavior (including their verbal behavior), and store the reconstructed mental representations in the appropriate place in memory. Neither the mechanisms that underlie the necessary inferences nor those that underlie memory are perfectly accurate, however. Such learners are bound to make mistakes, and those mistakes will often not be random. Rather, because of the way the mechanisms responsible for inference and memory are designed, the mental representations that are reconstructed and stored are more likely to selectively retain some features of the cultural parents' representations, to drop others, and to introduce new features that may not have been present in the cultural parents' representations. The features that are more likely to be retained or added might be thought of as biases or attractors in the transmission process, and over time the transmitted mental representations found in a population will tend to move in the direction of those attractors.

One influential example of research that adopts the epidemiological approach is Pascal Boyer's work on religion (Boyer, 2001). Boyer has shown that people's beliefs about supernatural beings tend to characterize those beings as having just one, or a small number, of bizarre and unfamiliar properties, and otherwise to be pretty much the same as natural beings in that category. Thus a supernatural person may be able to know what is happening in distant places or what will happen in the future, but apart from this, his mind will have all the normal characteristics posited by commonsense or folk psychology. The reason for this, Boyer argues, is that the small number of "supernatural" properties make the representations of these beings

particularly memorable, while the more mundane features of the supernatural agent's mind are supplied automatically, when people hear accounts of these beings, by the innate mental modules that are responsible for attributing mental states to real people. Shaun Nichols's work on etiquette norms provides another illustration of the epidemiological strategy. Nichols has shown that, while a wide variety of behavior has been governed by etiquette norms during the last 500 years, the norms that tend to survive, once they appear, are those that prohibit behavior that evokes disgust reactions we are innately predisposed to have. Our innate predisposition to find certain types of things disgusting, Nichols argues, biases the transmission process in favor of norms prohibiting disgusting behavior by making those norms more salient and more memorable (Nichols, 2004).

Although describing this approach to the explanation of cultural phenomena as "epidemiological" is a metaphor, it is in many ways a very apt one. The mental representations that are spread by the sorts of processes that are center stage in the epidemiological approach, like the infectious agents tracked by medical epidemiologists, rarely do their hosts much good. Those that succeed in spreading through a population do so by exploiting features of their hosts' cognitive systems that were designed for very different purposes. The mind-reading system that explains why supernatural beings are believed to have familiar psychological properties did not evolve because it enabled people to create religious myths, and the core disgust system was presumably in place long before the emergence of rules of etiquette. Thus the epidemiological approach gives us insights into some of the quirks of culture, and some of its pathologies. It explains how innate mental mechanisms that were designed to deal with adaptive problems can, inadvertently as it were, give rise to an efflorescence of cultural phenomena that often contribute nothing to fitness.

4 Cumulative Cultural Evolution and Adaptive Local Culture

Thus far we have considered strategies for explaining aspects of culture that were adaptive in ancestral environments (many of which, of course, are still adaptive) and aspects of culture that are often maladaptive. But as Robert Boyd, Peter Richerson, and a number of other researchers have argued, these approaches cannot explain some of the most conspicuous and important features of culture. Humans are by far the most widely distributed large animals on earth; they survive and often flourish in the Arctic, in temperate zones and in the Tropics, in deserts and in rain forests, on tiny atolls and in enormous cities. People can live in this staggering variety of environments because they have sophisticated, culturally transmitted, and locally appropriate technological knowledge that enables some groups of people to build igloos and kayaks and hunt seals, and enables other groups to build high-rise apartment towers and grow high-yielding genetically modified crops. None of this is plausibly explained by appeal to evoked culture alone. Boyd and Richerson (chapter 2 here) make this point vividly with a thought experiment in which a contemporary urban academic is deposited on an Arctic beach, where, in order to survive, he needs to make a kayak out of locally available materials. He would, of course, be a spectacular failure. The new environment would not evoke a Darwinian algorithm for kayak building. Nor would he be able to learn the art on his own, via trial-and-error

learning, even after years of trying. The Inuit, who are masterful kayak builders, do not rely on Darwinian algorithms or on individual learning to acquire their skills; rather, they get the relevant knowledge from other members of their culture. But, of course, this immediately raises another question: How did this knowledge get established in the culture? The answer, Boyd and Richerson argue, is that human cultural transmission, like genetic transmission, is *cumulative*. Small changes in existing cultural knowledge introduced by individual innovators, whether they are motivated by insight or by chance, will be adopted and passed on to subsequent generations if they are judged to improve the product whose production the knowledge guides. Over time, this process of cumulative innovation can lead to technologies that are exquisitely well adapted to local environments. And while it typically takes many generations for the process to achieve these results, it can nonetheless be extraordinarily fast when compared with the pace of cumulative biological evolution. This cumulative process of cultural evolution, Boyd and Richerson argue, is central in explaining the extraordinary success of our species.

