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Chapter 3

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ADAPTING MINDS

Evolutionary Psychology and the Persistent Quest for Human Nature

In what follows I am to engage some broader theoretical issues related to Evolutionary Psychology's advertisement that it is "the new science of human nature."

Some of the theoretical issues examined here are absolutely central to Evolutionary Psychology's claim that there is a universal human nature. That is, the very idea of a universal human nature stands or falls with some of the theoretical arguments considered here. Other theoretical issues engaged are more properly "philosophical," since they concern the broader conceptual framework in which the idea of a universal human nature is situated and interpreted. While these Issues may be less central to Evolutionary Psychology's narrowly focused *scientific project* of discovering universal psychological adaptations and understanding how: they function, they are nonetheless significant. For, in developing and promoting their account of human nature, Evolutionary Psychologists have often endorsed positions on broader philosophical issues, and the positions they've endorsed form part of a widely held, "common-sense" understanding of the idea of human nature. Consequently, it is important to understand both why their philosophical positions are wrong and how those positions help motivate the quest for human nature.

Throughout the discussion of these various theoretical issues, I will be focused on a single theme—that the idea of a universal human nature is deeply antithetical to a truly evolutionary view of our species. Indeed, I will argue, a truly *evolutionary* psychology should abandon the quest for human nature and with it any attempt to discover universal laws of human psychology. As the evolutionary biologist Michael Chiselin so pithily puts it: "What does evolution teach us about human nature? It tells us that human nature is a superstition."[1] In other words, the idea of human nature is an idea whose time has gone.

Human Nature: The Very Idea

Let's begin by examining what it *means* to talk of human nature. One possibility is that the concept of human nature could refer to the totality of human behavior and psychology. In this broad sense, human nature would simply be whatever humans happen to do, think, or feel, regardless of whether different humans do, think, or feel differently. If one person is violent, violence is part of human nature, even if another person is not violent. If one person is kind, kindness is part of human nature, despite another person's inveterate unkindness, which is also part of human nature. In this very broad sense, the concept of human nature has no particular *theoretical* meaning; it is merely an abbreviated way of talking about the rich tapestry of human existence. And, if this is what one means by human nature, no one can quibble about the existence of human nature, since the mere existence of humans guarantees the existence of human nature.

But, traditionally, the concept of human nature has never meant simply *whatever* people happen to do, think, or feel. Regardless of the details of the theory of human nature in which it featured, the concept of human nature has traditionally referred to *some* of the things that people do but not to others, to *some* of the things that people think and feel but not to others. Theories of human nature have differed over precisely which aspects of human behavior and psychology constitute human nature, but they have all used the concept of human nature to pick out only a small part of everything about humanity that meets the eye. That is, regardless of the theory of human nature in which it featured, the concept of human nature has traditionally designated only a proper subset of human behavior and mentation, which was claimed to belong to human beings *by their nature* as opposed to behavior and mentation that was claimed not to be owing to or in accordance with that nature. And there are three noteworthy features of this traditional concept of human nature.

First, the concept of human nature has always refered to what is distinctively human about us, to what distinguishes humans from the other animals on the planet. This aspect of its meaning put the *human* in the concept of human nature, and it is what David Buss alludes to when he writes that "humans also have a nature—*qualities that define us as a unique species.*"[2]

Second, the concept of human nature has typically referred only to *biologically based* behavioral or psychological characteristics of human beings. This aspect of its meaning put the *nature* in the concept of human nature and human *nature* has always been contrasted with human *culture*. As the philosopher Peter Loptson puts it, the characteristic that constitute human nature form a "single unitary nature that humans have, common and generic to all societies they have formed."[3] These characteristics thus form "a fixed unchangeable nature or 'essence' that human beings have," which "is independent of culture."[4] Accordingly, the characteristics that constitute human nature are a consequence solely of our biological properties, whereas characteristics that result from "socialization" in one's culture are not part of human nature. Eating is part of human nature, since it is a biological function, but using a fork to eat is not part of human nature, since fork users are so only by virtue of having been socialized in fork-using cultures. Thus, in accordance with the traditional concept of human nature, culture has been viewed as an "unnatural" imposition that typically transforms, represses, or corrupts what is biologically "natural" for humans.

Third, the biologically grounded characteristics constitutive of human nature have traditionally been assumed to be *universal* among humans. As the philosopher Roger Trigg expresses it:

> The concept [of human nature] has implications, particularly that we can assume similarities merely on the basis of membership of one biological species. We will then all have some tendencies, and some likes and dislikes, in common simply because of our common humanity.[5]

In sum, then, regardless of the particular theory of human nature in which it featured, the concept of human nature has traditionally designated biologically based, as opposed to culturally instilled, behavioral and psychological characteristics that are presumed to be universal among, and distinctive to, human beings. Because of this, traditional arguments that there is no human nature have tended to emphasize culture over "nature," to argue that humans are what they are principally because of their cultural socialization and that there is no human "nature" that strongly channels or constrains socialization.

Evolutionary Psychology's conception of human nature is but a minor variation on the traditional concept. Evolutionary Psychologists are clearly committed to the idea that human nature consists of psychological characteristics that are universal among humans. Tooby and Cosmides frequently speak of "the psychological universals that constitute human nature,"[6] and they claim that "theories of human nature make claims about a universal human psychology."[7] Further, Evolutionary Psychologists claim that the psychological universals constitutive or human nature evolved during our lineage's stint as hunter-gatherers, which was well after our lineage diverged from that of our nearest relatives, the chimpanzees. Consequently, our putative psychological universals are supposed to have evolved during hominid history; and, since we are the only surviving hominid species, these putative universals are unique to us and serve to distinguish us from other species. This is why Buss refers to the psychological universals that constitute human nature as the "qualities that define us as a unique species."

However, the contrast between nature and culture that provides the traditional concept of human nature with some of its meaning, and that provides the basis for the traditional arguments that there is no human nature, isn't part of Evolutionary Psychology's conception of human nature. There are two primary reasons for this. First, as we will see in greater detail later in the chapter, Evolutionary Psychologists contend that much of the content in human cultures across the globe is determined by universal psychological characteristics of humans. Evolutionary Psychologists argue that the cultural universality of marriage, for example, is the result of psychological universals that impel people to seek out and remain in long-term reproductive unions. If aspects of culture are determined by universals of human psychology in this way, and if psychological universals constitute human nature, then at least some aspects of culture are manifestations of human nature, rather than "unnatural" external constraints or impositions upon human nature.

Second, from a broad evolutionary standpoint, human culture as a whole is not opposed to human biology, but is part of it. From this standpoint, the practices that constitute human cultures differ only in degree of complexity, not in kind, from the web-spinning habits of spiders. For evolutionary biology is concerned to explain the emergence and characteristics of the various forms of life on our planet, and everything that we humans do we do as the living creatures that evolutionary biology studies. Whatever their potentially detrimental consequences, nuclear power plants differ only in degree of complexity, and degree of manipulation of nature, from beaver dams. And just as beaver dams are unproblematically a consequence of beaver biology, nuclear power plants are a consequence of ours. Within everything that is part of human biology, however, distinctions can he drawn between aspects of human life that are genetically transmitted across generations and aspects of human life that are transmitted in other ways, just as we can draw a *biological distinctions* between genotype and phenotype. Accordingly, the biologist John Bonnel defines *culture* as "the transfer of information by behavioral means, most particularly the process of teaching and learning," which he distinguishes from "the transmission of genetic information passed by the direct inheritance of genes from one generation to the next."[8] In this sense, culture is present in a vast array of species, and its evolution predated the emergence of modern humans. Thus, *culture is a biological phenomenon*, in the very broadest sense of the word *biology*, despite not being a genetically determined or genetically transmitted phenomenon. Consequently, the traditional arguments that there is no human nature, because humans are what they are due to cultural socialization rather than biology, rest upon a false dichotomy.

Although Evolutionary Psychology's conception of human nature doesn't involve the traditional dichotomy between human biology (nature) and human culture, it is highly dependent on a dichotomy between different biological characteristics of humans. As Tooby and Cosmides say, "the concept of a universal human nature," as employed in Evolutionary Psychology, is "based on a species-typical collection of complex *psychological adaptations*."[9] Evolutionary Psychology's conception of human nature is thus restricted to universal *adaptations*, which constitute only a proper subset of the biological characteristics to which the traditional concept of human nature has applied. If there are universal psychological characteristics that evolved under genetic drift, for example, these would not count as part of human nature for Evolutionary Psychologists, although they would for traditional theories that include in human nature all universal biological traits. Consequently, the contrast between nature and culture that is part of the meaning of the traditional concept of human nature is replaced within Evolutionary Psychology's conception of human nature by the contrast between traits that are universal adaptations and traits that aren't. In sum, then, according to Evolutionary Psychologists, human nature consists of a set of psychological adaptations that are presumed to be universal among, and unique to, human beings.

In the remainder of this chapter. I will argue that Evolutionary Psychology's theory of human nature is multiply problematic. For the most part, these problems are shared by the traditional concept of human nature. So, while my arguments will be directed at Evolutionary Psychology, they will apply in most instances to the traditional concept of human nature as well. For Evolutionary Psychology and the traditional concept of human nature share the idea that human nature consists of universal biological characteristics that "define us as a unique species." *In this sense*, I will argue, there simply is no such thing as human nature. But, since the dichotomy between nature and culture is a false one, I will not be arguing that Evolutionary Psychology's theory of human nature is wrong because it mistakenly emphasizes biology over culture. Rather, I will argue that the idea that there are universal biological characteristics that "define us as a unique species" simply *gets biology wrong* in a number of important ways. To begin exploring these arguments, let's return to Evolutionary Psychology's reasons for claiming that there is a universal human nature.

