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The Stone Age mind

> 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 equi-valent reference work for psychology and find in it detailed information-processing descriptions of the multitude of evolved species-typical adaptations of the human mind, including how they are mapped onto the corresponding neuro-anatomy and how they are constructed by developmental programs.
>
> John Tooby and Leda Cosmides, *The Psychological Foundations of Culture*

The vogue for finding moral lessons in evolutionary theory has now largely passed. Though philosophers, biologists and game theorists continue to expend a great deal of effort on trying to uncover the biological sources of morality, they now, on the whole, think their work has few implications for our understanding of how we ought to behave. In this chapter, we turn to another area of intellectual inquiry which tries to understand the human mind within its evolutionary context, and which hopes thereby to illuminate *contemporary* ways of thought, both normal and pathological.

There have been two waves of evolutionary theorizing about human mind and behavior in the past quarter of a century. The first was sociobiology, which attracted a storm of controversy. The second, more recent, and as yet less well known, is evolutionary psychology.

Both claim that the application of Darwinian ideas to human beings yields new insights into our behavior, and into what kinds of societies we might hope to achieve. Moreover, as I shall argue, their claims are directly relevant to our morality and our politics.

Sociobiology's best-known proponent is E. O. Wilson; indeed, the movement takes its title from his magnificent volume of that name, published in 1975. *Sociobiology: The New Synthesis* was devoted to the study of the social behavior of various species of animals (Wilson's primary area of expertise is the study of ants), and made many important contributions to the field. But it was his attempt to apply these ideas to human beings that attracted the most attention. Critics eviscerated Wilson for his claims that human behavior should be seen as biologically driven, and aimed at enhancing the genetic fitness of the actors. Sociobiology did not attempt to draw moral lessons from the large-scale process of evolution. It was careful to avoid the mistake of identifying what has evolved with what is good, or to see in the (supposed) direction of evolution a model for human societies. But it did claim that human behavior, preferences, desires, and abilities were the product of natural selection, and that we (*therefore*) were constrained in what we might achieve. To this extent, claimed its critics, sociobiology was continuous with Social Darwinism: yet another apology for the status quo – for capitalism, male dominance, racism, and war – based upon its supposed inevitability.[61]

I shall not discuss sociobiology here; at least, not directly. Few people today continue to describe themselves as sociobiologists. The debate has moved on, and is now centered on evolutionary psychology. Evolutionary psychology builds upon the work of sociobiologists, to such an extent that some people regard it simply as "rebranded sociobiology."[62] However, it is plausible to maintain that evolutionary psychology has contributed a distinctive approach to sociobiological questions – a focus upon the mind, and upon the empirical testing of hypotheses – which was largely absent from sociobiological speculations. In any case, I shall focus on the work of people who describe themselves as evolutionary psychologists.

The central claim of evolutionary psychology is simple. Most features – and almost all complex features – of the physiological structures of organisms are adaptations that enabled their ancestors to flourish in

their ancestral environments. So (for example) we have kidneys because they remove waste from our bloodstream. That our physiology can be broken down into component adaptations is something we could predict from natural selection. An inspection of the morphology of organisms confirms this prediction: indeed, their organs are very frequently superb adaptations to their local environment.

This is as true for human beings as for any other animals. Our bodies, too, are so well adapted to the environments in which our ancestors lived that we can be sure that a great many of our features are the product of natural selection. But we have no reason to think that natural selection applies only to bodies. After all, it is not only the physiology of other animals that has been shaped by natural selection, but also their behavior. Natural selection did not produce sterile castes of workers in the eusocial insects (that is, those insects which live in colonies with extensive division of labor and a high degree of cooperation, such as bees and ants) and then leave them to work out for themselves that they ought to aid the queen in producing as many of their sisters as possible. Rather, it selected the appropriate kinds of behavior, at the same time as it selected the kinds of physiology best suited to the life of a eusocial insect. Indeed, it had to: in the absence of the appropriate kinds of behavior, having the right kinds of morphological characteristics would not have constituted an advantage to the social insects. If this is true of other organisms, shouldn't we expect it to be true of ourselves? Shouldn't we expect our behavior, and therefore the minds that are very often proximate (that is, immediate) causes of that behavior, to be adapted to the environments in which our ancestors lived?

The foundational claim of evolutionary psychology is, therefore, that human minds are adapted for the environments in which our ancestors had to make their way. But this is not the controversial claim. Stated in this general and abstract form, the claim is *obviously* true. Of course human beings are cognitively, as well as physiologically, adapted to ancestral environments. Only human beings, for example, have the brain structures that underlie fully-fledged natural languages, as well as the morphological features (such as vocal cords), which permit us to speak. Decades of intensive effort to teach other animals to understand human languages have yielded few positive results, yet almost every human child picks up their native language (plus any others which are

regularly spoken around them) with apparent ease. There can be no doubt that this capacity is innate, in the sense that humans are born with brain structures (or, perhaps better, the propensity to develop brain structures) which, in the right environment, will enable them to learn a natural language. Nor can there be any doubt that this ability is heritable, or that it is an adaptation, selected for because it increased the fitness of our ancestors. Indeed, studies of patients who have suffered neurological trauma, or developmental disorders, have enabled us to locate the parts of the brain dedicated to processing language with a fair degree of precision. Just as evolutionary psychology claims, we have mental organs that are adaptations, which enable the kinds of behavior characteristic of human beings.

Since all sides recognize (or ought to recognize) that our minds are the product of evolution, and are very likely to bear traces of our evolutionary past, the debate between proponents of evolutionary psychology and their critics does not turn on the question of whether human beings possess cognitive adaptations. Instead, it focuses on the number and specificity of these adaptations. Evolutionary psychologists claim that the human mind consists of a large number of mental "organs," each dedicated to a specific task, each relatively isolated from the others and therefore acting relatively autonomously, whereas their critics typically maintain that the mind is best thought of as a general purpose learning tool, which enables human beings to adapt to a very wide range of environments, and which gives to their behavior a degree of plasticity unknown among other species.[63] As we shall see, a great deal turns on this apparently esoteric question, not just for abstruse debates in the philosophy of mind and cognitive science, but for morality as well.

In the middle part of the twentieth century, *behaviorism* dominated psychology. Behaviorists, led by B. F. Skinner, argued for a radical version of the position I have attributed to the opponents of evolutionary psychology. For Skinner and his disciples, the mind was no more than a general purpose learning device. Of course, no one can coherently deny that *something* is innate in the brains of animals. If the mind was entirely a blank slate, we would be unable to account for learning itself. The mind must be capable of noticing resemblances between stimuli, for instance, or it could not recognize the reoccurrence of similar

inputs and learn from their association. Skinner's claim was that the mind contained *little more* than the machinery required for learning. Apart from a few simple devices to recognize similarity and difference, the most important piece of machinery was a reward and punishment center. All animals are naturally attracted by pleasure and repelled by pain. Skinner's suggestion is that it is on the basis of these facts about ourselves, and our learning mechanisms, that all behavior is shaped.

Specifically, Skinner claimed that, in the course of development, animals would learn to associate certain stimuli with feelings of pleasure and pain. These feelings would act as *reinforcers* of its behavior, causing it to be more likely to repeat behavior associated with positive reinforcers, and more likely to avoid behavior associated with negative. Skinner's inspiration here was the work of the Russian scientist, Ivan Pavlov. Pavlov had noticed that if he rang a bell every time he fed the dogs in his laboratory, the dogs came to associate the sound of the bell with food. They would soon begin to salivate at the sound of a bell, even in the absence of food. For Skinner, the ringing of the bell was a conditioned association, and the conditioning was successful because it was reinforced by the food, which is a stimulus that dogs naturally find pleasurable (note that it is a very simple matter to give an evolutionary explanation of why dogs – in fact, all animals – find food naturally rewarding, since those of their ancestors who didn't like food would have been unlikely to have many descendants). Skinner's more radical claim was that all behavior, human and other animal alike, was conditioned in just this way. Everything we do, we do because we have been rewarded for acting in similar ways in the past. Accordingly, merely by altering the nature of the reinforcers, human behavior could be remade, in any image we pleased: if we would only put aside our fantasies about human free will and worth (get *Beyond Freedom and Dignity*, as the title of Skinner's didactic novel dramatizing the Utopian power of his work, had it), we could solve all the problems which plague human life.