Humans are not the only species that has a system of cultural transmission (Heyes & Galef, 1996). However, only humans exhibit the sort of massively cumulative cultural transmission that enables us to quickly adapt to a wide range of environments. What features of our innate minds make this powerful component of culture possible? Answers to this question are explored in several of the essays in this volume, including those by Boyd and Richerson (chapter 2), Fessler (chapter 4), and Sterelny (chapter 14). One intriguing suggestion is that the mind-reading (or "theory of mind") system plays a central role since it enables us to understand the intentions or goals underlying other people's behavior, and this may be crucial to successful imitation (Tomasello, 1999a). But if the mind-reading system, much of which appears to be unique to humans, gives us the ability to imitate, one or more other components of the innate mind must provide the motivation to imitate. Fessler suggests that some of this motivation may derive from the mental mechanisms underlying norms, perhaps like those described in by Sripada and Stich (chapter 17 here). But if this is right, it is clearly not the full story about the motivation to imitate and to internalize local knowledge, and much more work is needed in this area.

Some of Boyd and Richerson's most influential work has focused on the question of *who* to imitate. The question is an important one, since there will often be many potential cultural parents from whom a neophyte could learn. Using sophisticated mathematical models, Boyd and Richerson have shown that in some circumstances it will be adaptive to adopt the most common cultural variant, while under other circumstances it will be adaptive to adopt the variant exhibited by a high-prestige individual. This suggests that we may have evolved innate mechanisms or biases facilitating these choices (Boyd & Richerson, 1985; Richerson & Boyd, 2005).

The mechanisms that enable cumulative cultural evolution and that lead us to adopt appropriate cultural parents produce the spectacular results that dramatically differentiate human societies from those of even our closest primate cousins. But, as Richerson and Boyd have stressed (2005; Boyd & Richerson, chapter 2 here) there is a dark side to this as well. The processes vetting cultural innovations,

though they can be very effective, can also fail in a variety of ways. Prestige bias provides a clear and intuitive example. While it is often adaptive to imitate successful and prestigious individuals, it is hard to know which aspects of their belief systems and their preferences contribute to their success. So our inclination to imitate, while it may give us useful knowledge and skills, may also lead us to pick up idiosyncratic beliefs and preferences that are inefficacious or maladaptive. As Boyd and Richerson note, "our propensity to adopt dangerous beliefs may be the price we pay for the marvelous power of cultural adaptation" (chapter 2 here).

5 Introduction to the Rest of the Volume

We have reviewed some of the main strategies that have been proposed for explaining aspects of culture by appeal to innate features of the mind. But as the essays in this volume make clear, there is much more territory that needs to be explored. Some of these essays suggest additional strategies, some propose ways strategies can be combined, and many address the daunting task of assembling persuasive evidence in favor of—or against—proposed explanations. In this section, we will offer brief sketches of each of the chapters that follow.

5.1 *Learning, Culture, and Evolution*

The chapters in Part I all focus on possible relations between acquisition, learning, and culture and examine the extent to which ideas from evolutionary theory can aid our understanding of such relations.

Boyd and Richerson (chapter 2) examine the ways in which coevolutionary phenomena have shaped our cultural and genetic selves. In particular, Boyd and Richerson examine the costs and benefits associated with both social learning and more rigid cognitive mechanisms, and show how "trade-offs" between these acquisition methods necessarily underlie the kind of cumulative cultural evolution exhibited by the human lineage.

Rozin (chapter 3) continues the discussion of possible interactions between our cultural and genetic selves, presenting a set of nineteen principles that he suggests may be useful in understanding links between culture and the innate mind. Drawing on work by numerous researchers in a variety of research programs and domains—and with particular attention to the domain of food—Rozin provides a wealth of data and insight concerning the evolution and development of human preadaptations, predispositions, and preferences.

Fessler (chapter 4) compares and contrasts human and nonhuman primates' uses of cultural information. Fessler points out that the human capacity to acquire, employ, and elaborate on socially transmitted information is the cornerstone of humans' evolutionary prosperity, and argues that these capacities reflect the workings of special-purpose psychological mechanisms that evolved in order to exploit the enormous adaptive potential of socially transmitted information. To support these claims, Fessler first reviews the principal existing approaches to this issue, and then outlines some of the major topics he believes need to be addressed in developing an evolutionary psychology of our uniquely culture-dependent species.

Wilson (chapter 5) provides a more methodologically focused analysis, in which he examines our understanding of human groups in the light of evolutionary theory. Wilson argues that scientific and intellectual thought has for some decades been dominated by a form of individualism that renders groups as nothing more than collections of self-interested individuals. However, in recent years groups themselves have begun to be interpreted as adaptive units, and this interpretation has much in common with a much older understanding of the individual/group relationship. Wilson suggests that we now have to hand the ingredients for a permanent consensus on the relationship between human groups and evolution.