Evolutionary Psychologists offer two arguments for the existence of a universal human nature. One of these I called "the argument from sexual recombination," which contends that the genetics of adaptation necessitates the species universality of all complex adaptations. Elsewhere I demonstrated a variety of problems with this argument, and I showed how selection can, and frequently does, maintain polymorphisms of complex adaptations within populations. Contrary to the argument from sexual recombination, there is nothing in the nature of adaptation, or of the evolutionary process more generally, that necessitates a universal human nature as Evolutionary Psychologists conceive it. In other words, there are a variety of adaptational and genetic "natures" in human populations. But, while Evolutionary Psychologists typically take the argument from sexual recombination to be a definitive theoretical proof of the existence of a universal human nature, I don't think that that argument accounts for the intuitive pull that the idea of a universal human nature has enjoyed among Evolutionary Psychologists and their followers. That intuitive pull, I believe, is primarily due to another argument that Tooby and Cosmides offer, which I call "the argument from *Gray's Anatomy*." The argument from *Gray's Anatomy* is largely an appeal to common sense, and it thereby garners tremendous intuitive credibility for Evolutionary Psychology's claim that there is a universal human nature, since it makes the denial of that claim seem quite literally incredible.

The argument from *Gray's Anatomy* is compellingly simple, though not, I will argue, simply compelling. Tooby and Cosmides put it as follows:

> the fact that any given page out of *Gray's Anatomy* describes in precise anatomical detail individual humans from around the world demonstrates the pronounced monomorphism present in complex human physiological adaptations. Although we cannot yet directly "see" psychological adaptations (except as described neuroanatomically, no less could be true of them.[10]

Selection, in other words, has designed a universal human anatomy and physiology. As Tooby and Cosmides say, humans have a "universal architecture," in the sense that "everyone has two eyes, two hands, the same set of organs, and so on."[11] Since selection has presumably designed our minds as well as our bodies, the argument goes, we should expect selection to have designed a system of psychological adaptations that is just as universal as the anatomical and physiological adaptations described in *Gray's Anatomy*. Indeed, Tooby and Cosmides boldly claim that,

> just as one can now flip open *Gray's Anatomy* to any page and find an intricately detailed depiction of some part of our evolved species-typical morphology, we anticipate that in 50 or 100 years one will be able to pick up an equivalent reference work for psychology and find in it detailed information-processing descriptions of the multitude of evolved species-typical adaptations of the human mind.[12]

Despite its intuitive pull, however, the argument from *Gray's Anatomy* is multiply problematic, and it provides no reason to believe that there will ever be a reference work for psychology containing detailed descriptions of universal and species-typical psychological adaptations. I will discuss just five problems with the argument from *Gray's Anatomy*.

First, the argument relies on a questionable analogy between anatomy and psychology. Even if selection has designed a universal human anatomy, that fact alone doesn't justify the inference that selection has designed a universal human psychology. The features of the environment to which aspects of our anatomy have adapted are, for the most part, relatively stable and relatively simple. For example, the composition of the air, to which our lungs are adapted and whose contents they process, has been relatively stable throughout our evolutionary history. Recent problems with air pollution have precipitated changes in the chemical composition of the air we breathe, but our lungs still process the core chemicals in our air to which they are adapted. In contrast, the human mind has evolved to be responsive to rapidly changing environmental conditions. So the selection pressures that drove psychological evolution differ from those that drove anatomical evolution. Further, the selection pressures that drove most of the evolution of human intelligence stemmed primarily from human social life, rather than from the physical environment. But social life doesn't present a uniform condition to which a trait must adapt, in the way that the air presented a relatively uniform condition to which lungs had to adapt. Instead, human social life is characterized by behavioral variation. As a result, the fittest response to the complexities of human social life depends on the behavioral strategies of other humans in the population. This creates frequency-dependent selection, which can result in the evolution of adaptive psychological differences between individuals. Thus, there are reasons why minds could exhibit adaptive differences when and where bodies don't. So, even if there is a universal human anatomy, it doesn't follow that there must be a universal human psychology.

Second, the argument from *Gray's Anatomy* appeals to similarities among people at a relatively coarse scale. But, as the evolutionary biologist David Sloan Wilson points out, "uniformity at the coarsest scale does not imply uniformity at finer scales."[13] Every human may have a brain with two hemispheres, a cortex, an occipital lobe, and so on, just as "everyone has two eyes, two hands, the same set of organs, and so on." But the uniformity at this scale doesn't entail uniformity with respect to psychological mechanisms at a more micro level. Since Evolutionary Psychologists claim that our universal psychological adaptations are modules, which are highly specialized "minicomputers," the universal psychological adaptations they postulate are actually much smaller-scale brain mechanisms than the anatomical structures in the brain that are possessed by most humans. Thus, in order to demonstrate that there are universal psychological adaptations, Evolutionary Psychologists would need to demonstrate psychological uniformity at a much finer scale than that addressed by the argument from *Gray's Anatomy*.

Third, the "coarsest scale" which the argument from *Gray's Anatomy* appeals is incommensurate with Evolutionary Psychologists' understanding of human nature as constituted by "qualities that define us as a unique species. "For the universals appealed to in these arguments typify the whole primate order and sometimes the whole class of mammals and even all vertebrates. For example, all primates have two hands, all mammals have lungs, and all vertebrates have two eyes, a heart, a liver, and a stomach. So the analogical appeal to the coarsest scale of uniformity within our species ("everyone has two eyes, two hands, the same set of organs, and so on") supports no conclusions about universal psychological adaptions that "define us as a unique species," since uniquely human adaptations would have had to evolve during human evolutionary history. Hence, the appeal to very coarse-scale common characteristics supports no conclusion about distinctively *human* universals.

The fourth problem, related to the third, is that the basic structural plan that typifies the "universal architecture" of our species—and that, at ever coarser scales of description, typifies the body plan of our order (primate), class (mammal), and subphylum (vertebrate)—consists primarily of features that have *persisted* down lineages and through speciations for tens to hundreds of millions of years. Although selection probably played a role in designing the basic body plan that now characterizes humans, it did not design that structural plan during human history, but rather during the history of the common ancestor of humans and other primates, mammals, or vertebrates. Consequently, even though all humans may have two eyes, two hands, one nose, and a mouth, it doesn't follow that similarly universal adaptations emerged during comparatively recent human evolutionary history.

Finally, strictly speaking, there is no single human anatomy and physiology possessed by all humans around the world of which *Gray's Anatomy* provides a "detailed" and "precise" description. Approximately 0.25 percent of all humans are born with only one kidney, rather than two, yet nonetheless live reasonably healthy lives. Others are born with three kidneys, yet still live healthy lives (although there are no solid estimates of the incidence of this phenomenon). In addition, somewhere between

> one in every 8,000 to 25,000 people is born with a condition known as situs inversus, in which the positions of all the internal organs are reversed relative to the normal situation (situs solitus): the person's heart and stomach lie to the right, their liver to the left, and so on. (The organs are also mirror images of their normal structures.)[14]

There is no more precise estimate of the incidence of situs inversus because it creates no medical complications, so it is typically discovered only incidentally to routine physical examination (if sought) or medical treatment for some other condition. At the physiological level, there are four main blood types in humans (A, B, AB, and O), which are genetically coded for at a single locus. If we move from the four blood types coded for at that one locus to examine broader categories of blood type, there are more than twenty additional blood types in humans. And, moving to the outside of the body, approximately one in every fifteen hundred infants is born with ambiguous genitalia, which do not allow the assignment of a sex. Thus, the idea that *Gray's Anatomy* provides *a single* "detailed" and "precise" picture of the anatomy and physiology of every human on earth is plausible only if one ignores known facts about human anatomical and physiological variation. Although most of us are pretty much the same in a lot of "coarse" details, we are not all cast from the same anatomical and physiological mold, so there is no reason to think that there is a single psychological mold from which we are all cast. Despite its intuitive appeal, the argument from *Gray's Anatomy* provides no good reason to believe in the existence of a universal human nature.

Essentialism, Part I: "Normal" People

Of course, there is an obvious rejoinder to this last argument. No Evolutionary Psychologist really believes that literally all human beings on earth have precisely the same anatomy or that every single human being on earth possesses all of the characteristics that constitute human nature. Rather, as Cosmides and Tooby say, "a scientific definition of *human nature*" concerns "the uniform architecture of the human mind and brain that reliably develops in *every normal human* just as do eyes, fingers, arms, a heart, and so on."[15] So, *of course* there are some human beings born with only one or with three kidneys, just as some human beings are born without arms. And *of course* there are some human beings born with their organs reversed, just as some human beings are born with three copies of the

twenty-first chromosome (which results in Down syndrome). But such individuals are "abnormal," either because of an unusual genetic condition or because of exposure to some "environmental insult" during development. And the concept of an anatomical universal architecture, like the concept of universal human nature, is not intended to apply to cases of developmental "abnormality." Such concepts are intended, rather, to capture only what *all normal human beings* have in common. Thus, the obvious rejoinder goes, pointing out that some human beings depart from the "universal architecture" described in *Gray's Anatomy* doesn't constitute a valid objection to the argument from *Gray's Anatomy*, since that argument presupposes only that *Gray's Anatomy* provides a "precise" and "detailed" description of the anatomy of all *normal* human beings.

It should be clear at this point that any reasonable claim that there exists a universal human nature must be committed to some distinction between normality and abnormality. For, strictly speaking, there are *no* characteristics that are universally distributed among all and only human beings. So any claim about universality must refer only to characteristics that are universally distributed among "normal" humans, rather than characteristics that are distributed among all humans, and the "abnormal" must be conceived as not partaking of human nature. Accordingly, people who don't possess the characteristics definitive of some theory's concept of a universal human nature don't actually constitute counterexamples to the claim that there is a universal human nature, because those who are "abnormal" simply don't count.

This distinction between normality and abnormality, on which all claims regarding a universal human nature must depend, is part and parcel of a doctrine known as *essentialism*. In general, essentialism is a view about what makes *distinct individual entities* of the same kind into distinct individual entitles *of the same kind*. Essentialism is the view that there are certain characteristics that *define* a kind, so that two different entities belong to the same kind just in case they both possess the characteristics definitive of that kind. For example, two objects are both samples of the kind *platinum* just in case both of those objects are composed of atoms with atomic number 78. Having atomic number 78 is the characteristic that defines the kind *platinum*, it is the *essence* of platinum. Consequently, any two entities with atomic number 78 are instances of platinum, regardless of whatever other properties (size, shape, or overall weight) they may have. Kinds, such as platinum, that are defined by essential characteristics, which any object must possess to be a member of that kind, are known as *natural kinds*.