The behaviorist vogue has passed, and for good reason. The evidence, from many different regions of psychology and neurobiology, that the minds of animals are not the all-purpose learning machines envisaged by Skinner, is now overwhelming. One piece of data that behaviorism finds it difficult to account for is the compartmentalization of the brain. Brain imaging studies, and evidence from people who

suffer strokes which damage a region of their brain, have shown convincingly that the same functions are handled in the same areas of the brain in almost all people. People who suffer a stroke that predominantly affects the right hemisphere of their brain often become very impulsive. If the damage occurs in certain regions, they might develop a range of bizarre symptoms, such as anosognosia, in which the (apparently otherwise rational) patient denies that there is anything wrong with a paralyzed limb, or even somatoparaphrenia, in which the patient denies that the limb is theirs at all. It is worth reproducing a short dialogue, reported by Eduardo Bisiach, to get a sense of just how specific and strange the effects of local brain damage can be. Bisiach held his patient's paralyzed hand between his own hands, and asked the patient to look at them:

> Examiner: Whose hands are these?
> Patient: Your hands.
> Examiner: How many of them?
> Patient: Three.
> Examiner: Ever seen a man with *three* hands?
> Patient: A hand is the extremity of an arm. Since you have three arms it follows that you have three hands.[64]

Though the brain is sometimes able to adapt to deficits and damage, especially if they occur while the person is young, when functions usually served by one brain region can relocate to another, the evidence that many functions are normally localized is now overwhelming. Damage to specific brain regions causes quite specific impairments: patients may lose just the ability to recognize faces, just the use of language (aphasia), or even just experience difficulty with certain parts of speech, such as pronouns and articles.[65]

A thoroughgoing behaviorist might come up with some way to accommodate these findings. It's odd, from a behaviorist point of view, that the brain is so compartmentalized, but it's not decisive proof that the brain doesn't *function* as an all-purpose learning device. It just turns out, the behaviorist might argue, that for some reason the learned associations are stored in different regions of the brain. But there are other data, drawn from just the kinds of experiments the behaviorists loved, which show that the evidence against behaviorism

cannot be so easily dismissed. If we investigate conditioned learning in different animal species, we find that there are limitations, constraints, and dispositions that directly contradict the claims of behaviorism.

According to behaviorism, animals are just as capable of learning one set of associations as another. However, when this assumption is tested, it proves to be false. Instead, there are differences in the kinds of stimuli that are salient for different animals. For example, rhesus monkeys reared in captivity, which never encounter the snakes common in their natural environment, can easily be taught to be afraid of them. In one experiment, captive-born rhesus monkeys were shown a film of wild monkeys reacting fearfully to a snake. Though the captive monkeys had exhibited no fear of snakes before seeing the film, afterwards they were terrified of even a toy snake. But all attempts to make them fearful of a toy rabbit or a flower, using film which had been cut to make it seem as if the wild monkeys were reacting with terror to these objects, failed miserably.[66] Similarly, male white-crowned sparrows reared in isolation from other birds of their species fail to learn their characteristic song. If a white-crowned sparrow is reared with older males of a different species of sparrow, it may come to learn their song. But if it is reared with at least one other adult male white-crowned sparrow, it learns only its song.[67]

Behaviorism finds it hard to account for these results. Both examples show that a lot of behavior is learned, just as Skinner argued. Without the appropriate stimulation, neither the sparrows nor the monkeys come to behave in species-typical ways. But certain sorts of stimuli are much more salient for different species, and certain associations much easier. The brains of these animals are learning machines (among other things), but they are not *all-purpose* learning machines, as behaviorists supposed. Instead, they come pre-structured, in such a way that some kinds of learning are relatively easy (requiring only brief exposure to relevant stimuli), some more difficult, and some downright impossible. Moreover, the kinds of stimuli that are particularly salient are precisely those that are evolutionarily relevant. Rhesus monkeys find snake-fear relevant, because snakes represented a constant threat in their environment of adaptation, and white-crowned sparrows' brains are especially well set up to learn their song because their ancestors used it to attract mates and defend territory.

There is evidence that some stimuli are especially salient for humans. Think of the typical stimuli of phobic responses, where people find themselves reacting with inappropriate and intense fear in situations in which (as they acknowledge) they are perfectly safe. The objects of this fear are frequently just the kinds of things our ancestors would have good reason to be fearful of: snakes, spiders, heights, open spaces (which would make them visible to predators), and so on. There is also some experimental evidence that human beings form some associations much more readily than others: associating mild electric shocks with images of snakes more easily than with images of frayed electric cords.[68]

Noam Chomsky's work in linguistics provides further support for the claim that the human brain is not an all-purpose learning machine, but is instead pre-structured in significant ways. Chomsky claims that, beneath the evident differences between the six thousand or so human languages, there is a shared, deep, structure. This structure, he argues, is innate: it is preprogrammed into the human brain, in the same way that the song of the white-crowned sparrow is programmed into its brain. Like the sparrow, the human child will not learn any language at all, unless she is exposed to one: it is the structure of language that is innate, not the language itself. But she possesses a language-acquisition device, which (if she is presented with the relevant stimulus at the right time) will enable her to pick up any human language with an ease belying the enormous complexity of the task. For many evolutionary psychologists, this very ease clinches the case against behaviorism. They invoke the *poverty of the stimulus* argument, noting that the range of language to which a child needs to be exposed is really quite small, in comparison to the variety of the utterances of which she is then capable, and the sheer complexity of the language learned.

Further evidence for the hypothesis that language is somehow innate comes from the birth of new languages. Sometimes, people find themselves in a situation in which they lack a common language, as, for example, did the slaves on board the ships that took them from Africa to the Americas. In these circumstances, people often devise a *pidgin*: a skeletal language with which to communicate. A true pidgin has little grammatical structure, and is very limited in expressive power, but an interesting thing occurs when a new generation is born to people who

speak a pidgin. Apparently spontaneously, the children elaborate an entire grammatical structure, forming a new, fully-fledged, language on the basis of the pidgin. These new languages are called *creoles*, and possess the full expressive powers of any natural language. The persuasive suggestion of Chomsky and his followers is that, when children are exposed to a language, even a pidgin, their language acquisition device goes to work, and provides it with a full-blown grammar. Thus, they endow the new language with the deep structure common to all natural languages, spontaneously giving birth to one of humankind's most complex products.

We could continue to pile up the evidence, but it is surely not necessary. The conclusion is inescapable: radical behaviorism is false, because human minds – like those possessed by other animals – are not blank slates or even all-purpose learning devices. Instead, they come pre-structured in important ways, and these structures constrain how we, as a species, are capable of behaving and thinking. So much ought to be uncontroversial. Though there are still people who reject this view, they are misinformed, and their position is untenable. But how far should we go down the nativist road? Just how much, and just what, is innate in the human mind? Are the constraints many or few; are the limits they set broad or narrow?

The parties to this debate typically assume that there is but one answer to this question. Either nothing is significantly innate in the human mind, or we come into the world with a set of in-built dispositions that strongly structure our preferences and capabilities. My hunch is that this is a mistake: the degree to which the mind is pre-structured varies across different parts of life. We have strong in-built likes and dislikes in food, for example; it is very difficult to get human beings to prefer rotting meat to sweet fruit. But there is no reason to think that just because our food preferences are significantly innate, so are our political preferences and the kinds of social lives to which we can adapt.