The next two essays in Part I both focus on the relations between "genetic assimilation" and the "Baldwin effect," two famous models that envisage something that is initially learned by individuals becoming, over time, innate. Griffiths (chapter 6) takes issue with David Papineau's claim to have described a form of genetic assimilation dependent on social learning. According to Griffiths, the Baldwin effect is a phenotypic-level selection model that is supposed to explain how selection can cause an acquired phenotype to become innate. Conrad Waddington's "genetic assimilation," however, is a developmental model that is supposed to explain how very small genetic changes can cause acquired traits to become innate. Papineau conflates genetic assimilation with the Baldwin effect, and this, Griffiths argues, is a result of the way he thinks about genes. We need to think about genes in a more sophisticated way if we are to understand how and why the development of a phenotypic trait can become independent of certain aspects of the developmental environment.

In reply, Papineau (chapter 7) argues that Griffiths himself conflates two distinct notions—genetic *canalization* and genetic *assimilation*. Papineau argues that Griffiths's criticisms would be both correct and well directed if the focus of Papineau's concern was genetic canalization. However, Papineau claims, his concern is not genetic canalization but genetic assimilation. Thus, Papineau concludes, even though Griffiths's critique may be theoretically sound, it unfortunately misses its intended mark.

Finally in this part of the book, Giaquinto (chapter 8) discusses mental number lines, and the respective innate and cultural contributions to their construction during development. He argues that while one might initially think of such lines as cognitively simple objects that are routinely learned at school via associative mechanisms, in fact neither the nature nor the origin of these number lines is at all clear. Using data from a variety of empirical studies, Giaquinto concludes that the standard mental number line is ultimately the product of four interacting factors. Three of these are innate faculties—our number sense, our sense of the space around us, and our visual imagery system—and one is the culture-specific convention of a written numeral system.

5.2 *Modularity and Cognitive Architecture*

The essays in Part II examine central elements of our cognitive architecture, and focus in particular on the nature and role of modularity in human cognition.

Siegal and Surian (chapter 9) investigate two seemingly uniquely human cognitive capacities—language and theory of mind—and examine the extent to which

these capacities interact during ontogenetic development. Using evidence from developmental psychology, cognitive neuroscience, and behavioral genetics, Siegal and Surian conclude that the development of both systems is significantly modularized and characterized by a "poverty of the stimulus." Nevertheless, they point out that in typically developing persons these systems interact substantially to support word learning and the emergence of specific cultural beliefs.

Sperber and Hirschfeld (chapter 10) address the relations between cognitive modularity and cultural diversity, and argue that these supposedly incompatible properties can in fact be reconciled. Indeed, Sperber and Hirschfeld claim, cognitive modularity is necessary to explain important aspects of cultural diversity that would otherwise remain mysterious, and they therefore conclude that these two properties should be considered as complementary rather then conflicting elements of human existence.

Todd and Heuvelink (chapter 11) examine the information-gathering and decision-making mechanisms that may underlie the construction of culture and cultural knowledge. Todd and Heuvelink claim that such mechanisms may be much simpler than is often supposed, and support this claim with details from simulations of the use of one class of such simple heuristics—"recognition heuristics"—by a population of socially interacting agents. They argue that the emergent behavior of these simulated agents is importantly similar to that of real world agents, and thus conclude that such simple heuristics may well shape a great many of the social processes that occur in the real world.

Carruthers (chapter 12) continues with the theme of simple heuristics, and assesses the impact of results from the simple heuristics research program on the notion of "massive modularity" prevalent in evolutionary psychology. Carruthers begins by defusing several potential sources of conflict between these two programs, but then goes on to show that the simple heuristics program does have the potential to undermine one of the main arguments frequently used in support of massive modularity. This leads Carruthers to reexamine the notion of modularity as understood in cognitive science, and in so doing he develops a characterization of modularity that can both support massive modularity and accommodate the results from the simple heuristics program.

Barrett (chapter 13) also focuses on claims of massive modularity. More specifically, he is concerned to reconcile modularity with development. He argues that it is a mistake to assume that modules would have to be either innate or genetically "prespecified." Rather, modules should be thought of as functionally distinct aspects of cognitive organization that emerge in the course of normal development (where sometimes the developmental process can include various forms of learning). And thus considered, they can still be targets of selection, and can count as adaptations.

A more direct challenge to the simple heuristics program comes from Sterelny (chapter 14). Sterelny investigates the decision-making processes involved in human social situations, and claims that many instances of such decision-making involve what he terms a "high information load." Sterelny then argues that in these cases it isn't possible for "simple" or "fast-and-frugal" heuristics to do the decision-making work. He suggests that social decision-making must therefore require a

variety of other sorts of information-processing mechanism, especially those that utilize social and environmental structures that are external to individual agents. Sterelny then considers how such mechanisms and the corresponding external structures may have coevolved.