While essentialism is comfortably at home in the table of elements, it has also been applied to biological classification at least since the time of Aristotle. Within biological classification, essentialism becomes the view that species are natural kinds. Accordingly, species are defined by characteristics that serve to differentiate them from all other species, and those characteristics are taken to constitute the essence of a species. An organism belongs to a particular species, then, by virtue of possessing the characteristics definitive of that species. But the philosopher of biology Elliott Sober points out that essentialism regarding species typically involves more than the minimal claim that species are defined by sets of unique characteristics. According to Sober, a species essence does not simply constitute a condition that is necessary and sufficient for membership in that species, but plays an explanatory role as well. As Sober says:

> The essentialist hypothesizes that there exists some characteristic unique to and shared by all members of *Homo sapiens* which *explains why they are the way they are*. A species essence will be a causal mechanism that acts on each member of the species, making it the kind of thing that it is.[16]

That Evolutionary Psychology is committed to essentialism regarding species, and that its essentialism underlies its conception of human nature, is often explicit when Evolutionary Psychologists wax theoretical about *Homo sapiens* and human nature. The passage quoted earlier from Buss, in which he speaks of human nature as consisting of "qualities that *define us as a unique species*," is clearly committed to essentialism regarding species. From the opposite side of the same viewpoint, Cosmides and Tooby write: "By virtue of being members of the human species, all humans are expected to have the same adaptive mechanisms."[17] In other words, membership in the same species entails the shared possession of the essential characteristics definitive of the species. Elsewhere, in a clear expression of the essentialist view that species are natural kinds, Cosmides and Tooby say,

> the species-typical genetic endowments of species, and the common ancestry of larger taxa do cause an indefinitely large set of similarities to be shared among members of a natural kind, as does a common chemical structure for different instances of a substance.[18]

Finally, tying essentialism directly to the concept of human nature, the Evolutionary Psychologist Donald Brown writes: "Universals of essence at the level of the individual collectively constitute human nature."[19]

But how can essentialism regarding species be reconciled with the existence of organisms that appear to belong to *Homo sapiens* even though they don't possess all of the "qualities that define us as a unique species"? If species are natural kinds, so that an organism is a member of a species if and only if it possesses the characteristics essential to that species, and if some people don't actually possess all the characteristics that define human nature, which is the essence of *Homo sapiens*, aren't those people not actually human beings? Isn't essentialism committed to claiming that people who lack a characteristic essential to the human species simply aren't human? And, if so, how can essentialism integrally involve a distinction between "normal" and "abnormal" human beings? Aren't "abnormal" humans not actually human, so that, strictly speaking, there is no such thing as an "abnormal" human?

Throughout the history of essentialism there has been a tension between essentialism regarding species and apparent variation within species. The usual way of resolving this tension is to conceive of a species' essence as a *causal mechanism* that produces the phenotypic characteristics considered definitive of membership in that species. This involves what Sober calls the "Natural State Model." According to the Natural State Model,

> there is a distinction between the *natural state* of a kind of object and those states which are not natural. These latter are produced by subjecting the object to an *interfering force*. . . . The cause for this divergence from what is natural is that these objects are acted on by interfering forces that prevent them from achieving their natural state by frustrating their natural tendency. Variability within nature is thus to be explained as a deviation from what is natural.[20]

When applied within biology, the Natural State Model entails that "there is one path of fraetal development which counts as the realization of the organism's natural state, while other developmental results are consequences of unnatural interferences."[21] The Natural State Model consequently explains variation in a species as a result of causal interactions between an essential developmental mechanism and potentially interfering forces.

The distinction between "normal" and "abnormal" characteristics of members of a species derives from the Natural State Model. For, according to the Natural State Model, each member of a species possesses the causal mechanism that produces that species' essential characteristics. When not interfered with, the causal essence of a species thus produces normal members of that species. But various factors can prevent the causal mechanism from producing its normal results, and when it is prevented from doing so it results in species members with abnormal characteristic. Thus, according to this version of essentialism, abnormal humans are still human, since despite their abnormal phenotypes they still possess the developmental mechanism considered essential to humans.

Evolutionary Psychology's essentialism, and hence its conception of human nature, is clearly committed to the Natural State Model. Although Evolutionary Psychologists typically identify human nature with a cluster of psychological (phenotypic) adaptations, in a more guarded moment Tooby and Cosmides indicate that their concept of a "universal human nature" is intended to apply primarily at the developmental level and only secondarily at the phenotypic level:

> when we use terms such as "evolved design," "evolved architecture," or even "species-typical," "species-standard," "universal," and "panhuman," we are not making claims about every human phenotype all or even some of the time; instead, we are referring to the existence of evolutionarily organized developmental adaptations, whether they are activated or latent. Adaptations are not necessarily expressed in every individual. . . . For this reason, adaptations and adaptive architecture can be discussed and described at (at least) two levels (1) the level of reliably achieved and expressed organization has for example, in the realized structure of the eye), and (2) at the level of the developmental programs that construct such organization.[22]

Thus, universal developmental programs are the causal mechanism that produces "the species-standard physiological and psychological architecture visible in all humans raised in normal environments."[23]

In addition, the more guarded identification of "universal human nature" with "universal developmental programs" underlies Evolutionary Psychologists' commitment to the idea that some aspects of human nature are sexually dimorphic and age differentiated. For Evolutionary Psychologists argue that the sexes have faced different selection pressures, which designed some adaptive morphological and psychological sex differences, and that differences in selection pressures faced across the life cycle created age-differentiated adaptive "coordinated design differences." These adaptive sex and age differences, however, result from universal developmental adaptations, which are programmed to produce sex-specific adaptations in response to the presence or absence of the *SRY* gene and to bring age-specific adaptations "on line" and take them "off line" at appropriate ages.

Despite the existence of adaptive age and sex differences, Evolutionary Psychologists are nonetheless committed to the idea that there are certain things that all humans share. First, all humans share the "universal developmental programs" that produce programmed sex and age differences. And, second, these universal development programs produce some morphological and psychological characteristics that are not sex or age differentiated. The latter constitute "the species-standard physiological and psychological architecture visible in all humans raised in normal environments." This "architecture" is "normal," or the "natural state" for humans, and departure from that natural state is presumed to be caused by forces—for example, genetic mutation or "environmental insult"—that interfere with developmental programs and thereby produce "abnormalities." Similarly, there are male and female "architectures" that are "normal," or the "natural state," for human males and human females, and departures from those natural states are caused by interference with universal developmental programs. Consequently, departures from human nature (or male nature or female nature) at the phenotypic level are due to causal interaction between "interfering forces" and a universal human nature at the level of developmental mechanisms.

There are, however, several problems with Evolutionary Psychology's essentialism. There are problems with the Natural State Model, on which the distinction between "normal" and "abnormal" phenotypes depends, and there are problems with essentialism regarding species more generally. These problems don't so much show that the Natural State Model and essentialism can't possibly be right, but they point up that both are inconsistent with contemporary theory and practice within biology. In other words, the Natural State Model and essentialism can't be founded in contemporary evolutionary biology; there is simply nothing evolutionary about them. And any psychological theory that claims to be *evolutionary* must trade in theoretical constructs that can be founded in evolutionary biology. Further, as we will see in the next section, when essentialism regarding species is abandoned, the prospects for the kind of "science of the mind" that Evolutionary Psychology envisions providing disappear with it. In the remainder of this section, let's examine the problems with the Natural State Model.

As we have seen, according to the Natural State Model there is one path of development that results in the "normal" or "natural" state for the organism, and other paths of development are the result of "interfering forces." "Put slightly differently," as Sober says "for a given genotype, there is a single phenotype which it can have that is the natural one. Or, more modestly, the requirement might be that there is some restricted range of phenotypes which count as natural."[24] The problem with this view is that there is no basis in genetics for the idea that a genotype is associated with a phenotype that is "natural" for it to produce. As Sober says,

> when one looks to genetic theory for a conception of the relation between genotype and phenotype, one finds no such distinction between natural state and states which are the results of interference. One finds, instead, the *norm of reaction*, which graphs the different phenotypic results that a genotype can have in different environments.[25]

For example, the norm of reaction for a particular genetic strain of corn would be a graph showing the different heights that corn of that genotype would have in each of a range of environments, where the different environments could be characterized by differences in amount of rainfall and sunlight. That is, the norm of reaction would be a graphed function showing that corn with genotype G_1, has height phenotype P_1 in environment E_1, phenotype P_2 in environment E_2, phenotype P_3 in environment E_3, and so on. But nothing in the norm of reaction would identify any particular height as "natural" for corn of that genotype. There are simply different heights that corn of that genotype can have under a range of different environmental conditions.

Of course, there may be a phenotype that is the *statistically most frequent* phenotype produced by a particular genotype. And it makes perfect sense to speak of that statistically most frequent phenotype as the "normal" phenotype for that genotype—as long as we bear in mind that by "normal" we mean only what is statistically most frequent. But this sense of "normal" is not at all the sense that has always been intended by proponents of the Natural State Model. For, in this statistical conception of "normal," a diseased phenotype can be normal for a population. If a virus has reached epidemic proportions in a population, for example, it can be statistically normal for members of that population to be diseased. But no proponent of the Natural State Model would consider disease to be the "natural state" for members of that population, despite its frequency in the population. The Natural State Model is after a more robust notion of "normal" phenotype, one that would pick out a phenotype as normal regardless of whether that phenotype is prevalent or even represented at all in a population. But the norm of reaction, which is the geneticist's way of understanding the relation between genotype and phenotype, simply doesn't underwrite such a robust notion of "normal" or "natural" phenotype for a genotype.

