Section 1

WHY YOU DO WHAT YOU DO

1. THE MEMORY LINGERS ON

You are a guest at a fashionable dinner party. Your host pours some wine for each guest, raises his glass, and wishes everyone good health. You respond to his toast by clinking your wine glass with that of the other guests. Why do you do that?

Silly question. Everyone knows that people clink glasses as a sign of friendship. Well, yes and no. You didn't do it when your water glass was filled. Asians don't do it. It wasn't done in Roman times. And why is clinking wine glasses a wish of good health and not, say, of prosperity?

In the Middle Ages, a not-uncommon way to eliminate an enemy was to put poison in his wine, where the taste wouldn't be too obvious. To protect himself, each guest poured some wine from his cup into all the other cups. If you're poisoning me, we're all going down together! You showed trust in your host by touching his glass without pouring some of your wine into it. We now clink the glasses without knowing why we are doing it. What was once an act of distrust and self-preservation has become a symbol of friendship.

Chances are that you shook hands with each of the men when you arrived at the party. Why did you do that? Why didn't you embrace and kiss their cheeks as the Arabs do? And why not shake his left hand instead of his right? Although you might have shaken hands with some of the women, this would never have entered your grandfather's mind. Shaking hands was strictly a man thing.

Here again, you might say, shaking hands shows friendship. Here again, yes and no. When two men met in the Middle Ages, each grasped the other's wrist so he couldn't draw his sword. Now we simply shake each other's sword hand. No need to shake hands with a woman because few of them wore swords. Presto! Another act of self-preservation has been converted to a symbol of friendship.

Did you carry your bride over the threshold of your home on your wedding night or its equivalent? (Or, for female readers, were you carried over the threshold?) Why did you do that? Now it's just something charming that you are supposed to do.

In many societies, the threshold of a building was considered to be sacred. The Polynesians, among others, often killed and buried a captive under the threshold of a communal building. Women, as everyone in olden days knew, were unclean, at least at certain times. You wouldn't want to contaminate your new threshold by having someone unclean walk over it, would you? Despite the effort, it's much better to carry her over it. (Don't get mad at me, ladies. I'm only explaining the origin of the custom.)

What did you do on New Year's Eve? Did you drink a lot more than usual, wear a funny hat, and blow a horn at midnight? Did you kiss the members of the opposite sex, which you never do at any other party? Why did you do that? What's so special about the earth starting another trip around the sun to warrant such bizarre behavior?

Actually, our celebration of a new year is only a pale remnant of the original. You can get a better picture of how our ancestors celebrated the new year from the Roman Saturnalia. It was a week of unrestrained license, of drunkenness and sexual activity with no restriction on adult partners, whether slave or master. (That's where our kissing the opposite sex comes in. Pale, pale remnant!)

Our ancient ancestors didn't know anything about a new year, much less about the earth going around the sun. What they did know was that they couldn't live without the sun. The sun was a god; in fact, the most important of their gods. When the sun was weak, they were cold and the crops didn't grow. The sun rose from behind that hill over there and grew stronger as it climbed into the sky. Then the sun went down to fight the forces of evil in the fires below the surface of the earth. They knew the fires were there by the red glow on the horizon as the sun entered the underworld. After fighting all night, it rose, pale and weak, on the other side of the world. Each day it rose further to the right and stayed less time in the heavens. Everyone could see that the sun was losing the fight. If it died, they would all die with it!

To follow the sun's progress in this struggle, one of our smart ancestors could have used two sticks. In a clear area, he plants one stick at an observation post. He moves forward some distance and uses the other stick to form a line toward the point where the sun first appeared that morning. The members of his group wait anxiously through the night, but the next morning the sun again rises to the right of the line formed by the sticks. It is still getting weaker. They move the forward stick to form a new line. The result is the same the next morning and the next and the next. The world is going to end!

Then, one wonderful, memorable day the sun rises to the left of the stick. It is getting stronger! They are going to live! Being rescued from death is the best reason there is for a celebration. More important than getting your work done. More important than your society's restrictions on sexual activity. You are going to live!