In this and the next chapter, I shall examine evolutionary psychology at its most controversial: as it argues for significant constraints on our social life and gender relations. Before we get to these claims, however, it is worth examining the kinds of arguments advanced by evolutionary psychologists, setting out the different kinds of constraints

upon the human mind that its practitioners identify, and isolating the ways in which their claims might be significant for our morality and politics. The thesis that I have been examining up until now, that the brain is strongly compartmentalized, has attracted the most philosophical debate. But there is a second important thesis characteristic of evolutionary psychology, which is, I suspect, more important for human morality, and which attracts more popular attention: the claim that our desires and preferences are to be understood as evolved adaptations.

Modularity

Followers of Chomsky postulate that the normal human mind possesses a language acquisition device. According to many psychologists, cognitive scientists, and philosophers, such a device is a mental *module*; a component of the mind that is dedicated to one task (or a small number of tasks) and which it performs in relative isolation. Evolutionary psychologists claim that we possess many such modules: a module for face recognition, a module for estimating distances in visual perception, and so on. Each module is *informationally encapsulated*, that is to say, its internal workings are isolated from the information available to the rest of the mind. The Müller-Lyer illusion is a classic example of informational encapsulation:

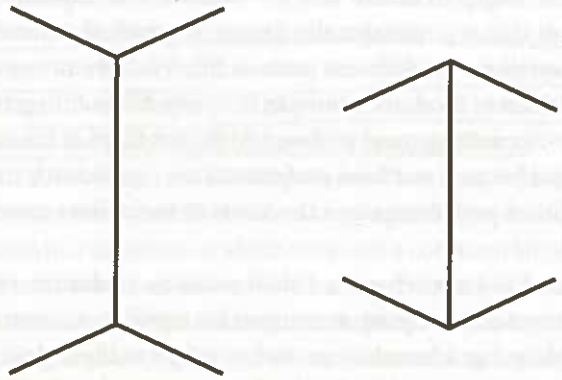

Figure 1: The Müller-Lyer illusion

Both vertical lines are precisely the same length, yet we cannot help seeing the one on the right as longer. The information that the lines are the same length does nothing to dissipate the illusion; hence, the module concerned with estimating length must be informationally encapsulated.[69] The information that the lines are the same length is not available to it. Similarly, the knowledge that a particular spider is harmless is not available to the module responsible for the fear reactions of the phobic.[70]

Psychologists have long known about phenomena such as the Müller-Lyer illusion. They study them for what they might reveal about the workings of the perceptual system, and the manner in which the brain processes information. These studies take their place in a long tradition of studying instances where judgments go wrong, in order to see what light they cast on more normal cases. But the actual phenomena have traditionally not been regarded as important. Psychologists did not conclude, from the existence of optical illusions, that people generally make mistakes in their judgments. However, recent work by evolutionary psychologists elevates the importance to cognition of illusions and other (alleged) biases. For these psychologists, the biases and bents that careful study reveals to be inherent in the human brain give important clues to the manner in which we negotiate and interpret the world. They suggest that we see it through lenses made for us by natural selection.

Some of the modules allegedly discovered by evolutionary psychologists are directly concerned with our moral life. For example, Leda Cosmides and John Tooby argue that human beings possess mental modules that enable their possessors to solve problems that would frequently have been encountered in the EEA, including problems of direct relevance to morality, such as the fair sharing of scarce resources. Cosmides and Tooby adapted a pre-existing tool, the *Wason selection task*, to argue for the existence of these mental modules. They compared the performance of subjects on two Wason selection tasks.

Wason selection task 1

You are employed by the city of Cambridge to study the use of public transportation in the area. According to a previously published report on this topic, the following statement is true:

If a person goes into Boston, then that person takes the subway.

You are interested in discovering whether this is still true. You are presented with a number of cards, which record the transportation habits of Cambridge residents. On one side of the card is printed their destination, and on the other their means of transport. Here are four such cards:

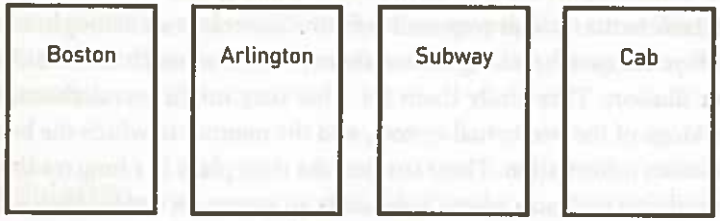

Figure 2: The Wason selection task, version 1

Is the rule true for the people whose transportation habits are recorded here? Which cards *must* you turn over to test the rule?

Wason selection task 2

You are an anthropologist studying a Polynesian people called the Kaluame, a tribe ruled over by the dictatorial chieftain, Big Kiku. He makes all those who swear loyalty to him tattoo their faces as a sign of their allegiance. Thus, all, and only, Big Kiku supporters have tattooed faces. Since Big Kiku is very unpopular with members of other tribes, being caught in another village with a tattooed face is certain to get the unfortunate Kiku supporter killed.

One day, four men who have been kicked out of their own villages come to Big Kiku starving and exhausted. They beg him for food. Big Kiku agrees to feed them, so long as each has his face tattooed. They must get their tattoos that night, and in the morning they will be fed. Each man agrees to the deal.

However, an informant tells you that Big Kiku hates some of these men, who have previously betrayed him. You therefore suspect that he might cheat on this occasion. The cards below record information about the fate of each man. On one side is recorded whether or not the man had his face tattooed, and on the other whether or not Big Kiku fed him the next day.

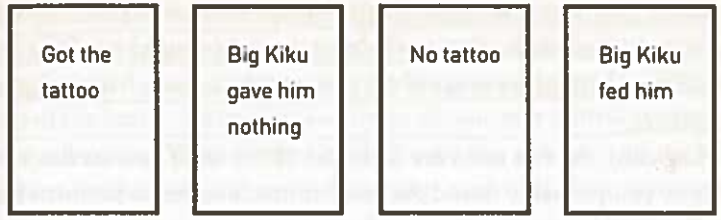

Figure 3: The Wason selection task, version 2

Which cards *must* you turn over to discover whether Big Kiku cheated any of these men?[71]

These two tasks are structurally identical. In both cases, the rule to be tested is of the form *modus ponens*: if *p* then *q*. Thus:

If you travel to Boston, then you take the subway.
If you have your face tattooed, Big Kiku will feed you.

To discover whether this rule is violated, we can ignore cases in which *p* is not the case. If you travel anywhere *other than* Boston, it does not matter how. The rule does not apply to your action, and you cannot violate it. Similarly, if you did not have your face tattooed, the second rule does not apply. We can also ignore cases in which all we know is that *q* was the case. The rule does not state "everyone who travels by subway goes to Boston." We can therefore ignore cards which tell us that the person travelled by subway. Turning them over cannot falsify the rule, no matter what they say on the other side. Similarly, we can ignore cards that tell us that Big Kiku fed the man concerned. Plainly Big Kiku did not cheat this man, whether he fed him either as a result of having his face tattooed, or for some other reason.

Therefore, we need only to turn over cards which tell us that *p* is the case, in order to test whether *q* indeed follows, and cards which tell us that not-*q* is the case, in order to see whether, in violation of the rule, *p* was the case. When we think of the selection task in this manner, the solution is obvious. In the first task, we need turn over only the card that tells us that the person traveled to Boston (in order to see whether they indeed traveled by subway) and the card that tells us that the person traveled by cab (in order to see whether, in violation of the rule, they went to Boston). In the second task, we need turn over only the

card that tells us that the man got the tattoo (in order to see if Big Kiku fed him, true to his word) and the card that tells us that Big Kiku gave him nothing (in order to see if the man got the tattoo). We can ignore the others.