Since the norm of reaction doesn't privilege any particular phenotype as "normal" or "natural," but simply identifies which phenotypes result in which environments, one way to save the Natural State Model would be to provide some independent justification for identifying one of the environments specified in the norm of reaction for a genotype as the "natural environment" for that genotype (or identifying a restricted range of environments as being "natural environments"). Derivatively, then, a "natural" phenotype for that genotype would be a phenotype that develops in a "natural environment" for that genotype.

This would be the obvious move for Evolutionary Psychologists to make, since it fits quite naturally with their overall theoretical framework. For, as Tooby and Cosmides say, "the species-standard physiological and psychological architecture" is the architecture that is "visible in all humans *raised in normal environments*."[26] And the "normal environments" are clearly those that closely resemble the environment of evolutionary adaptedness (EEA), the statistical composite of the environments in which our adaptations evolved and to which they are adapted. Indeed, in one of the earliest discussions of the EEA in the Evolutionary Psychology literature, Donald Symons refers to the environments that compose the EEA as the "natural environments" for humans, which he characterizes as "environments to which ancestral populations were exposed for sufficient lengths of time to become adapted to them."[27] Thus, Evolutionary Psychologists could argue, of all the environments specified in the norm of reaction for a genotype, those that closely resemble the EEA are the "natural environments" for that genotype. So, of all the phenotypes specified in a norm of reaction, those that develop in "natural environments" are "normal" phenotypes.

There are, however, two problems with this attempts to specify natural environments for development and, derivatively, to define "normal" phenotypes. First, the EEA is supposed to be a natural environment because that is the environment to which we are adapted, the environment for which we are "designed." But we must bear in mind precisely what talk of being "adapted to" and "designed for" an environment means. These expressions appear to describe some direct relationship between our traits (or genotypes) and the environment; but they to fact do not. For selection never "designs" traits for particular environments in isolation from competing traits. To say that a trait is "adapted to" or "designed for" a particular environment is simply shorthand for saying that the trait was *selected over alternative traits* in that environment. And that in turn, simply means that individuals with that trait had higher average fitness in that environment than individuals with alternative traits. Thus, to say that a trait is "adapted to" or "designed for" a particular environment emphatically does *not* mean that the trait is a perfect "fit" for that environment, that the trait is the fittest of all possible traits in that environment, or that the trait has higher fitness in that environment than in any other.

If the motivation for identifying a genotype's "natural environment" with its EEA is that the EEA is the environment in which the genotype made the greatest contribution to fitness (by producing a trait that enhanced fitness), then there are undoubtedly other environments that would be better candidates for a genotype's "natural environment." For example, the EEA of a genotype is simply the environment in which that genotype had *higher fitness than available alternative genotypes* in the population. In a different environment, the genotype may have had an even greater fitness advantage over those alternatives. So why not identify the "natural environment" of a genotype with the environment in which the genotype has its highest fitness? Similarly, had a genotype competed in its EEA against a different set of alternative genotypes, one of those alternatives may have had higher fitness than the genotype that was actually selected. Why should a genotype's EEA be the "natural environment" for *that genotype* rather than for some other genotype that would have had higher fitness in that environment? Had a mutation occurred that improved the human eye so that it could see as well at night as during the day, for example, the genotype for that supereye would have been selected over the genotype for the typical human eye in the EEA of the human eye. Why should the EEA of the human eye be the "natural environment" for the human eye rather than for the supereye that would have been selected in that environment had in actually been present in our ancestral population? If a genotype's "natural environment" is defined in terms of a genotype's fitness, there are no principled grounds on which to identify as a genotype's natural environment its EEA rather than an alternative environment in which it would have higher fitness, or to identify a genotype's EEA as *its* natural environment, rather than that of an alternative genotype that would have had higher fitness in that environment. Thus, it is arbitrary to call a genotype's EEA its "natural environment."

Second, calling the EEA the "natural environment" involves defining "natural environment" in terms of *selection*, since the EEA of a trait or genotype is the environment in which it was selected over alternatives. This presumes that what is selected for is somehow more "in accordance with nature" than what is selected against or what is neither selected for nor against. But nothing in evolutionary theory justifies privileging selection in this way.

Evolution is change in gene or genotype frequencies across generations in a lineage, and evolutionary theory is concerned to explain *all* such changes. Selection is just *one* of the causes of evolution. Evolution is also caused by mutation, recombination, genetic drift, and migration into and out of populations, and evolutionary theory encompasses these as well. In addition, a trait can increase in frequency because of selection, but it can also increase in frequency because of genetic drift or migration, and evolutionary theory will be there to explain all such changes. Evolutionary theory also explains why traits decrease in frequency and why they sometimes disappear from populations entirely. It also explains why entire species go extinct. All of these processes are natural, each is every bit as real as the others, and evolutionary theory is designed to explain them all, without privileging the process of selection. Thus, an environment in which a trait or genotype is selected for is no more natural than an environment in which it is selected against.

Now, it is true that selection plays a particular explanatory role within evolutionary theory. If we want to explain the process of *adaptation*, selection will be central and indispensable to that explanation. And this fact no doubt underlies Evolutionary Psychology's idea that the EEA is the "natural environment." But, again, adaptation is just one process among many in evolution, and nothing in evolutionary theory privileges the process of adaptation over other processes by considering it more natural than other processes. Similarly, nothing in evolutionary theory privileges traits that are adaptations over traits that are not by considering them a more natural part of an organism's endowment than traits that are not adaptations. We do, of course, appeal to evolutionary theory and the process of selection in order to answer the question, Why is this highly articulated and apparently well designed trait so prevalent in this population? But we also appeal to evolutionary theory to answer the question, Why do humans have an appendix when it serves no apparent function? Which kind of question we ask reflects only *our explanatory interests*. Nothing in evolutionary theory itself justifies the conviction that one question is more important than the other or that one question better reflects what is "natural." Rather, the conviction that one question is more significant than the other is a theoretical vestige of an outdated worldview, as I will argue in greater detail in the final section of this chapter.

Thus, there are no principled reasons deriving from evolutionary theory to designate certain environments in a norm of reaction as "natural environments." And this means that there are no principled reasons deriving from evolutionary theory to designate certain phenotypes in a norm of reaction as "normal" phenotypes. Our best *biological* understanding of the relation between genotype and phenotype is reflected only in the norm of reaction itself, a simple mapping of environments onto phenotypes for any given genotype. The distinction between "normal" and "abnormal" phenotypes, which is central to the Natural State Model, can't be drawn by the norm of reaction. That distinction is imposed on biological theory from a nonbiological worldview.

But the Natural State Model presupposes not only that each genotype is associated with a normal phenotype, which is the organism's natural state, but that for any locus that codes for a trait there is a normal genotype for an organism to have at that locus. That normal genotype is, of course, the genotype that produces the organism's normal phenotype, and alternate genotypes at the same locus are abnormal because they produce abnormal phenotypes. Again, however, there is nothing in genetic theory that allows for a distinction between "normal" and "abnormal" genotypes (unless, again, by "normal" one simply means the genotype that is most common in a population).

The fact is that substantial genetic variation exists in natural populations, human populations included. A genetic analysis of thirty species of mammal found that, on average, those species were genetically polymorphic—that is, more than one genotype occurred—at approximately 20 percent of their loci.[28] While this analysis didn't provide an estimate of the overall genetic polymorphism within humans, a global genetic study of human populations found that the average heterozygosity in human populations ranges from 21 percent to 37 percent.[29] That is, the average percentage of loci at which individuals in a population are heterozygous is anywhere between 21 and 37 percent of loci, depending on the population; the lowest average heterozygosity is found in New Guinea and Australia, and the highest average heterozygosity is found in the populations of the Middle East, western Asia, and southern, central, and eastern Europe. Heterozygote mating produces genotype polymorphisms, even when heterozygotes mate with homozygotes. Thus, the high degree of heterozygosity in human populations sustains a prodigious amount of genetic variation in human populations. And genetic theory doesn't label some of the genetic variants "normal" and others "abnormal." From the standpoint of population genetics, there are simply a variety of genotypes that change in frequency across generations. A new mutation, which may or may not increase in frequency under selection, is no more or less normal than a statistically more frequent allele at the same locus. Any distinction between "normal" and "abnormal" genotypes must be imposed on genetic theory from a nonbiological perspective.

Therefore, the Natural State Model, on which any distinction between "normal" and "abnormal" human characteristics must rely, has no basis in biology. Nothing in biology justifies viewing certain phenotypes, but not others, as the "normal" phenotypes for a genotype, and nothing in biology justifies viewing certain genotypes, but not others, as the "normal" genotypes for humans. There is substantial variation in human populations at both the phenotypic and genetic levels, and our best biological theories to date simply do not partition that variation into "normal" and "abnormal" variants. As Sober so nicely puts it: "Our current theories of biological variation provide no more role for the idea of a natural state than our current physical theories do for the notion of absolute simultaneity."[30] To the extent that Evolutionary Psychology's theory of a universal human nature relies on the Natural State Model for a distinction between "normality" (which exemplifies human nature) and "abnormality" (which does not), its theory of human nature has no foundation in biology.

Essentialism, Part II: Species

The problems with the Natural State Model, however, are merely symptoms of deeper problems with essentialism itself. The distinction between "normal" and "abnormal," which characterizes the Natural State Model, is necessary only if one is antecedently committed to the view that there are certain characteristics that all and only humans share. For, since the claim that there are characteristics that *literally* all and only humans share is an obvious empirical falsehood, it becomes necessary to retreat to the less robust claim that there are characteristics that all and only *normal* humans share. But, if we are not driven to formulate our understanding of species in terms of what *all and only* members of a species have in common, we don't need a category of "abnormal" to which to relegate the individuals in a species that happen to lack one or more of the characteristics we take to be essential to a species, and we then don't need a category of "normal" to contain the individuals that do happen to possess those characteristics. It is essentialism that forces these categories on us by mandating that our understanding of species in general, and of human beings in particular, be formulated as a claim about what *all and only* certain organisms have in common.