These examples show that you continue to do some things long after the original reason for doing them no longer exists. This behavior is part of your cultural heritage. You learned some of it as part of your formal education. Some you picked up informally from your parents and peers. Yet chances are that no one taught you, formally or informally, to clink wine glasses or to cut up on New Year's Eve. Much behavior is learned by observing the behavior of others and so is passed on without explanation from generation to generation.

In many cases, the original, valid reason for some item of behavior has long since been forgotten. Some new reason that is more-or-less reasonable for present conditions is adopted instead. In some cases, the reason accepted changes many times as conditions change. Each new reason is accepted without conscious thought, even though a careful examination might show it to be ridiculous.

How can you tell whether or not the present reason for a behavior is correct, and why does it matter anyway? Unfortunately, there is no easy way to do this. Sure, you can examine a few behaviors where you suspect the accepted reasons for them are vague, superficial, or nonexistent (such as that for carrying a bride over a threshold) and trace them back to their origin. But this is a lot of work for little gain. So this book will start, instead, with the beginning of all social behavior and trace it forward to the present. This will make it possible to identify the original reason for almost everything you do or say.

Is learning the reason for your behavior worth the effort? There's no harm in offering a toast as you clink wine glasses. In fact, now that you know why you are wishing others good health instead of poisoning them, you'll get a bit of ironic pleasure from it. Even carrying a bride over a threshold might be worth an occasional bad back, provided you don't tell her why you are doing it. On the other hand, some unrecognized obsolete behavior causes unnecessary unhappiness. Have you ever been present when one person "talked down" to another? How did this make him (and you!) feel? Has anyone ever dished the dirt in your presence? Surprisingly, as you will learn later, both behaviors once contributed to that person's survival. But since conditions have changed, pushing others down now loses, instead of gains, social approval. Obsolete behavior causes most of your unnecessary unhappiness.

You can reduce this unnecessary unhappiness by changing some of your obsolete behavior. Once you become aware of what you are doing and why, your improvement will be almost automatic. For example, when you understand why you try to keep up with (or get ahead of) the Joneses, you will be able to decide objectively if you really want to do that or not. And if Jones gets ahead of you, your new understanding will eliminate, or at least significantly reduce, the unnecessary unhappiness it would have caused.

Your task now is to identify your inappropriate behavior so that you can change it. It won't take much effort. All you have to do is relax and absorb the material as you enjoy it. Your reward will be more success in achieving your objectives.

2. THE VERY BEGINNING OF ALL BEHAVIOR

A good place to start a book on behavior is with a definition of what the word means. Webster's Ninth Collegiate Dictionary defines it as follows:

1. The manner of conducting oneself.
2. Anything that an organism does involving action and response to stimulation.
3. The response of an individual, group, or species to its environment.

The first definition just says, "It's the way you do something. "It implies that you choose what you do.

The second definition partially contradicts the first one. It says you act in response to something outside yourself.

The third definition says that whatever is causing you, your friends, and your ancestors to act is in your environment.

These definitions are of some help, but not much. So let's try the social science, behaviorism, that deals with this activity. This science is based on the relationship S -- R, which is read as "a stimulus yields a response." This tells us there is a relationship between a stimulus (which is something in your environment that affects you) and your response to it, but doesn't tell us what that relationship is, why it exists, or how it works.

We know that other factors are involved because different people respond differently to the same external stimulus. Also, the same person sometimes responds differently to the same stimulus. What's more, people sometimes act even when there is no external stimulus to start the action. So, if all behavior is started by a stimulus, there must be internally generated stimuli as well as external stimuli.

From this we can pull together a working definition of behavior. Behavior will be defined as the physical response of a creature to all the stimuli, internal and external, affecting it at the time.

