**The Modular Mind**

The concept of the modular mind is related to, but not identical to, the concept of the modular brain. Mind is defined as the collective conscious and unconscious processes of a sentient organism that direct and influence mental and physical behavior. Moreover, these mental processes are considered to be a direct manifestation of brain activity. Although it may seem reasonable to assume that a modular mind would be the direct outcome of activity in a modular brain, this is not necessarily true. Some could argue that the activity of a multitude of modular brain components could result in a non-modular mind. There is, however, a lot of empirical evidence that suggests that the mind itself is modular in nature.

What is meant by the term modular mind is that instead of being a general all-purpose information processor, the mind consists of a number of specialized mechanisms designed by evolution to cope with certain recurring adaptive problems. Tooby and Cosmides (1992) have argued that the better analogy for the human mind is not that of a general all-purpose computer, but rather a Swiss army knife.

Many academics have been resistant to the idea of a modular human mind despite the mass of supporting empirical evidence. Part of this resistance may arise from a basic confusion of what is exactly meant by the term modular mind. To each individual human introspecting his own mental processes the mind appears to be a seamless whole. In response to this we should mention the stroke patients that were discussed earlier in this chapter. Often times these individuals are totally unaware of the deficit they have incurred as a result of their brain damage. In a similar manner an intact person is unaware of the limitations and innate biases that characterize his or her own mental processes. Evolutionary psychology research has demonstrated that the human mind is not a logic devise, but rather a specialized mechanism for dealing with certain types of adaptive problems. In the next few sections we shall explore some prominent examples of innate predispositions and mental functionings in humans and their close relatives. The most parsimonious explanation for the particular mental biases that have been demonstrated through psychological research is that they are the result of natural selection.

**Fear Learning**

A phobia is an irrational fear response to an object or situation that is typically harmless. According to behaviorist theory, a phobia develops when a neutral stimulus becomes associated with an aversive experience. From the strict behaviorist view, all stimuli have equal potentiality for becoming phobic stimuli. Alternatively, preparedness theory posits that because of certain innate predispositions humans and other animals will acquire fear responses to certain classes of stimuli much more readily than others. In order to investigate fear learning, Susan Mineka of Northwestern University and her colleagues conducted a series of experiments on rhesus monkeys and humans during the 1980’s and 1990’s.

Mineka (1983) observed that rhesus monkeys born and reared in captivity evidenced no fear of snakes. Rhesus monkeys that have been captured in the wild, however, displayed a frenzied panic when confronted with a snake, even a toy rubber one. Mineka found that when naïve lab raised rhesus monkeys were shown motion picture films of wild captive monkeys reacting fearfully to snakes, the lab reared monkeys quickly acquired the same fear of serpents. This confirmed that fear responses could quickly be developed purely through observations of other's reactions to certain stimuli. The more interesting effect from these studies was the fact that the fear responses occurred only if the subjects in the film were shown to be reacting to certain stimuli and not to others. The films were specially edited so that in some versions the snake, or rather the toy snake, which was originally inducing the agitated fear response was replaced by some other stimulus such as a flower. If the naïve monkeys viewed a film displaying a fear relevant stimulus such as a toy snake or toy crocodile then the subjects developed a fear response to the same type of object. On the other hand, if the naïve subjects viewed a film displaying a toy rabbit or a flower they did not develop a fear response. To demonstrate unequivocally the same kind of hard-wired preparedness to fear certain categories of stimuli in humans would require an experiment or experiments that were parallel to those conducted on the rhesus monkeys. In other words, humans would have to be reared in a special environment that precluded their exposure to the relevant test stimuli prior to running the experiment. This of course would constitute a major breach of any sort of ethical guidelines prescribed for human subjects. However, experiments that can be legitimately conducted on human subjects provide strong support for the hypothesis that human fear learning is constrained by biological limits that are very similar to those found in rhesus macaques and other primates.

When human subjects were given mild electric shocks followed by slides of various stimuli they were more likely to form associations between electrical shock and images of snakes than between electrical shocks and images of frayed electrical cords and damaged electrical outlets (Mineka, 1983). It has been demonstrated that this sort of fallacious association will occur even in the absence of a personal history of experience with the fear relevant stimuli suggesting its phylogenic origins. As to what sort of perceptual cues are hard-wired in the sensory processing areas of the brain that prepare us to find certain classes of stimuli more salient for fear learning than others is a question that remains yet largely unresolved.