But essentialism about species is absolutely and completely wrong. Essentialism about species takes each species to be a *natural kind*, which is defined by a set of essential properties. This has two significant implications. First, it implies that species are *individuated*—i.e., distinguished from one another—by virtue of their essential properties. If species A and species B are defined by different sets of essential properties, then they are distinct species; if they are defined by the same set of essential properties, then they are, in fact, the same species. Accordingly, every species has its own essence, which is distinct from the essence of any other species, just as every element in the table of elements has its own essential atomic number, which is distinct from the essential atomic numbers of all other elements. Second, it implies that an organism belongs to a species by virtue of possessing the properties essential to that species. If a certain set of characteristics defines a species, then any organism possessing those characteristics belongs to that species, and any organism lacking them doesn't, regardless of what else may be true of those organisms. Thus, the essence of a species constitutes the criterion for belonging to that species, just as atomic number constitutes the criterion for being a particular element.

These implications of the view that species are natural kinds do not accord with the way that biologists individuate species or the way that they assign individual organisms to species. To see why, let's first get a handle on how species are understood according to theory and practice within biology, then let's examine how the view that species are natural kinds conflicts with the biological understanding of species.

When viewed within a relatively brief interval of evolutionary time, a species, in the biological sense, is a group of *interbreeding populations*. When some organisms in one population reproduce with organisms in another population, the genes from the former population are introduced into the latter population, where those genes can then spread as the organisms in the latter population continue to reproduce. When interbreeding occurs between two populations in this way there is *gene flow* between those populations' gene pools. And when there is gene flow between populations, the interbreeding populations constitute a single species.

However, each of the interbreeding populations that constitute a species itself belongs to a lineage, a temporally extended sequence of populations, the later of which are descended by reproduction from the earlier. Consider two currently interbreeding populations. Do all the descendent populations in their respective lineages also belong to the same species? That depends. If the populations in those lineages continue to interbreed, then both lineages, not just their earlier populations, belong to the same species. Of course, it needn't be the case that there be continual interbreeding between the populations in two lineages, only that there be at least periodic interbreeding between the populations in those lineages. When there is at least periodic interbreeding between the populations in two or more lineages, those lineages are *reproductively interwoven* (by periodic gene flow) across evolutionary time, and they consequently belong to the same species over a longer stretch of evolutionary time.

However, there may come a time at which populations in two reproductively interwoven lineages become *reproductively isolated* from one another (due, for example, to geographic separation). When populations become reproductively isolated, no further gene flow occurs between them, and those populations then belong to different species. So, lineages can be reproductively interwoven over long stretches of evolutionary time, but then reach a point at which they *branch* because populations in those lineages become reproductively isolated. When this branching occurs, the previously existing species is replaced by two (or more) daughter species. This is much like how the letter Y consists of three line segments, where each line segment represents a distinct species. In the species case, of course, the vertical line segment, in the Y is actually one of the diagonal line segments of another Y, so that the representation of how species have diverged over evolutionary time requires an elaborate branching structure. This elaborate branching structure is the "tree of life," which is the goal of biological classification. The tree of life shows how each species is descended from an earlier species, and each node (each point at which a branching occurs) in the tree of life represents a point at which populations become reproductively isolated.

Thus, in the biological sense, a species is a group of reproductively interwoven lineages that lie on a single "line" segment in the tree of life. Each organism in one of these reproductively interwoven lineages is thus descended from earlier organisms in those lineages, and ultimately the genealogy of each organism is traceable to organisms in the ancestral population that started a new branch in the tree of life. When the genealogy of each organism in a group of reproductively interwoven lineages is traced in its entirety, it will crisscross the genealogies of the other organisms in those lineages, and the network of all such genealogies will constitute an elaborate *genealogical means* within which each organism is situated. All the organisms in this genealogical nexus will be descended from common ancestors in the population that founded the species, and the genealogical nexus will display the manner in which they are all related. And, according to biological classification, two organisms that are situated within a common genealogical nexus, which lies on a single segment in the tree of life, are classified as belonging to the same species, regardless of the characteristics those organisms happen to possess.

We are now in a position to see how the biological concept of a species conflicts with the view that species are natural kinds. First, what matters for assigning an organism to a species is the *genealogical nexus* in which it is situated (that is, from which organisms it was descended), not the particular traits it happens to possess. This principle of classification differs sharply from that involved in determining the natural kind to which a particular substance happens to belong. If two samples of liquid contain two parts hydrogen and one part oxygen, bonded in the right way, they both belong to the kind *water*, regardless of how those two samples of liquid happened to come about. One sample may have been produced in a lab by a chemist, and the other may have been scooped out of a river. The provenance of the samples is completely inessential to whether they are samples of water. All that matters is whether the samples have the same *intrinsic properties*. This is because water *is* a natural kind. But, when it comes to determining the species to which an organism belongs, provenance trumps intrinsic properties. Thus, species, *as biologists understand them*, do not exhibit the features of natural kinds.

Second, according to the view that species are natural kinds, if species A and species B possess the same essential characteristics, then they are the same species. But this doesn't accord with practices of biological classification. According to biological classification, if all humans ceased to exist today, *Homo sapiens* would be extinct. If, after millions of years, creatures came to roam our planet that were exactly like us, filling a "precise and detailed description" from *Gray's Anatomy*, and behaved like us in every respect, they would nonetheless not be *Homo sapiens*. Similarly, if we discovered such creatures in another galaxy, they would not be *Homo sapiens* if they had evolved independently of us. For, as biologists see them, terrestrial species are branches in the tree of life that represents the evolution of all living creatures from the first life form on earth. Accordingly, regardless of whether two distinct branches are perfectly identical in all their observable characteristics, they are nonetheless two distinct branches, just as identical twins are two different organisms despite their similarity. So, when one branch on the tree of life terminates, no other branch that may happen to grow further up the tree will be the same branch, regardless of whether it perfectly resembles the lower, terminated branch. This is the significance behind the slogan "extinction is forever." For species are not individuated by their characteristics, they are individuated as segments in the tree of life. If species were individuated by their characteristics, as natural kinds are, then even if a species ceased to exist it could reemerge later, provided that organisms evolved later that possessed the same characteristics as those that had died earlier. Thus, again, *as biologists understand them*, species don't exhibit the features of natural kinds.

Third, species evolve. In fact, one and the same species may evolve so significantly that characteristics that typify a species at one time period cease to typify it at a later time, and another set of characteristics may become typical of that species. If species were natural kinds, however, a species could not undergo such significant change. A lineage undergoing such significant change would have to be classified as one species before the change and another species after it, since the different sets of typical characteristics would constitute the essences of different species. By analogy, given the right chemical intervention, a volume of carbon monoxide could be transformed into carbon dioxide. But it would not be the same *kind* of gas through the change. That is, the kind carbon monoxide *itself* wouldn't become the kind carbon dioxide, but rather a volume of gas would be transformed from an instance of the natural kind *carbon monoxide* into an instance of the natural kind *carbon dioxide*. The natural kinds themselves would remain unchanged. Similarly, if species were natural kinds, a sufficient degree of evolution would simply transform a species into another, distinct natural kind. But, as biologists understand them, species can be radically overhauled by evolution, yet nonetheless remain *one and the same* species. Provided that the evolutionary change occurs *within* a single branch of

the tree of life, the lineage is classified as the same species, no matter how radical the evolutionary change. Evolutionary change creates new species only if the change results in the *branching* of a lineage (the reproductive isolation and splitting of two populations). So, again, *as biologists understand them*, species don't exhibit the features of natural kinds.

Indeed, this last point generates something of a dilemma for the essentialist view that species are natural kinds. Consider the dilemma with respect to Evolutionary Psychology's view of *Homo sapiens*. According to Evolutionary Psychologists, there are "qualities that define us as a unique species," but these qualities evolved during our species' history. Evolutionary Psychologists maintain that our "species-typical architecture" consists of adaptations that evolved to fixation during the Pleistocene and that, by the end of the Pleistocene some 10,000 years ago. Those adaptations reflected "completed rather than ongoing selection."[31] But *Homo sapiens* emerged some 150,000 years ago. So, during at least some of our species' evolutionary history, the qualities that purportedly "define us as a unique species" did not typify our species at all, since they had not yet evolved. In order for those qualities to evolve, however, there had to be sufficient *variation* in our species, since evolution can only occur if there is variation. Thus, during a significant stretch of our evolutionary history, *Homo sapiens* had to be characterized by variation rather than by "the qualities that define us as a unique species."

Here, then, is the dilemma. Evolutionary Psychologists must claim either that we are the same species now that we were 150,000 years ago or that we aren't. If Evolutionary Psychologists claim that we are the same species now that we were 150,000 years ago, before the "qualities that define us as a unique species" became "species typical," then those qualities do not, in fact, "define us as a unique species." For, in that case, *Homo sapiens* would have become a unique species before it was characterized by those qualities—indeed, it would have become a unique species despite being characterized by variation. Thus, because *Homo Sapiens* remained the same species both before and after the emergence of its alleged "species-typical architecture," no such architecture is essential to the species. On the other hand, if Evolutionary Psychologists claim that we are not the same species now that we were 150,000 years ago, because 150,000 years ago our lineage did not possess the "qualities that define us as a unique species," then Evolutionary Psychology's demarcation of *Homo sapiens* is directly at odds with the standard biological demarcation of our species. In that case, whatever Evolutionary Psychologists are talking about, they can't be talking about human beings *as a biological species*, since *Homo sapiens* is a term of biological art. Clearly this horn of the dilemma is unacceptable, especially for any psychological theory that claims to be evolutionary. So the only viable option is to grasp the first horn of the dilemma. Grasping that horn, however, requires giving up the idea that species are natural kinds.