Logically, the two tasks are identical. However, if you are like most people, you probably found the second much easier to perform than the first. Cosmides and Tooby found that between 65% and 80% of subjects gave the correct answer in Wason selection tasks like the second, whereas only about 25% of subjects were able to give the right answer in selection tasks like the first. Why is this? Cosmides and Tooby argue that an important difference between those selection tasks we find difficult and those we find relatively easy is that the second kind are all concerned with free-riding, or other types of cheating, in social situations. We are much better at solving logical problems where cheating is at issue than those that turn upon more abstract questions. Yet the logical structure of the problems remains the same.

The fact that the substance of the problem makes an important difference to our ability to solve it constitutes, for Cosmides and Tooby, further evidence that the brain is not an all-purpose learning device. Just as studies of perception and illusion show that we have informationally encapsulated modules for judging distance and depth, so the study of the ease with which we comprehend social situations reveals that we have modules in the brain dedicated to the tasks of social life. In particular, the Wason Selection Task reveals that we possess a cheater-detection module, dedicated to enabling us to navigate the difficult waters of life in social groups. The explanation of the origin of this module, like that of the module or modules involved in perception, is evolutionary. Our ancestors faced recurrent problems to do with depth and distance perception in the EEA, the solution of which was, literally, a matter of life and death. So important was it to get quick and accurate answers to these questions that people with a dedicated brain module had an advantage over their conspecifics, and therefore had more numerous descendants. Similarly, and as we have seen in the previous chapter, they faced recurrent and important questions to do with social interaction and the detection of cheats. A brain module dedicated to this task therefore evolved alongside those involved in perception.

Cosmides and Tooby hope that further research will increase the number of modules discovered. Eventually, they believe, we will learn that most or all our important decisions are delegated to different parts of the brain, not undertaken by an all-purpose central processor. For the moment, little further evidence for the existence of morally relevant modules has been forthcoming, and even their most convincing example is vulnerable to challenge. Some philosophers and psychologists reject the claim that the apparent ease with which we negotiate Wason selection tasks dealing with social situations is evidence for a cheater-detection module. These challengers hold that it is the *familiarity* of the information and its *relevance* to everyday life that is most important, not its subject matter, and subsequent studies have been dedicated to testing this hypothesis.[72] A second significant challenge to the modularity explanation for performance on the Wason task comes from the traditional opponent of evolutionary psychology: social explanations. Whatever the EEA may have been like, it is obvious that we today must negotiate a complex social world, in which behavior is structured, in important ways, by norms and expectations. In this environment, we are constantly preoccupied with the moral or immoral behavior of others. From childhood, we are taught the importance of norms of fairness, and the need for constant vigilance in seeing these norms adhered to. So, it is not surprising that we acquire the ability to detect violations of those norms quickly and efficiently.[73]

Whatever the intrinsic interest of the subject, we needn't spend a great deal of time on the claim that the brain is massively modular. No doubt, if true, it will have interesting implications for morality, but until we know just what modules we might have, we are unable to see what the implications might be. Moreover, they may be far from earth-shattering. The fact that we have modules for this or that is an obstacle to the plasticity of human behavior, but it may not be a particularly significant one. What follows from the claim that we have a cheater-detector mechanism? Very little, so long as we can shape the content of the norms upon which that mechanism can go to work. If evolutionary psychology proves to have truly momentous consequences for human morality, it is likely that this will be not because it reveals the existence of modularity in the mind but because of what it shows about the fixity of human desire.

The evolution of desire

Evolutionary psychologists claim that our desires and preferences are the legacy of our evolutionary history. Since certain desires and preferences proved to be adaptive, they went into fixation, and the genetic basis for them became a permanent part of the human genome. A simple example should make the general form of this claim clear. There are remarkably robust, cross-cultural, commonalities in the taste preferences of normal human beings. For example, we tend to like sweet tasting and fatty foods. As any parent will tell you, it is difficult to get children to eat, never mind to enjoy, the subtle flavors of vegetables. What explains this preference? Perhaps our sweet tooth is an adaptation. In the EEA, our ancestors were engaged in a constant struggle to find sufficient calories to sustain life. In this environment, people who preferred energy-rich foods – that is, foods containing sugar and fat – had a decisive advantage over those with what today might seem more refined taste-buds. As a result, we come into the world with an in-built preference for high-calorie foods. Today, of course, for many of us in wealthy countries, this taste is dysfunctional. We find it all too easy to consume sufficient calories for our needs; for some, the challenge lies in resisting our evolved preferences, not in giving them full reign. In a new environment, a formerly adaptive preference wreaks havoc, in the form of obesity, strokes and heart attacks. Nevertheless, we have the preference because it was once valuable.

I believe it will help, at this point, to introduce some terminology. Biologists call evolutionary explanations *ultimate* explanations. To give an ultimate explanation of a characteristic is to explain it in terms of its selection history, of what it is ultimately *for*. The explanation of our preference for sugar in terms of its adaptive function in the EEA is an ultimate explanation: it explains the phenomenon in terms of its function, and it was this function that was the target of natural selection. But an ultimate explanation of a behavior tells us nothing about how it is implemented in the life of organisms. Evolutionary psychology aims to fill this gap, with its stories about modularity and about preferences. These are *proximate* mechanisms, the mechanisms that are actually at work in individual organisms. A taste for sugar was selected for because of the fitness advantages that accrued to organisms

with this taste in the EEA, but neither today nor in that environment did people eat sweet things because doing so gave them an advantage in terms of fitness. Rather, they acted upon the proximate mechanism, the desire for sweet tasting foods, which evolution had given them, as a reliable means of motivating them to do what was in their (genetic) interest.

According to evolutionary psychology, this story is generalizable. For every typical human desire and aversion, there is an evolutionary explanation. We have these desires because acting upon them increased the fitness of our ancestors. We do not, typically, act to increase our inclusive fitness. But when we act as we want to – when we pursue sexual opportunities, career ambitions, loving relationships, and esthetic satisfactions – we nevertheless act, unknowingly or not, to enhance our fitness. As Daly and Wilson, two of the most eminent evolutionary psychologists, put it, "Apprehensions of self-interest – such as the absence of pain and hunger, or the positive satisfactions derived from social and sexual success and from the well-being of one's children – evolve as tokens of expected genetic posterity."[74] Evolutionary psychology provides an evolutionary (ultimate) explanation for the existence of the desires (proximate mechanisms) upon which we all act. We like sugar because it is sweet, but it is sweet (for us) because eating it was, in the EEA, adaptive.

The claims of evolutionary psychology

The simple example of our evolved taste for sugar hints at the kind of challenge to morality presented by evolutionary psychology. If many of our desires and aversions are adaptations, in the manner in which our tastes seem to be, then we shall find that we have a hard time constraining, channeling, or altering them, if and when they prove to be obstacles in the way of constructing better norms and a more just world. If, as evolutionary psychology claims, a great many of our desires are adaptations, they will be difficult to control, and the limits they impose upon human behavior might be significant.

The significance of these constraints will greatly depend upon what desires we prove to have. It is only if these desires are importantly

concerned with central aspects of our social and moral life that they will represent real obstacles in the way of shaping our social world. As we shall see, evolutionary psychology claims that it is indeed some of our morally central desires and preferences that must be understood as adaptations.

Sexuality

Perhaps the most interesting set of results here – certainly the one that has caught the public's attention – concerns the evolution of sexual desire. A great deal of ingenuity, and ink, has been devoted to the claim that our sexual preferences are adaptations. After all (other things being equal), sexual success translates quite directly into reproductive success, so any strategy that enhances it will give organisms a decisive fitness advantage. Successful sexual strategies will rapidly go to fixation. On *a priori* grounds alone, we might expect that human sexual behavior will show the effects of millennia of evolution.