5.3 *Morality, Norms, and Religion*

The essays in Part III all focus on the development of cultural norms and beliefs.

Dwyer (chapter 15) focuses on the development of children's moral capacities, and examines the extent to which this development may mirror the development of our linguistic abilities, as understood from a Chomskian perspective. She argues that there are in fact many deep similarities between the development of our moral and linguistic competencies, and suggests that such similarities provide good evidence for the existence of an underlying "normative competence" that allows us to see the world in moral terms—indeed *makes* us do so.

Joyce (chapter 16) seeks to clarify the claim "Human morality is innate" and asks why moral thinking may have been adaptive for our ancestors. By putting forward a hypothesis in terms of individual selection (and "reciprocal altruism" in particular), Joyce raises the question of what practical advantages accrue to the individual (as opposed to the group) by having a tendency to categorize certain actions (including one's own) as "good," "prohibited," "virtuous," and so on. Although he accepts that explanations involving group selection are entirely legitimate in principle, in this instance, Joyce argues, explanations involving only individual selection and reciprocal altruism provide a less complicated and ultimately more successful hypothesis.

Sripada and Stich (chapter 17) develop a framework within which to investigate what they term "the psychology of norms." Broadly speaking, norms are rules or principles that govern various aspects of human behavior, and that often do so without any explicit recognition or enforcement by social institutions. In addition, norms usually give rise to powerful subjective feelings, and people often feel motivated to comply with such norms, irrespective of any explicit social requirement. Norms therefore play an extremely significant role in human culture, and in our explanations of cultural change and evolution. However, as Sripada and Stich point out, research into the development and deployment of norms is both partial and piecemeal. They therefore present a model of the cognitive mechanisms underlying the acquisition and use of norms, which can not only explain the existing data but serve as a focus for future more structured research.

Finally, Atran (chapter 18) considers the evolutionary and ontogenetic origins of human religions. He argues that religious beliefs in general—and supernatural beliefs in particular—are the by-product of various cognitive mechanisms that originally evolved under natural selection for the purpose of performing other, more mundane adaptive tasks. Atran claims that applying these more mundane capacities to *existential* rather than *practical* problems would produce precisely the same kinds of "solutions" that we see illustrated by human religious systems, and he shows that the scope and limits of several actual religious systems (including those of the Lowland Maya, Tamil Hindus, and Ladakhi Buddhist tanshumants) provide good evidence in favor of his claims.

6 Conclusion

These are fascinating times for multidisciplinary research into the interaction between culture and the innate mind. Current research is producing results of unprecedented detail and scope from within and across many different investigative domains, and these results are increasingly both influenced by, and serve to build upon, nativist models of the mind. This volume provides further evidence of just how widespread and profitable nativist theorizing now is, and offers significant insight into the many ways in which anthropologists, psychologists, philosophers, and other cognitive scientists now employ and depend upon such theorizing for their own research. However, this volume also shows how much more work is still to be done, and suggests a variety of new directions for future research. We believe, therefore, that this book provides an important contribution to our understanding of what it is that we as humans are, and of how we came to be that way.

Peter Carruthers, Stephen Laurence, Stephen Stich. This is the first volume of a projected three-volume set on the subject of innateness. The extent to which the mind is innate is one of the central questions in the human sciences, with important implications for many surrounding debates. Stephen Laurence. PhD (Rutgers University). Department of Philosophy.Â Stephen came to Sheffield in February 2000. He has also taught at the University of Manchester, Hampshire College, London School of Economics, and the University of Hull. Stephen's main research interests are in the philosophy of mind, philosophy of psychology, and cognitive science. Some of the issues that interest him in these areas are: the nature of concepts, the nativism/empiricism debate, and philosophical methodology. Publications. Books.Â Simpson T, Stich S, Carruthers P & Laurence S (2007) Introduction: Culture and the Innate Mind . Carruthers P, Laurence S & Stich S (2007) The Innate Mind . Edited books. Margolis E & Laurence S (Ed.) Edited by Peter Carruthers, Stephen Laurence, and Stephen Stich. Evolution and Cognition. Description.Â List of Contributors 1. Introduction: Nativism Past and Present, Tom Simpson, Peter Carruthers, Stephen Laurence, and Stephen Stich PART ONE: ARCHITECTURE 2. What Developmental Biology Can Tell Us about Innateness, Gary F. Marcus 3. Innateness and (Bayesian) Visual Perception: Reconciling Nativism and Development, Brian J. Scholl 4. Modularity and Relevance: How Can a Massively Modular Mind Be Flexible and Context-Sensitive?, Dan Sperber.