But, if species aren't natural kinds, if they aren't what they are because of particular essential qualities that define them each as unique species, what are they? The answer to this question comes from the work of the evolutionary biologists Ernst Mayr and Michael Ghiselin and the philosopher of biology David Hull. As they have shown, the only metaphysical category that exhibits the properties biologists ascribe to species is the category of *individual*. The fact that species are individuals, rather than natural kinds, however, remains little known and little appreciated outside of biology proper. Indeed, Mayr has bemoaned the fact that, although taxonomic biologists are effectively unanimous in rejecting the idea that species are natural kinds, accepting that they are individuals instead, cognate areas of inquiry have failed to absorb the idea and its implications. With characteristic spunk, Hull echoes, then responds to, the "considerable consternation" voiced by those who find it difficult to accept that species are individuals rather than natural kinds:

> *Biological species cannot possibly have the characteristics that biologists claim they do*. There must be characteristics that all and only people exhibit or at least *potentially* exhibit, or all *normal* people exhibit at least potentially. I continue to remain dismayed at the vehemence with which these views are expressed in the absence of any explicitly formulated biological foundations for these notions.[32]

Hull lampoons these views as exemplary of the attitude, "What do biologists know about biology."[33] In an attempt to break this impasse, let's examine more closely the idea that species are individuals.

The first task is to get clear about what *individuals* are and how they differ from natural kinds. There are three primary characteristics that define the concept of an individual, three things that make something an individual entity. Individuals, are spatiotemporally localized (hence discrete), spatiotemporally continuous, and cohesive. An organism is, by everyone's measure, a paradigm example of an individual, so let's examine these three properties of individuals by seeing how they are exemplified by organisms.

First, each individual is spatiotemporally localized. That is, each individual has a beginning and an end in time, and each individual occupies a specific region of space. For example, an organism's spatial and temporal location constitute the *boundaries* of that organism. No two distinct organisms have precisely the same boundaries, and numerically the same organism cannot have two distinct sets of boundaries (two distinct locations in space and time). Even though a parasite organism may reside within a host organism, it nonetheless occupies a region of space that is properly contained within the region of space occupied by its host. The parasite does not occupy precisely the same region of space as its host. Further, parasite and host virtually never begin and cease to exist at precisely the same moments in time. Thus, organisms are *discrete*: There are points in space and time at which an organism begins and ends, and these points are different from the points at which another organism begins and ends. As Ghiselin says,

> an individual occupies a definite position in space and time. It has a beginning and an end. Once it ceases to exist it is gone forever. In a biological context this means that an organism never comes back into existence once it is dead.[34]

In this respect, individuals differ from kinds. The individual members of a kind are located at particular regions of space-time, but the kind itself has no particular location in spacetime. Further, since kinds are constituted by their members, kinds are not discrete. The same individuals can belong to more than one kind, in which case the kinds to which they belong overlap rather than having discrete boundaries. Indeed, two different kinds can have precisely the same members, in which case they overlap one another completely.

Second, each individual is spatiotemporally continuous. Each individual exists continuously between its beginning and end in time, and at every moment of its existence it occupies the same or contiguous regions of space. Given its spatiotemporal continuity, an individual's existence can be plotted as a "spacetime worm," a single unbroken line, however squiggly, through the three dimensions of space and the fourth of time. For example, we often identify an organism as the same organism solely because of its spatiotemporal continuity, since in many cases the same individual organism undergoes radical change over time. As Mayr points out, "that caterpillar and butterfly are the same individual is inferred not from any similarity in their appearance but from this continuity."[35] In this respect, also, individuals differ from kinds or classes. A kind is not spatiotemporally continuous, since a kind is constituted by its individual members, and those members are frequently scattered across disparate regions of spacetime. Indeed, kinds are potentially unlimited, in that members of a kind can come into and go out of existence in remote reaches of the universe at any time. Due to some bizarre chemical catastrophe, for example, all water could cease to exist today, but tomorrow we could synthesize more water in a lab. The kind *water* would thus not exhibit temporal continuity. Similarly, even if the only water in existence today were in Brazil, and the only water in existence tomorrow were in Scotland, the Brazilian and Scottish substances would both be water despite the fact that the kind *water* would not exhibit spatial contiguity. This is because all that matters with respect to whether liquids are water is that they possess the tight chemical structure, and individual samples of liquid can share that structure without being continuous with one another in time or contiguous with one another in space.

Third, each individual is a cohesive whole. For example, although each individual organism is composed of parts (organs, cells, and so on), and can be broken down into its parts, those parts are not a mere collection, but are *organized* and *functionally integrated*. Indeed, what makes the parts of an organism parts of that organism is the fact that they are functionally integrated with other parts of the organism, the fact that they contribute to the organization that makes up that organism. The functional integration of an organism's parts consists in the fact that those parts causally interact with one another, on a local level, in ways that help to sustain the organism over time and in ways that they do not causally interact with the parts of any other organism. In addition, the parts of an organism need not resemble one another in any respect in order to be parts of the same organism and contribute to its functional organization. Your left lung doesn't resemble your right femur in any interesting respect, and they don't have to share any particular properties in order to be parts of your body. In this respect, again, individuals differ from kinds. The individual members of a kind are not members of that kind because they are functionally integrated or organized in any particular fashion. Rather, individuals are members of the same kind simply by virtue of their similarity to one another.

As Mayr, Ghiselin, and Hull have shown, given the role that the species concept plays in biological theory, species exhibit each of the three characteristics definitive of individuals, just as organisms do. First, each species is spatiotemporally localized, occupying the region of spacetime that is circumscribed by its temporal beginning and end and its spatial borders. More important, each species has a definite location in the tree of life, a definite segment of the tree, with a definite beginning and end. No two species can occupy the same segment of the tree of life, and no one species can occupy two distinct segments. For, as we have seen, when a species goes extinct, numerically the same species cannot come into existence later. Even if other, identical organisms were to come into existence later, they would be classified by biologists as a new species, not as a continuation of the earlier species. Species, then, are spatiotemporally localized and discrete.

Second, each species is spatiotemporally continuous. Each species exists continuously from its temporal beginning to its end, and each species as a whole is spread over the same or contiguous regions of space for every moment of its existence. In this respect, like an organism, a species' existence can be plotted as a "spacetime worm." Further, as Hull points out, the organisms that make up a species are related by descent.

> But descent presupposes replication and reproduction, and these processes in turn presuppose spatiotemporal proximity and continuity. When a single gene undergoes replication to produce two new genes, or a single cell undergoes miltotic division to produce two new cells, the end products are spatiotemporally continuous with the parent entity. In sexual reproduction, the propagules, if not the parent organisms themselves, must come into contact. The end result is the successive modification of the same population.[36]

Thus, species are spatiotemporally continuous.

Third, species are unified, cohesive wholes, held together by the organizational glue of reproduction. For species consist of interbreeding populations, and both individual populations and groups of interbreeding populations are united by the *reproductive interactions* of organisms. As Mayr points out, this is due to the fact that the organisms that compose a species develop "from the joint gene pool of the species, and that they jointly contribute their genotypes to form the gene pool of the next generation."[37] The contribution of genotypes to the next generation, however involves a great many causal interactions among organisms. The organisms in a population must structure a great many of their activities around the pursuit of sex with conspecifics, the act of sex with conspecifics, the incubation or gestation of the embryonic products of sex, and the care and production of live offspring. These causal interactions on a local level between the organisms involved in reproductive activities produce a cohesiveness within populations and species that is much like the functional organization of an organism (which derives from local causal interactions between its parts). Thus, species are unified, cohesive wholes.

Species, then, exhibit all the properties that are definitive of individuals. But, if species are individuals, just like organisms, how are we to understand the relation between organisms and species? According to essentialism, the only individuals are organisms, and species, as natural kinds, are classes of individuals that are united by a shared set of essential properties. Organisms are thus *members* of the classes that are their species. In this respect, essentialists see the relation between organisms and species as just like the relation between organisms and higher taxa such as orders and phyla. In the essentialist's view, higher taxa are also classes of the same individuals that are members of species, but those individuals are united in orders, and so on, by sharing increasingly more inclusive sets of essential properties. In the view that species are individuals, however, organisms are *parts* of species in precisely the way that cells are parts of organisms. In other words, organisms compose a species in precisely the way that cells compose a body.

The parallel between cell/organism and organism/species is worth belaboring for a moment. Cells are clearly individuals. They are spatiotemporally localized (discrete), spatiotemporally continuous, and cohesive. Yet these individuals are unproblematically parts of another, larger individual (an organism). But what makes the cells in an organism all parts of the same, larger individual? It is *not* shared properties that makes cells all parts of the same organism. The cells in your body, for example, aren't cells of *the same body* because they have the same genetic makeup. For, in fact, many of them don't. In the process of mitosis which created all the cells in your body, mutations occur. As a result, there are genetic differences among many of the cells in your body. They are, nonetheless, all *cells of your body*. Conversely, the cells in the bodies of identical (monozygotic) twins are genetically identical, with the exception of the cells in each twin that contain mutations. But two genetically identical cells from the bodies of two twins are not cells of the same body, despite their genetic identity. So, the genetic makeup of a cell, and its genetic similarity to other cells, is not what determines which body a cell belongs to. Rather, the cells in your body are cells *of your body* because they satisfy two conditions. First, they all descended, via iterated rounds of cell division, from the same zygote. For every cell in your body, there is an unbroken chain of descent via cell division that links it with the same zygote. And, second, those cells that are parts of your body are so because they are causally integrated into the overall organization that makes up your body.

In the same way, organisms that belong to the same species need not share any properties. Sharing properties is not what determines whether two organisms belong to the same species, even if those organisms do share a significant number of properties. In fact, in many cases, organisms that belong to the same species do not resemble one another much at all. For example, we encountered *Paracerceis sculpta*, a species in which males come in three "morphs" that pursue different mating strategies. Large males are many times the size of small males, and they possess spiked "horns" where small males have only little nubs. Judging by shared properties, the two would be classified as different species, yet they belong to the same species. In addition, in some species in which developmental plasticity is common, individual organisms develop to mimic the appearance of other species. In such cases, different organisms in the species can develop to mimic distinct species, thereby having more observable characteristics in common with those other species than with one another. Thus, similarity is only *incidental* to belonging to the same species; it is not a criterion of it.