Evidence from animal studies buttresses the claim that sexual strategies have been shaped by natural selection. Robert Trivers, with his concept of *parental investment*, provided a key to understanding central aspects of sexual behavior. In sexually reproducing organisms, the minimum level of resources that the members of each sex are required to contribute to their offspring diverges widely. Typically, though not invariably, the female is the more heavily investing parent, while the male is able to get away with investing much less. This is especially the case in mammals, in which females lactate to feed their offspring.

In a situation in which there is this kind of disparity, Trivers predicts, the more heavily investing sex will be very picky in its choice of sexual partners, for they will be left, literally, holding the baby. However, if the minimum investment on the part of the other sex is small enough, we can expect them to be very eager to mate with as many partners as possible, thereby improving reproductive success and fitness. Natural selection should reward those organisms that are able to maximize the number of their offspring (other things being equal), and this strategy promises a direct route to such success. So, we should expect members of the lightly-investing sex to be motivated

by proximate mechanisms that drive them to seek out multiple sexual partners.

As Trivers put it, the members of the heavily investing sex become a "limiting resource" for the other. That is, their reproductive success is limited only by their sexual access to fertile members of the other sex. Trivers, and the sociobiologists and evolutionary psychologists who have built upon his work, have been able to explain a great deal of sexual behavior by looking at it through the lens of parental investment. They can explain, for instance, why males are frequently much more willing to mate with a large number of partners than females are, why males frequently compete with one another for mates, and why females usually do the choosing.

Consider, for example, the behavior of elephant seals. In this species, females invest heavily in offspring: while nursing a pup, she loses between 200 and 450 kilograms, while the pup increases from its birth weight of fifty kilograms (which already represents a significant investment) to about 200 kilograms. On the other hand, the minimum investment needed by a male to have a reasonable chance of producing offspring is low – merely the energy required for a few seconds' mating, and a teaspoonful of sperm. Given this disparity, we can expect male elephant seals to be highly motivated to compete for access to females. And this is precisely what happens. Male elephant seals compete ferociously for access to "harems" of females, so ferociously that though deaths directly resulting from their battles are rare, dominant males often die after only a year or two of controlling a harem. However, the pay-off, in terms of reproductive success, is worth the cost. Fewer than ten percent of all male elephant seals ever succeed in mating with a female, but the lucky few who succeed in controlling a harem might easily end up inseminating over one hundred females.

This great variation in reproductive success is essential to understanding the sexual strategies pursued by different sexes. Males play a high-stake, high-risk game, in which the jackpot is having their genes well represented in the next generation, but in which there are few winners. Females, on the other hand, play a low-risk strategy. Almost all females succeed in having one pup a year, and very few have more than one. Since females can easily find a mate, but can have only a relatively small number of offspring, they can be expected to be choosy, if they

are able to be. Since males find it relatively difficult to secure a mate, but are able, under the right conditions, to father hundreds of offspring, they have little reason to be choosy, and will mate with any accessible female.

Elephant seals also exhibit a notable degree of *sexual dimorphism* as a result of this intense competition between males. Sexual dimorphism is the extent to which, on average, the members of each sex differ. In some species, the degree of sexual dimorphism is slight; in elephant seals, it is quite dramatic. Since reproductively successful male elephant seals must compete, there is strong selection pressure on them for the characteristics that will enable them to succeed. Body size is strongly correlated with success; accordingly, males weigh about four times as much as females.

This brief excursion into the sociobiology of elephant seals has provided us with many of the tools and perspectives we shall need to understand and evaluate the claims of evolutionary psychology relating to human sexual behavior. Before we turn to our main subject, however, let us briefly consider two other animal models, in order to illustrate the power of the parental investment viewpoint, and to provide further insight into the nature of sexual selection. Elephant seals are unusual among mammals in one way: the degree to which females exercise mate choice is relatively low (though not non-existent). In some other species, the sex that invests relatively little in the offspring puts all its effort into turning the heads of members of the other. Take bowerbirds, for example. Male bowerbirds certainly compete, but this competition does not take the violent form it does in elephant seals. Instead, they compete for the attention of females. Each adult male constructs a "bower" – a nest of twigs and grass, constructed on the ground, which comes in a variety of forms, depending on the species. At the entrance to the bower, he places an assortment of colored objects, ranging from flowers and mosses to bits of plastic. These have no apparent purpose, other than to attract females. Females mate with the builders of the most impressive bowers, then fly off to construct the nest in which the young will be reared.

The bowerbird combines male competition with female selection. These features, in one form or another, are very common across animal species. In general, males compete with one another to be chosen by

females. The bowerbird, like many other birds, also exhibits a marked degree of sexual dimorphism. The kinds of characteristics that vary according to sex reflect the ways in which members of a species compete with one another. Accordingly, in male bowerbirds, it is not large body size that is favored by natural selection. Since females choose, and are apparently attracted to bright colors, male bowerbirds have much brighter plumage than do females.[75]

Trivers predicts that, other things being equal, males will compete, while females choose. This prediction is a consequence of another, more fundamental, forecast: that females will tend to invest more heavily in offspring than will males. Why will females be the more heavily investing sex? There are biological factors that incline natural selection to work to this end. At a very fundamental level, females are inevitably the more heavily investing sex. Female gametes (sex cells) are generally very much larger than male gametes; in some birds, the egg weighs as much as fifteen percent of the female's body weight. In addition, the egg is relatively expensive to produce, since it contains the nutrients required by the growing embryo. Females produce a small number of eggs, each of which represents a great deal of investment, whereas males produce an enormous number of sperm, which are easily replaced. This disparity in initial investment is intensified in those animals in which fertilization is internal to the female, since she is then committed to carrying the fetus, channeling resources to it, and giving birth to it. In mammals, lactation ensures that female investment (of time, energy, and resources) must continue after birth, if the infant is to survive. Thus, while it is not inevitable, across all sexually reproducing species, that females invest more heavily than males in their offspring, there are biological factors which ensure that females are rarely able to escape with low levels of investment, and that when investment is unequal, it will rarely be the male who invests more heavily.

The power of any theory is best demonstrated by its ability to explain apparent exceptions to its predictions. How, then, does the parental investment perspective account for cases which are, apparently, exceptions to its rule? Some species exhibit reversed sex-roles. In these species, females compete for access to picky males. Mormon cricket males are very choosy about the females they will mate with, rejecting lighter in favor of heavier females. In these, and other

reversed role species, it turns out that the male invests more heavily in the offspring than the female. Male Mormon crickets produce a mass of nutritious substance for their mates, called a *spermatophore*, which contains both the male sex gametes and the energy the female needs to produce eggs. The spermatophore represents up to twenty-seven percent of the weight of the adult male Mormon cricket, and therefore is a sizable investment. Indeed, he is likely to produce only one spermatophore in his life. Since he makes a larger investment in reproduction, he can be expected to play the role of choosing, while the females compete to be chosen.

Can we transfer these kinds of findings from non-human animals to human beings? Can we, on the basis of the extent of parental investment of human males and females, predict what roles each will play in sexual behavior? This was precisely the aim of many sociobiologists. They made predictions about human behavior, based on the patterns they observed in other animals. Human beings, they claimed, were more or less typical representatives of sexually reproducing species. They pointed out that human beings are mammals, and that as a result human females are committed to investing heavily in their offspring, if they are to reproduce at all. They will have to bear the costs of producing large and relatively scarce eggs, gestating the fetus, and breast-feeding the baby. Males, in contrast, can get away with very low levels of parental investment. Thus, we can expect that females will be very choosy about their sexual partners, while males will seek to maximize their number of sexual encounters. Males will compete for access to females, who will choose among them. We can expect to find evidence of sexual dimorphism in human beings, particularly along the dimensions relevant to male competition. And this is exactly what we do find: males are, on average, larger and stronger than females. To be sure, the degree of sexual dimorphism is modest, when compared to other primates. Male gorillas, for instance, are very much larger than females. But gorilla sexual behavior is more similar to that of elephant seals than to humans, in that the males pursue the same high-risk, high-gain strategy of attempting to control a harem of females and exclude other males from access to reproductive opportunities. Since sexual dimorphism is closely correlated with polygyny, and its absence with monogamy, we can infer that human beings are mildly polygynous.