In the studies of the rhesus monkeys it was found that only models possessing most of the features of the living animal were adequate to elicit the fear responses. Sinusoidal shapes, such as water hoses, were not adequate in and of themselves to produce the fear association. In one study of the squirrel monkey, a new world primate, it was found that these animals would only develop the fear response if they had been fed a diet of live insects, but not if they had been reared on purely vegetarian fare

(Masataka, 1993). These results suggest that at least in this particular primate species an experience with live, moving animals is necessary to prime the perceptual mechanisms upon which, category specific fear reactions, are based.

Mundkur (1978) has described the universal tendency among human beings to attribute symbolic significance to certain animal species. In almost every society throughout the world, symbols of the serpent compel repugnance, reverence, or both, more so than any other animal species. Cooke (1996) has referred to this cultural phenomenon as the evolution of interest, arguing that we have evolved psychological mechanisms that make certain classes of stimuli intrinsically more interesting to us. To illustrate his point, Cooke draws attention to the prevalence of the serpent motif in art and literature throughout all of the world's cultures, going back through historical time. Even in societies where the environment is devoid of snakes such as Ireland, the serpent is prominently depicted in the art works of the culture. What our primate relatives and we have evolved is not a hard-wired fear of snakes and other fear relevant stimuli. Rather, these stimuli have a salience that is not present in other types of stimuli because of our inherited brain mechanisms. It is each individual's specific ontogenetic history, which of course includes the culture in which one is born, which determines whether we view creatures such as the snake with fear and repugnance, or with awe and reverence, or are even indifference. In this respect, fear learning is similar to the other types of evolved psychological mechanisms that we will discuss in this book. The final form of the behavior pattern does not depend solely on the genetically coded propensities. The individual's ontogenetic history and the proximate cues involved in each specific situation interact with the genetic predispositions to produce the myriad, complex patterns of behavior. (If you understand these last two sentences, then you have evolutionary psychology in a nutshell!)

**Social Reasoning**

Since 1966, one of the most widely used experimental procedures for investigating people's ability to reason logically has been the Wason Selection Task (Barkow, Cosmides, & Tooby). Peter Wason developed this procedure in order to see if people used scientific-hypothetico-deductive reasoning in their day-to-day problem solving. Hypothetico-deductive logic when applied to science was based on Karl Popper's idea that in order for a hypothesis to be truly scientific it had to be falsifiable. In the Wason's Selection Task a subject has to see whether a conditional hypothesis in the form of "if p then q" has been violated by one of four instances represented by cards. The best way to understand this procedure is to work through a few of the Wason Selection Tasks. (These examples are reproduced from L. Cosmides and J. Tooby, "Cognitive adaptations for social exchange", from *The Adapted Mind*, edited by J. Barkow, L. Cosmides, and J. Tooby, copyright 1992 by Oxford University Press; used by permission of Oxford University Press.)

Problem #1: As part of your new clerical job at a local high school you have to make sure that student documents have been processed correctly. Your job, in part, is to make sure that the documents conform to the following rule: if a person has a D rating then his documents must be marked Code 3. You suspect that the secretary you replaced made errors in the filing system. The cards below have information about the documents of four people in the high school. Each card represents one person. One side of the card tells the person letter rating and the other side of the card tells the person's number code. Your task is to indicate only those cards that definitely need to be turned over to see if any of these people violate this rule.

| | | | |
|---|---|---|---|
| **D** | **F** | **3** | **7** |

Indicate your choice or choices of the problem on a separate sheet of paper and then continue to the next problem.

Problem #2: In the following scenario you are a bouncer in a bar and your job requires that you prevent minors from drinking alcoholic beverages. The rule states that if a person is drinking beer then he or she must be over 20 years old. The following cards have information about four people sitting at a table in your bar. Each card represents one person. One side of the card tells the person's age and the other side of the cards tells what the person is drinking. Indicate only those cards you definitely need to turn over to see if any of these people are breaking the rule. Indicate your choice or choices on a sheet of paper.

| | | | |
|---|---|---|---|
| **Drinking Beer** | **Drinking Coke** | **25 Years Old** | **16 Years Old** |

Problem #3: Imagine a culture living on a South Sea island. In this culture, married individuals wear a tattoo on their face and single people do not. There is a common food item called a mola nut which is readily available and can be eaten by anyone. Another food item called a cassava root is relatively rare and is forbidden to be eaten by anyone except married people. This is because the cassava root is an aphrodisiac. The rule in place here is as follows: If a man eats cassava root then he must have a tattoo on his face. The four cards each representing one man would read:

| | | | |
|---|---|---|---|
| **Eats Cassava Root** | **Eats Mola Nuts** | **Tattoo** | **No Tattoo** |

Decide which card or cards must be turned over to see if there is a violation of the rule and record your answer(s) on a sheet of paper.