Indeed, not only need there be no shared properties among the organisms in a species, but the fact that species are reproductively organized individuals ensures the maintenance of variation among the organisms in a species. For, in meiosis, the early stage of sexual reproduction, gametes are created that contain only half of an organism's genes, and two gametes often contain different halves of an organism's genes. New organisms, or zygotes, are formed by a process that is, in effect, the random sampling of the parental gametes. This ensures that offspring are never genetically identical to either parent, so that every organism in a species (except for monozygotic siblings) is genetically unique. Further, an organism's development is the result of interactions between its genes and its environment, and no two organisms share precisely the same history of interactions with the environment. Consequently, each organism's unique genome encounters a unique environment during development, and the interactions between genome and environment ensure that each organism develops to be phenotypically unique. Of course, the organisms in a species do tend to share a lot of genes, and their developmental environments are often similar in gross outline, so these processes also tend to create some relatively widespread similarities, among organisms in the same species *in certain respects*. But, *on the whole*, each organism is phenotypically unique. Thus, the fact that species are reproductively organized individuals actually serves to guarantee and maintain significant genetic and phenotypic variation among the organisms in a species.

One thing that makes this viewpoint difficult to accept is the prevalence of "field guides" of various sorts—for example, Peterson's *Field Guide to Western Birds*. In field guides (or in dictionaries), you find species apparently defined by certain clusters of "field marks." For example, you will find a list of characteristics that identity the rose-breasted grosbeak: Males have a black head and upperparts, white belly, and a bright splash of red on the breast. This gives the impression to the nonspecialist that these characteristics are the qualities that define the rose-breasted grosbeak as a unique species. But this is mistaken. These characteristics are merely *markers*, which aid in identifying the species to which a bird belongs. They do not *define* the species. In the same way, "yellow house on the corner" can be a marker for identifying the house at 17 Primrose Lane, but it is not definitive of that house, since the house could be repainted, or even moved to another location, yet retain its identity as a unique individual house. Indeed, even though reliance on field guides can induce the conviction that species are defined by the characteristics associated with a species' name in a field guide, a little reflection on their use can actually disabuse one of that conviction. The female common redpoll, for example, shares none of the characteristics that "define" the male of the species; instead, it more closely resembles the female pine siskin, which in turn doesn't much resemble the male pine siskin. Nonetheless, field guides are very clear about the species to which the females belong, and they are not classified in those species because of their distinguishing marks. Thus, field marks are rules of thumb for identifying the species of an organism; they should not be conflated with defining characteristics of a species.

Species, then, are larger-scale individuals than organisms, but they are individuals in the same sense that organisms are. And conspecific organisms are *parts* of the same species, in the same sense in which two cells can be parts of the same body. The fact that you and I belong to *Homo sapiens*, then, *does not entail* that "we can assume similarities merely on the basis of membership of one biological species."[38] Similarly, the fact that my heart and my thumbnail both belong to my body does not entail that there are properties they must share. Thus, when Cosmides and Tooby claim that, "*by virtue* of being members of the human species, all humans are expected to have the same adaptive mechanisms," they are simply wrong.[39] They misunderstand the nature of species, they misunderstand what's involved in two organisms' belonging to the same species, and they fail to understand how the reproductive organization of a species/individual serves to maintain variation among the organism/parts of that species/individual.

But what does the fact that species are individuals and not natural kinds have to do with human nature? What does the fact that organisms are parts of larger individuals, rather than members of a natural kind, have to do with human nature? The implications of these facts for the idea of human nature are surprisingly direct. If species are individuals, and organisms are parts of those individuals, then organisms do not belong to the same species because of shared possession of a set of characteristics that is purportedly the essence of that species. Shared characteristics are not *definitive* of belonging to the same species, they are *incidental* to belonging to the same species. Indeed, since organisms belong to the same species by virtue of being situated within a common genealogical nexus, there need be no characteristics that are shared by all the organisms that belong to a species. Thus, if human nature is supposed to be a set of "qualities that define us as a unique species," there is no human nature. As Hull says, if species are individuals, "then particular organisms belong in a particular species because they are part of that genealogical nexus, not because they possess any essential traits. No species has an essence in this sense. Hence there is no such thing as human nature."[40]

But the fact that species are individuals, rather than natural kinds, has additional implications. Evolutionary Psychologists envision that their "new science of the mind" will discover the "Darwinian algorithms" that are processed by universal psychological mechanisms. This discovery would demonstrate to us the universal functioning of the human mind, and the descriptions of that functioning would constitute *laws of thought* or *psychological laws*. The fact that species are individuals, however, entails that there can be no such species-specific psychological laws. To see why, let's begin by examining the nature of laws of nature.

Laws of nature are exceptionless universal generalizations. That is, a law of nature applies to all objects, at any point in space and at any time, that possess the properties mentioned in the law. As such, laws of nature mention no specific individuals. For example, Newton's law of gravitation states that two bodies attract one another with a force that is proportional to the product of their masses divided by the square of the distance between them. Although this law applies to any two bodies in the universe, it makes no mention of any specific individual body. As Ghiselin puts it, "although there are laws about celestial bodies in general, there is no law of nature for Mars or the Milky Way."[41] The reason is that laws of nature are designed to capture *regularities* in nature, and regularities involve the *repetition of nonunique properties* or events. While unique individuals can instantiate a regularity, they do so only insofar as they possess properties that are also possessed by other individuals—in particular, the properties mentioned in the law stating the regularity, in other words, only the *nonunique features* of unique individuals—only those features of an individual that are *or could be* possessed by other individuals—fall under laws of nature. Thus, Ghiselin says, "there are no laws for individuals as such, only for classes of individuals."[42]

However, there aren't laws of nature for just *any* classes of individuals. For example, each individual gold watch is a member of the class of watches and a member of the class of gold things. There are no laws of nature that apply to individual gold watches by virtue of their being *watches*, but there are laws of nature that apply to them by virtue of their being *gold*. This is because, although *watch* is a kind, it is not a *natural* kind; *gold*, on the other hand, is a natural kind. Kinds, in general, are defined by properties, so that an individual is a member of a kind just in case it possesses the property or properties that define the kind. Some properties, however, are such that their different instances don't exhibit precisely the same patterns of causal interaction with other objects. Watches, for example, come in many shapes and sizes, and they are made of many different materials. So the different instances of the property *watch* tend to exhibit different patterns of causal interaction with other objects. Some tarnish or scratch in certain conditions, whereas others don't. Other properties, though, are such that their different instances exhibit the same patterns of causal interaction with certain other properties. Each sample of gold, for example, exhibits a range of causal interactions with certain other properties that is also exhibited by every other sample of gold, since the essence of gold (its atomic number) features in deep and robust regularities in nature. The properties that exhibit uniform patterns of causal interaction with other properties are the ones that define *natural kinds*. Thus, since laws of nature describe exceptionless causal regularities in nature, and since the properties that define natural kinds are properties that interact in regular ways, the classes of individuals to which laws of nature apply are natural kinds. In short, laws of nature serve to capture the regular interactions among the natural kinds that make up our world.

Laws of nature, then, apply to individuals only insofar as those individuals exemplify the natural kinds over which the laws generalize. Given this fact, could there be laws of *specifically human* biology or psychology? That is, could a science that studies properties that are necessarily unique to a single species discover laws of nature that necessarily apply to that species and that species only? There are two ways in which this question can be taken, but the answer in each case is no.

On the one hand, if we are asking whether there could be laws of nature that apply to our species as a whole, and only to our species, the answer is no because *Homo sapiens* is an individual, not a natural kind, and there are no laws of nature that apply exclusively to a single individual. On the other hand, if we are asking whether there could be laws of nature that apply to individual human beings insofar as they possess properties that uniquely *define Homo sapiens*, the answer is still no. For, since *Homo sapiens* is an individual, not a natural kind, individual human beings are not human beings by virtue of instantiating the natural kind *Homo sapiens*. Rather, individual human beings are all human beings by virtue of being *parts* of the same genealogical nexus. And, as we have seen, the individuals that constitute the parts of another, larger individual are not parts of that individual by virtue of being members of the same natural kind.

There are, however, two respects in which this argument must be qualified. First, although there are no laws of nature that apply *exclusively* to human beings, there are laws of nature that apply to *Homo sapiens*. For *Homo sapiens* is a species, and the category of *species* is a natural kind. That is, there are laws of biology, including the laws of evolution, that apply to *all* species. But, the properties that make *Homo sapiens* a *unique* species—the properties that make it a unique segment in the tree of life—will not figure in these laws. Rather, insofar as laws of evolution apply to *Homo sapiens*, they apply to *Homo sapiens* because of properties that it shares with other species—in particular, the properties essential to the natural kind *species*.

Second, although there are no laws of nature that apply exclusively to *Homo sapiens*, there are many laws of nature that apply to individual human beings. The laws of physics and chemistry apply to individual human beings, and there are laws of biology, including the laws of genetics, that apply to individual human beings. But these laws apply to individual human beings only insofar as humans exemplify properties that are not exclusive to human beings, but that are (or could be) possessed by much larger classes that include human beings. The laws of mechanics, for example, apply to individual human beings, but they apply to us as objects with mass, and mass is not unique to human beings. Similarly, the laws of genetics apply to individual human beings, but they apply to us as developmental systems or as sexually reproducing organisms, and these properties are not unique to humans. Thus, the laws of nature that do apply to individual human beings are not candidates for scientific laws of *human nature*, since they are laws that do not apply exclusively to human beings.