Indeed, in human cultures polygyny is relatively common, whereas polyandry (one woman marrying more than one husband simultaneously) is very rare.

Thus, sociobiology advanced its claims about human behavior largely on the basis of observed similarities in morphology and social organization between human beings and other animals. The behaviors upon which it focused are, supposedly, adaptations; we can therefore expect them to have been selected for by evolution. Evolutionary psychology takes over a great deal from sociobiology, with regard both to the content of its claims, and to the kinds of backing it provides for them. What it adds are the methods of experimental psychology, particularly the rigorous testing of hypotheses under controlled conditions, in order to refine and confirm its predictions. The most comprehensive work on human sexuality by an evolutionary psychologist is that undertaken by David Buss.[76] Buss frames predictions using the resources of sociobiology, then tests them using those of psychology. That is, he first asks himself what recurrent problems our ancestors would have needed to solve in the EEA, and then proceeds to test whether the genetic basis for solutions to such problems has been laid down in the human genome.

The reproductive problems faced by each sex are crucially different. Since females are the heavily investing sex, they require resources for successful reproduction: resources with which to feed the growing embryo and to produce milk for the newborn, resources to get them through a period of relative vulnerability in the later stages of pregnancy and while the baby is young, and so on. Since males are the low investing parent, they have much smaller resource needs. How are these differing needs translated into preferences? We can expect females to be very choosy about their partners, demanding evidence of good genes, of the possession of resources, and of the ability and the disposition to stay and assist with the tasks of child-rearing. Since men invest much less, we can expect them to be relatively undiscriminating in the choice of a sexual partner, but if they are considering whether to invest in an ongoing relationship, we should expect their standards to rise considerably. So this is the prediction Buss tested: that females will value resources in a potential mate much more than will males.

To test his hypothesis, Buss and his associates surveyed men and women in thirty-seven cultures, which represents a fair sampling of the different kinds of extant human groupings. In every culture, they found that women value financial prospects in a potential mate more than men do. On average, women value resources roughly twice as much as men, though there were significant variations across cultures. Nowhere, however, was the prediction falsified: in every culture women placed more weight on resources than men did.[77] Buss revealed many other systematic mate-choice preferences of women, and gave them an evolutionary explanation. In almost every culture, women value older men, presumably because age is strongly correlated with the possession of resources. Women value intelligence in a partner more than men do, for the same reason. Less predictably, women prefer tall partners. Why? Buss speculates that male tallness would be correlated with ability to protect partners and children. And so on. In general, women have just the kinds of preferences one would expect, on the basis of the facts about their biology and their degree of parental investment.[78]

Though Buss says that he finds women much more mysterious than men, and therefore in greater need of scientific examination, he also investigated, and attempted to explain, male preferences. He paid particular attention to male judgments of female attractiveness. Men place much greater emphasis on attractiveness than women do. Accordingly, they value those traits that we regard as attractive: youthfulness, symmetrical faces, clear and smooth skin, and so on. Why are these features universally regarded as attractive, and highly valued by men? Buss argues that it is because they are cues to lifetime fertility. A young woman is obviously capable of bearing more future children than an older one; moreover, she is less likely to come with already existing children, who would represent a drain on male resources for no good end (in genetic terms). Clear skin is a sign of a low parasite load and current health. Bodily and facial asymmetries are the result of environmental and developmental insults – injuries and diseases that afflict a growing embryo or a young child – and therefore are indicative of poor health or low genetic quality.[79] Buss also explains men's preferences in body shape. It's often suggested that our current preoccupation with feminine slenderness is historically unique. As a glance at a Rubens' painting will confirm, at earlier stages in Western history men preferred rather larger women. It's reasonable to think this preference was a response to the relative scarcity of food before the industrial revolution: only wealthier women could afford to have excess weight. Today, at least in Western countries, it seems harder to remain slim than to gain weight. Our preferences have changed accordingly.

This explanation seems thoroughly cultural and historical. Moreover, Buss does not deny that it contains more than a grain of truth. But, he insists, its truth is not evidence against evolutionary psychology. Evolutionary psychology holds that our behavior is the result of adaptive modules and preferences, but it does not claim that our behavior is programmed, in the sense that we always act in the same way, no matter what the circumstances. Instead, our behavior is *facultative*, which is to say that different strategies are triggered in different circumstances. Men do not have an evolved preference for a certain percentage of body fat in prospective mates: "Rather, they have an evolved preference for whatever features are linked with status,"[80] and this preference leads them to prefer women with whatever degree of fat is linked with status in their culture.

However, though male preferences can be shaped by culture, inasmuch as they will prefer whatever body shape a culture selects as high status, there are evolutionary constraints that ensure that only some body shapes are potential candidates for this position. Beneath the variations in body fat across cultures, one preference remains fixed. In all cultures, men have a strong preference for women with a particular waist-to-hip ratio (WHR). Here Buss relies upon a well-known, and much repeated, experiment by Dev Singh.[81] Singh found that, given a range of different body types to choose from, some of which were heavier than is considered attractive in our culture, some normal, and some underweight, men always preferred a WHR of around 0.7. Further studies show this preference to be quite robust; in almost all cultures, no matter what amount of fat that culture considers attractive, the same WHR is preferred (I shall examine apparent exceptions, and the kind of explanations evolutionary psychology advances for them, later).

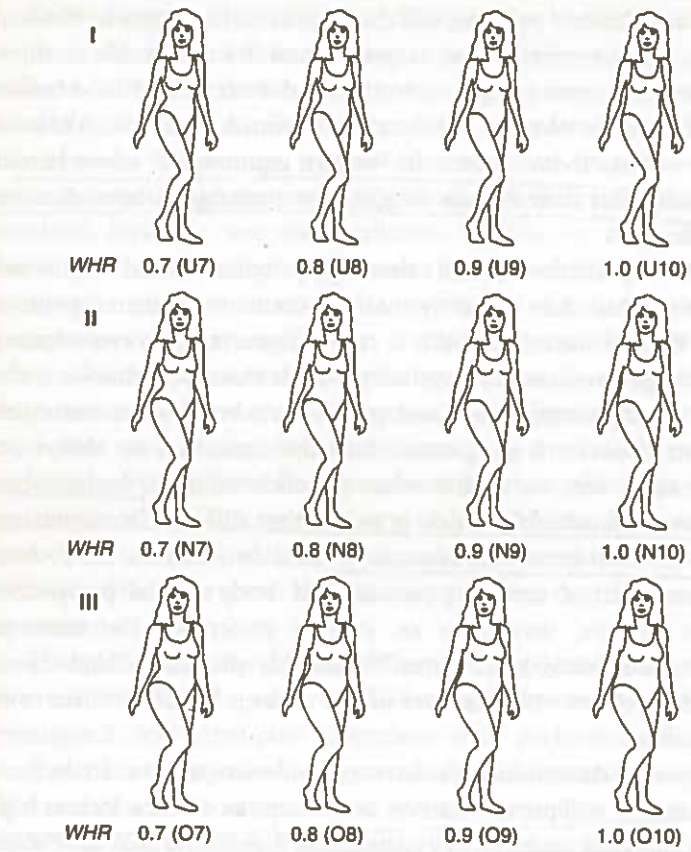

Figure 4: Male subjects in Singh's study were presented with these sketches of underweight (I), normal weight (II) and overweight (III) women. The subjects exhibited a consistent preference for the figure with a WHR of 0.7 across the weight ranges. From Devendra Singh, "The Adaptive Significance of Female Attractiveness: Role of Waist-to-Hip Ratio," *Journal of Personality and Social Psychology*, 65, 1993, p. 298. Reproduced with the permission of Devendra Singh and the American Psychological Association.