Problem #4: Now for the final Wason Selection Task imagine the following scenario: An elementary school teacher is taking her class for a field trip to a national park. The park environment is relatively benign and children can go barefooted in most of the environment with the exception of areas with tall grass. In the tall grass lurks a parasite called the fire worm. So, the following rule is in place: If the grass is tall then you must wear boots. The four cards, each representing one child in one environment read:

| | | | |
|---|---|---|---|
| **Tall Grass** | **No Tall Grass** | **No Boots** | **Boots** |

Select which cards you would have to turn over to decide if there was a violation of these rules and record your answer(s) on a sheet of paper.

In the first problem the rule stated that if a person has a D rating then his documents must be marked Code 3. The only cards with which you can falsify the hypothesis would be D and 7. In the second problem the rule stated that if a person is drinking beer then he must be over 20 years old. The choices here that could falsify the hypothesis or detect a rule violation would be drinking beer and 16 years old. In the third problem, if a man eats cassava root then he must have a tattoo on his face, the correct choices would be eats cassava root and no tattoo. And finally, in the fourth problem which stated that if the grass is tall then the child must wear boots, the correct choices would be tall grass and no boots. All of these problems are basically the same. There is the statement “if p then q” and to falsify the statement the correct choices are p and not q. However, unless you have had a course in formal logic you probably did much better on the last three problems than on the first one. This is the pattern observed by Tooby and Cosmides and a number of other researchers. Generally only about 25% of college students get the correct answer on the first problem, whereas 75% typically get it correct on the other problems.

One of the first explanations for this variation in performance was that one involved familiar material and the other abstract and unfamiliar material. This hypothesis was tested, but did not hold up. Problems involving food and drink, for example using the rule if you eat hot chili peppers then you must drink cold milk, did not produce the high level of correct responding that you see in the second, third, and fourth problems presented here. Tooby and Cosmides hypothesized that the explanation was that we have evolved special propensities for dealing with problems involving social contracts.

Cosmides and Toobey (1992) demonstrated that it was not that social contract content simply facilitated logical reasoning, but rather that it activated a "cheater detection" mechanism. For example, a standard social contract is presented in the form "if you take the benefit, then you pay the cost". This statement corresponds to if p then q and the correct responses should be a choice of p and not q. P means the benefit is accepted, and q means the cost is paid. "Not q" means cost is not paid. A specific example would be "if you give me your watch I'll give you twenty dollars". The Wason selection items that would be used to check for a rule violation would be benefit accepted: you take the watch which equals p, benefit not accepted, you don't take the watch which corresponds to not p, cost paid you pay twenty dollars which corresponds to q, and cost not paid you don't pay the twenty dollars which stands for not q. So, the correct choice here is to turn over the card saying you take the watch and the card saying you did not pay twenty dollars.

In the switch form I give you twenty dollars corresponds to cost paid which corresponds to p and I take the watch which corresponds to benefit accepted which is q, so the logical choice should be you pay twenty dollars, but you do not accept the watch which corresponds to not q. Most subjects given this switched version of the social contract chose not p, they did not pay twenty dollars, and q, they selected the watch, which is logically incorrect.

These types of results support Cosmides and Toobey's contention that what we are seeing activated is a cheater detection mechanism. Further support for this is indicated by comparing the differential outcomes of a problem posed to detect cheaters versus the same problem posed to detect altruists (See APPENDIX A for a full description of these problems). Cosmides and Tooby (1992) found that when participants were asked to do the cheater detection problem their level of correct responses rose to 74%. Given the altruistic version of the problem their response level was around 37%. Just as we have no special evolved mechanisms allocated to finding dietary fiber we also do not have special psychological mechanisms allocated to detecting altruists. Actually, a more correct way to put this would be to say that it is more important to detect cheaters than to detect altruists. Individuals who would gain from our actions and support of them but do not reciprocate those actions are wasting our energy and posing potential risk to us and our survival. Although it is important for us to be able to detect altruists to some degree it is vitally important to us to be able to detect cheaters since they may jeopardize our very existence. This is also true of the other types of problems that we show a particular propensity for. Problems involving hazards like the tall grass, boots problem are similar to the cheater detector problems in that they both potentially pose a threat to our continuing existence. Our ancestors survived and produced progeny because of their facility with problems of this kind.