There are, however, more specific reasons why there can be no scientific laws exclusive to *human* psychology. For, if there were psychological laws that applied exclusively to humans, those laws would have to generalize over natural kinds, and those natural kinds would have to be human psychological mechanisms (or aspects of their functioning). In other words, in order for there to be psychological laws, human psychological mechanisms would have to be natural kinds. But, since psychological mechanisms are phenotypic traits, the question of whether psychological mechanisms form natural kinds is really the question of the logic underlying the classification of phenotypic traits. In particular, it is the question of the criteria involved in classifying a trait of two different organisms as "the same" trait (in this case, classifying psychological mechanisms in two individuals as "the same" psychological mechanism). If traits were natural kinds, the criterion involved in classifying a trait of two different organisms as the same trait would simply be whether those two traits shared certain essential properties—namely, the properties definitive of that natural kind of trait. Again, this would be identical to the logic involved in classifying two samples of platinum as the same substance; the two samples are the same substance if they are both composed of atoms with atomic number 78. But this is never the logic involved in the biological classification of a trait in two organisms as instances of the same trait. Indeed, there are two distinct ways of classifying traits as "the same" in biology and neither of these ways involves identifying shared essential properties, such as could feature in laws of nature.

The traits of two organisms are grouped as "the same" trait by virtue of being either *homologies* or *analogies* (also known as *homoptasies*). Traits of two organisms are *homologous* if those traits derived, possibly with modification, from an equivalent trait in the common ancestor of those organisms.[43] The ancestral trait is determined to be "equivalent" to the derived traits just in case it occupied the same position relative to other parts of the body and had similar connections with those other body parts. For example, the human eye is homologous to the eye of a cat, since the human eye and the cat eye derived from an equivalent eye of an ancestor of both humans and cats, although eyes in both lineages were modified after their divergence. Similarly, human limbs and cat limbs are homologous, since they were both derived from the limbs of a common ancestor. This is the sense in which the human eye and the cat eye are both eyes. As the evolutionary biologist Gunter Wagner puts it:

> A large number of characters are certainly derived from the same structure in a common ancestor and are therefore undoubtedly homologous. One simply cannot escape the conclusion that the brain of a rat and a human are actually the "same" in spite of their obvious differences.[44]

In contrast, traits of two organisms are *analogous* if those traits have a similar structure or function, but evolved in those organisms' lineages independently of one another. The human eye and the octopus eye are not derived from the eye of a common ancestor, since the common ancestor to humans and octopuses had no eyes. The human eye and the octopus eye have structural and functional similarities, however, so the human eye is analogous to the octopus eye. Similarly, the wings of the black-capped chickadee are analogous to the wings of the mosquito, since wings evolved separately in birds and insects. They are nonetheless both wings, because of their structural and functional similarities.

Thus, when two organisms are said to have "the same" trait, it means that those organisms possess either homologous traits or analogous traits. There is no other sense, in biology, in which two organisms can be said to have "the same" trait. This is true not only of trait comparisons between species, as in the examples above, but of trait comparisons within a species as well. Your eyes and my eyes are homologous, because they were derived from the eyes of a common ancestor. Of course, the common ancestor from which you and I derived our eyes was far more recent than the common ancestor from which human eyes and cat eyes were derived. Nonetheless, the sense in which your eyes and my eyes are "the same" is that our eyes are homologous. Indeed, all of the traits that you and I share and that are described in "precise anatomical detail" by *Gray's Anatomy* are homologies.

Homologous traits, however, are not classified together by virtue of shared characteristics, let alone by virtue of shared essential characteristics. The human brain and the cat brain are homologous despite many structural differences, and the hind limbs of the crocodile and those of the starling are homologous despite sharing virtually no interesting properties. The same is true of homologous traits *within* species. The eyes of each individual human are not human eyes because they share properties essential to being a human eye, but because they are homologies, traits derived from an equivalent eye in a common ancestor. Indeed, "deformed" eyes, which lack some of the properties of eyes detailed in *Gray's Anatomy*, are nonetheless eyes. And the eyes of the blind are human eyes despite not performing the typical visual function of eyes. Further, male nipples and females nipples are all nipples because they are homologous traits, not because of shared morphological or functional properties (which, in fact, they do not share). This is because, as Wagner says, "homology is assessed regardless of shape or function."[45] In fact, homology is assessed in precisely the way that the species classification of two organisms is assessed—genealogically. Traits of two organisms are homologies if they were derived from an equivalent trait in a common ancestor, regardless of whether they share properties, just as two organisms belong to the same species if they descended from a common ancestor in that species, regardless of whether they share properties. In short, homologies, like the organisms of a species, are unified by descent, not by shared properties.

Two individual instances of a trait (in two distinct organisms), then, are not classed together as homologous by the same logic as two samples of platinum are classed together as the same substance. Instances of natural kinds, like platinum, are classed together because of their intrinsic properties, regardless of their provenance. If we froze the universe at a particular moment of time, for example, we could identify every instance of platinum simply by determining whether objects were composed of atoms with atomic number 78. But, in that frozen instant, we would not be able to identify every instance of a particular homology. For history is everything with respect to determining whether two individual instances of a trait are homologous. Your eyes and my eyes are homologous ("the same") not because of properties they share *at this instant*, but because of chains of descent that reach back from each of us into the past and converge upon a common ancestor. Our eyes are not "the same" because they are connected by common properties at this moment, but because they are connected by that historical V of descent, with our common ancestor located at the apex. Thus, the logic by which traits are classified as "the same" (homologous) in biology is very different from the logic by which two entities are classified as instances of the same natural kind. In short, "the same" trait in organisms of the same species are homologies, and homologies are not natural kinds.

If many humans share "the same" psychological mechanism, then what makes their psychological mechanisms the same is their derivation from a common ancestor, not any properties they may happen to share. But no phenotypic traits are inherited directly, by being directly copied as wholes from one generation to another. They are, instead, constructed anew in each generation through the process of development. Indeed, like all phenotypic characteristics of individual human beings, psychological mechanisms develop via the interaction between an individual human's unique genome and the unique sequence of environments to which that individual's genome is exposed. And this process consistently produces variation among the psychological mechanisms possessed by humans, just as it consistently produces variation among all phenotypes. Despite these variations, however, psychological mechanisms in different individual humans remain "the same" mechanism. For what makes them the same is that they are derived from a common ancestor, even if they have been modified in the process. Thus, human psychological mechanisms are not natural kinds, they are homologies, which may exhibit significant variation despite being "the same." Consequently, there can be no *laws* of *human* psychology, since laws of nature apply only to natural kinds.

This doesn't mean, however, that we can't make discoveries regarding human psychology, and it doesn't mean that human minds exhibit no regularities. Even if there are no laws of nature that apply to single individuals as such, individuals can nonetheless be *described*. There are no laws of nature that pertain to you and only you, but those who know you well can give richly detailed descriptions of your physique and personality. And those descriptions can convey to others a great deal of knowledge about you as an individual. Similarly, although there can be no laws of nature that pertain exclusively to human psychology, psychology may one day provide us with richly detailed descriptions of human minds. And some of those descriptions may prove general enough to apply to vast segments of our species *for a particular period of time*. In other words, psychology may one day provide us with descriptions of some very widespread regularities among the minds of our conspecifics. But those descriptions will never achieve the status of laws of nature, since laws of nature apply only to instances of natural kinds. Insofar as psychology concerns itself with distinctively *human* cognition and emotion, it must begin to conceive of itself as being in the business of providing *descriptions* of *homologous characteristics*, rather than being in the business of providing laws of thought in the way that physics provides laws of mechanics or chemistry provides laws of chemical bonding.

To conclude, then, since *Homo sapiens* is an individual, not a natural kind, there is no such thing as human nature. And, since human psychological mechanisms are homologies, human psychological mechanisms do not form natural kinds. Consequently, there are no laws of nature that pertain exclusively to human minds, so Evolutionary Psychology can never fulfill its promise to be the "new science of human nature" by discovering the psychological laws that govern the functioning of evolved psychological mechanisms. A truly *evolutionary* science of human psychology will not only abandon the quest for human nature, but, with it, the quest to be a science in the model of physics or chemistry.

Notes

1 Ghiselin 1997, p. 1.
2 Buss 1999, p. 47; emphasis added.
3 Loptson 1995, p. 1.
4 Loptson 1995, p. 19.
5 Trigg 1988, p. 4.
6 Tooby and Cosmides 1990a, p. 19.
7 Tooby and Cosmides 1990a, p. 18.
8 Bonner 1980, p. 9.
9 Tooby and Cosmides 1990a, p. 17; emphasis added.
10 Tooby and Cosmides 1992, p. 38.
11 Tooby and Cosmides 1992, p. 78.
12 Tooby and Cosmides 1992, pp. 68–69.
13 Wilson 1994, p. 224.
14 Izpisúa Belmonte 1999, p. 47.
15 Cosmides and Tooby 1997, p. 72; emphasis added.

16 Sober 1994, p. 205; emphasis added.
17 Cosmides and Tooby 1992, p. 211.
18 Cosmides and Tooby 1994, p. 101.
19 Brown 1991, p. 50.
20 Sober 1994, p. 210.
21 Sober 1994, p. 222.
22 Tooby and Cosmides 1992, p. 82.
23 Tooby and Cosmides 1992, p. 78.
24 Sober 1994, p. 222.
25 Sober 1994, p. 222.
26 Tooby and Cosmides 1992, p. 78; emphasis added.
27 Symons 1979, p. 32.
28 Lewontin 1995, p. 41.
29 Cavalli-Sforza, Menozzi, and Piazza 1994, p. 141.
30 Sober 1994, p. 214.
31 Tooby and Cosmides 1990b, pp. 380–381.
32 Hull 1989a, p. 12; emphasis added.
33 Hull 1989a, p. 17.
34 Ghiselin 1997, p. 41.
35 Mayr 1988, p. 343.
36 Hull 1989b, p. 85.
37 Mayr 1988, p. 344.
38 Trigg 1988, p. 4.
39 Cosmides and Tooby 1992, p. 211; emphasis added.
40 Hull 1978, p. 358.
41 Ghiselin 1997, p. 45.
42 Ghiselin 1997, p. 45.
43 See Futuyma 1998, p. 109.
44 Wagner 1989, p. 51.
45 Wagner 1989, p. 51.

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