Why the preference for this particular WHR? WHR might be a reliable indicator for a great variety of reproduction-relevant information. It is primarily the result of the distribution of adipose tissue, which is directed by the sex hormones (estrogen and testosterone). Thus, WHR is an indicator of the health of the endocrine system, of whether the

individual possesses the optimal amount of sex hormones, and so is correlated with fertility. Moreover, a higher WHR might be indicative of pregnancy; if our judgments of attractiveness are keyed to the extent to which potential partners might aid us in increasing the representation of our genes in the next generation, a female who is already pregnant is a liability to a male. She cannot become pregnant with his child until she has given birth and stopped breast-feeding; and, from the gene's eye view, channeling resources to the child of another man is wasteful.

Infanticide

What, though, if a man marries a woman who is already pregnant with another man's child, or if two people who already have children marry? The "blended family," formed when relationships that have produced children break up and new relationships form, is increasingly common. Obviously, when such families form, at least one of the adults becomes a step-parent. For evolutionary psychologists, this is alarming; a little thought soon shows why. From an evolutionary point of view, children of previous relationships are a liability for the new partner. Therefore, we might expect sexually reproducing organisms to be strongly motivated to rid themselves of such children, or at least to refuse to channel their resources to them. Indeed, in many animal species, males are likely to kill the young of rivals. Among those animals in which a single male (or a small coalition of males) controls a harem, a new dominant male will frequently kill all the young animals. This has the dual function of limiting the number of mouths to be fed, and of bringing the females into estrous, therefore ensuring that they are capable of falling pregnant to the newcomer. This behavior is found in lions and in langurs and other primates; infanticide of the offspring of rivals outside the context of "harems" is found in mice and rats, and some bird species.

It appears that human beings do not have an evolved disposition to kill the offspring of rivals, but why might this be true? It might seem obvious that infanticide cannot be adaptive, since it is difficult to see how anyone who engages in it could find their reproductive success

thereby enhanced. They are likely to end up in jail, or worse. However, recall that a behavior counts as an adaptation if it would, on average, have boosted inclusive fitness *in the EEA*. Its effect on fitness today is irrelevant. Our evolved preference for high-calorie food is an adaptation, despite the fact that in the changed environment in which we – the inhabitants of the developed countries – live, it is dysfunctional. So, infanticidal behavior would be adaptive, and possibly selected for, if it boosted inclusive fitness in the EEA. However, on the best evidence we have, which stems largely from the study of hunter-gatherer groups, it fails to be adaptive. Such groups impose heavy punishments on those who engage in this behavior, and because females who have had their children killed are hardly likely to warm to the killer, it seems that, in the EEA, infanticide would usually have detracted from inclusive fitness. However, just because infanticide is not an adaptation, we ought not to conclude that evolutionary psychology will have nothing illuminating to say about it. Despite the fact that it is not adaptive, an evolutionary perspective might be able to explain its occurrence. How can this be? The answer lies in the fact that many aspects of animal behavior are not direct targets of natural selection, but are instead *by-products* of adaptations.

Martin Daly and Margo Wilson are the champions of the by-product theory of infanticide. Their analysis of the available cross-cultural data on infanticide reveals a striking fact: step-children are at a much higher risk of being abused, injured, or killed by their step-parents than are biological children. In the United States, a child living with at least one step-parent was approximately one hundred times more likely to be seriously injured or killed than a child living with both its genetic parents.[82] Similar – or worse – findings were reported for other societies: hunter-gatherer, agricultural and industrial. Even if we control for other risk factors, such as income and education levels, being a step-child remains an independently significant risk. Moreover, abusive step-parents are selective: they tend to spare their own children who live in the same household.

If infanticide and abuse are not adaptive, what explains the fact that its victims are precisely those children who, if it were adaptive, we might expect would be harmed? Daly and Wilson argue that the behavior in question is a maladaptive by-product of a true adaptation: the

adaptation that leads parents to feel overwhelming and unconditional love for their offspring. It is the *absence* of this adaptation, the fact that these feelings are not typically triggered by step-children, which explains the pattern of abuse, not the presence of any actual adaptation. For isn't it the case that, in the absence of these feelings, parents would harm their children far more often than they do?

> Little children *are* annoying after all: they cry and soil themselves and sometimes refuse to be consoled. A caretaker with a heartfelt, individualized love for a squalling baby is motivated to tenderly alleviate its distress, but a caretaker who is simply playing the part without emotional commitment – and who might even prefer that the child had never been born – is apt to respond rather differently.[83]

Thus, evolutionary principles explain an important feature of human behavior, present and past, and this despite the fact that the behavior is acknowledged not to be an adaptation.

Rape

In a similar manner to the way in which, by reference to an evolutionary explanation of normal family interactions, evolutionary psychology claims to be able to explain abnormal family behavior, so it has offered to explain rape, by reference to normal sexual desire. The best representative of work in this area is that of Thornhill and Palmer.[84] The pattern of argument should be familiar. Since rape is a sexual activity, it is clear how it is directly relevant to reproduction, and therefore to inclusive fitness. On the one hand, the disposition to engage in rape might be a facultative adaptation: under the right conditions, males might be disposed to rape because being so disposed boosted the inclusive fitness of their ancestors. On the other, it might be that rape is not itself an adaptation, but a by-product of other aspects of male sexuality that are, themselves, adaptive: for example the propensity of males to be easily sexually aroused (adaptive since males, unlike females, can benefit from a large number and great variety of sexual encounters). Thornhill and Palmer disagree on this question: Thornhill favors the view that rape is a facultative adaptation, and Palmer argues that it is a by-product of other adaptations, not

itself an adaptation. However, they do agree that it is one or the other, and that therefore rape can best be explained using the tools of evolutionary psychology.

What is the evidence that rape is either an adaptation or a by-product of adaptations? Thornhill and Palmer proceed in the same manner as other evolutionary psychologists. Firstly, they adduce what we might call sociobiological evidence: they give examples of coerced sexual activity in other animals. In some species, the circumvention of female mate choice by males is quite common. Some species of duck, engage in it, as do orang-utans. But the most suggestive animal model is provided by the behavior of the scorpion fly. Male scorpion flies seduce females by offering them a "nuptial gift": either a mass of hardened saliva they have produced, or a dead insect. Female scorpion flies willingly accept the advances of males who bring them such gifts, and reject those who cannot provide them. But male scorpion flies also have a clamp on their abdomen, the only purpose of which seems to be to hold reluctant females immobile. When they cannot or will not produce nuptial gifts, they use this clamp to circumvent female mate choice. Since the clamp has no other purpose, it seems that it is an adaptation specifically for "rape."

There is good evidence, therefore, that at least in some species "rape" is an adaptation. What about human beings? Thornhill and Palmer claim that if we examine patterns of rape, we see evidence that it is adaptive. The evidence concerns both the conditions under which men are likely to rape, and the effects of rape on its victims. Men are most liable to rape, they argue, when the costs of doing so are likely to be low, and the (reproductive) benefits relatively high. The cost for rapists is, typically, the risk they run of injury or death, either at the hands of a successfully resisting victim, or of the victim's kin group or society. These costs are eliminated, for all practical purposes, in certain circumstances: for example, in time of war the social networks that normally ensure rapists are punished break down; in these circumstances, soldiers can rape with impunity, and that is exactly what many of them do. Moreover, Thornhill and Palmer claim, young women – at the peak of their fertility – are far more likely to be raped than older women, and their rape is more likely to be vaginal, so more likely to result in pregnancy.

Even more striking, and surprising, is the effect that rape apparently has on its victims. If rape were a male adaptation, then *women's* sexual behavior would itself have evolved in a context where rape was an ever-present threat. If rape were a reproductive strategy that (on average, and in the EEA) enhanced the fitness of males who employed it, then this benefit to individual men would come at the expense of women. If rape is adaptive, then raped women pay a cost, not only in emotional and physical trauma, but also in the currency of inclusive fitness. As we have seen, women choose their mates by reference to cues which are guides to fitness: the health of prospective partners, their genetic prospects, their ability to support them and their children when they are vulnerable, and so on. Rape prevents women from making these choices, thereby ensuring that their children are fathered by men with possibly less than optimal genes and who will not provide them with the resources they need. From this perspective, rape might best be understood as the best reproductive strategy employed by men who, for one reason or another, would not be chosen by women as partners.

Thornhill and Palmer therefore hypothesize that we shall find evidence of female counter-adaptations to male rape. In particular, the degree to which different women find rape traumatic suggests to them that female responses evolved in a context in which rape circumvented reproductive choices often enough to exert selection pressure on women. The evidence suggests that women of reproductive age experience more trauma than girls or post-menopausal women.[85] Thus, the trauma associated with rape is not caused only by the violence and coercion it involves. Indeed, the greater the level of violence employed by rapists, the *lower* the degree of psychological distress the victim reports. We can explain this surprising finding, Thornhill and Palmer suggest, by invoking the evolutionary function of expressions of trauma. Women in the EEA who were the victims of rape faced not only the immediate consequences of the attack, but also the possibility of rejection by current or potential partners. Men seek faithful partners, to minimize the chance that they will invest in the offspring of another man. They will therefore seek assurances that a raped woman was indeed raped, did not consent, and that she will take every step within her power to ensure that it never occurs again. Genuine and

heartfelt expressions of distress signal to partners that the woman did not consent, and reassure him that she will do all she can to avoid a recurrence of her pain. But if she sustained physical injuries, then these are signaled for her. Hence, the apparently counter-intuitive fact that the victims of violence suffer less, not more, psychic distress.

Empathy and systemizing ability

Let me present one final example of an evolutionary explanation of human psychological characteristics. In a recent, highly successful, book, Simon Baron-Cohen argues that, as a result of their respective biological heritage, men and women have substantially different brains. His thesis, stated starkly on the very first page of *The Essential Difference* is that "*The female brain is predominantly hard-wired for empathy. The male brain is predominantly hard-wired for understanding and building systems.*"[86] Empathy, as Baron-Cohen uses the word, is the ability to understand the mental states of others and, by producing similar feelings in oneself, to react appropriately. This allows the empathizer to respond easily and naturally to the distress of others. A good empathizer will know, intuitively, what to say to someone in emotional pain, how to put a tense person at their ease, what to do to settle disputes, and how to get everyone at a party relaxed and talking.

Systemizers find all this difficult because they take a rule-based approach to understanding the world. They attempt to formulate rules that govern the behavior of everything they confront. But this approach, which serves them so well when it comes to understanding and controlling the physical world, leaves them at a loss when it comes to negotiating the trickier world of social interaction. Human behavior just isn't rule-governed in any sense that would be useful to someone trying to understand it. True, we are able to formulate many rules of thumb to predict human actions and emotions. But there are just too many exceptions to these rules for them to be very helpful as a guide to action. Consider the rule "if people get what they want, they will be happy." Now suppose you gave Hannah what she wanted for her birthday. Will she be happy? She might, but that depends on many other facts about her. Is she upset about getting older? What else is going on in her life? How does she feel about you? Perhaps she doesn't want a present from you at all. Systemizers, Baron-Cohen argues, "just cannot get a foothold into things like a person's fluctuating feelings."[87]

Baron-Cohen's primary area of expertise is autism, and it is his studies of autistic people, especially those with the less severe Asperger's syndrome, which have revealed to him the severe limitations of an exclusively rule-based approach to social life. Sufferers of Asperger's syndrome are often highly intelligent people, yet they lack even the most minimal understanding of the social world of human interaction. They cannot see what is appropriate in a social situation, and are forced to substitute their rule-following, systemizing ability for empathy. They often "struggle to work out a set of rules concerning how to behave in each and every situation, and they expend enormous effort in consulting a sort of mental table of how to behave and what to say, from minute to minute."[88] But their brilliance at rule-formulating invariably proves insufficient. They cannot have rules for all eventualities, and sooner or later they are caught out by the unpredictability of social life.

Autism and Asperger's syndrome are primarily found in males. Baron-Cohen believes that this is significant. Systemizing is predominantly a male ability and empathizing a female ability. Autism and Asperger's syndrome, Baron-Cohen suggests, represent the male brain in an extreme form, lacking almost all empathizing ability. People with the extreme male brain are at a disadvantage in many ways, but if their systemizing ability is intact, or even enhanced, as it may be in Asperger's syndrome, they are nevertheless able to make important contributions to areas of inquiry in which systemizing is the most important skill. Baron-Cohen believes that it is no accident that many areas of science are male-dominated. It is no coincidence, he says, that we refer to the products of technology as man-made, or that only three of 170 living Nobel Prize winners in science are women.[89] Systemizing brains are much better at physics, engineering and mathematics than empathizing brains, and far more males than females have systemizing brains.

So, males and females typically have very different abilities. Males are good at understanding the world, at making and repairing things. They are also good at understanding and raising their status in social

hierarchies, since these, too, are systems. Females, on the other hand, are typically good at understanding people, and responding to them: "There are things that most women can do that most men cannot do as well. Hosting a large party tactfully, making everyone feel included, is just one example of something that many men may shy away from."[90]

But why do these sex differences exist? The explanation is evolutionary. Baron-Cohen claims that systemizing abilities would have been useful to males in the EEA. Systemizing gave them an advantage in the tasks males typically performed: tool-making, hunting and fishing, navigating, trading, and fighting for status in the social hierarchy of the group (which would allow them to command more resources, and therefore to attract more female partners). High empathizing ability would not merely be unnecessary for engaging in such tasks, it might actually be counter-productive. An ability to feel others' emotional states, and respond with similar emotions, would interfere with the efficient performance of such tasks. If one cares about the feelings of others, one will find it more difficult to treat them as rungs on the ladder of success.

In contrast, females in the EEA needed the skills that allowed them to be, above all else, effective mothers. Here, the crucial skill is the ability to read the emotional state of their baby, even before it is able to articulate its needs in language. Hence, females needed high empathizing skills. Such skills would also have proved useful in constructing alliances of females, who may have found they needed to rely upon one another when the adult males were off hunting or at war. So, females typically evolved quite a different psychological profile to males. Females will be good empathizers; males will be good systemizers. We see the consequences today, in the tendency of males and females to gravitate toward certain occupations and to shun others. Males become scientists, engineers, and plumbers – occupations that require good systemizing skills. Females become nurses, primary school teachers and social workers – occupations that require good empathizing. It is not culture, but evolutionary biology, which explains the patterns of social life.

We now have before us four examples of evolutionary psychological explanations, stemming from major figures in the field and widely hailed as having, for the first time, put the study of human beings on a

truly scientific footing. Before we evaluate the successes and failures of evolutionary psychology as an explanatory method, we need to pause to examine its moral implications. Evolutionary psychology has been accused of almost every crime that could conceivably be committed by an intellectual theory: of offering support to racists and sexists, of supporting elitism and inequality, and of cultural imperialism. Naturally, its practitioners deny these charges, arguing that evolutionary psychology is a neutral scientific enterprise, not a political program. Its only relevance for morality, they argue, is its ability to provide accurate accounts of phenomena of moral concern, thereby enabling us to better predict and control aspects of social life that matter to us. We need to discover where the truth lies in this debate. Is evolutionary psychology truly a morally significant, or even a dangerous, enterprise, which changes the terms upon which moral debate ought to be conducted, or is it merely a scientific discipline, whose findings we can and ought largely to ignore, when it comes to framing our moral principles and social policies? In the next chapter, we assess evolutionary psychology, and discover what implications its claims might have for our evolved morality.