That sounds nice and seems reasonably correct, but it still doesn't tell us much about behavior. It's impossible to identify all the external stimuli acting on a person at any given time, let alone deal with all his experiences that contribute to his internal stimuli. So we'll do what some scientists do when they have a system that's too complicated to handle. We'll look for the simplest system that fits our new definition of behavior and see how it works. We can then follow its evolution to the complex behavior patterns of modern people.

Fortunately, we have the ideal creature with which to start our study of behavior, one that permits us to trace the evolution of behavior all the way from its beginning to you personally.

Our examination of behavior starts with creatures that lived about 3.5 billion (yes, that's billion) years ago. Life had gained a foothold on Earth hundreds of million years earlier and had now spread to several different forms. These creatures were all single cells, rather like the amoebae in your high school biology laboratory, but even more primitive. We know what some of them looked like and about when they lived from the imprint their tiny bodies left in what became rocks.

Although these creatures are microscopic in size, each one is a complex chemical factory. It contains numerous copies of thousands of different chemical molecules engaged in innumerable reactions simultaneously. Some molecules are engaged in reactions that generate the energy for the cell's activities. Others form a membrane to allow entry to those molecules needed to maintain the cell's reactions and to exclude those that interfere with them. When all its reactions are working reasonably well, the creature is said to be "alive." When its key reactions are interrupted for any reason, the property of life no longer exists; the creature is "dead."

You can get some idea of what life was like in those early days by examining a drop of pond water under a microscope. You'll see several creatures of different sizes and shapes. Some of these creatures whiz by, others ooze along, while still others look like ships being propelled by hundreds of oars. Every now and then, one creature engulfs another. Every now and then, one creature approaches some location, abruptly turns around and moves away as fast as it can. Why are they doing that?

These creatures do not move randomly. They move in response to something in their environment. The something that starts the movement is a "stimulus." Some stimuli are inanimate, such as light and sound. Some are molecules emitted by other creatures, as when humans exhale carbon dioxide.

Single-celled creatures have receptors that react with some kinds of stimuli in their environment. This "detection" starts a chain of reactions within the creature that causes it to move. No choice is involved. The creature has no equipment to decide whether it will move or not. When it detects a certain type of stimulus, it always moves and always moves in the same way. This is the earliest example of a movement in response to the detection of a stimulus. It is the origin of all behavior.

When life on earth was just getting started, these single-celled creatures responded randomly to a stimulus. Some types responded to a given stimulus by moving toward it. The same stimulus might cause other single-celled creatures to move away from it. The creature's movement might lead it to food or to a more favorable environment, but it was equally possible that its response would lead to its destruction. The creatures that, by chance, moved toward benefits and away from threats when they detected a stimulus, lived; all others died. After this drastic evolutionary shakeout, the only creatures that remained were those that moved toward stimuli that represented benefits and away from stimuli that were threats. Indeed, any new creature that evolved that did not have this pattern of behavior was soon extinguished.

This development was a momentous step in the evolution of behavior. It established the basic objective of all behavior in all creatures for all time, that of survival. Despite its importance, this behavior is based on only three elements:

- A receptor that detects a stimulus in the environment
- A means of transferring this information to a motor element
- A motor element that moves the creature

These three elements will be referred to as the "basic survival system."

If success is measured by the ability of the descendants of a life form to survive, these early single-celled creatures were enormously successful. Some types have continued essentially unchanged for billions of generations. Others mutated into a wide variety of forms, some of which still exist today. All the advanced creatures that evolved from the survivors of the shakeout inherited the basic survival system and so responded to stimuli by moving toward benefits and away from threats. This behavior is now present in all living creatures, including people. It is our most important biological heritage.

Conditions changed slowly in these early waters, but what's a million years to a single-celled creature? Eventually, some gradual changes became significant. Here and there the temperature in shallow areas changed. The sea became saltier. More efficient predators evolved. Some food sources appeared while others disappeared.

Contrary to common belief, creatures don't automatically change their nature or their behavior when their environment changes. They continue to behave as they always did. But some of their responses to stimuli do not work as well in their new environment. Their response might be too slow to escape an improved predator. Or they might continue to move toward a location that provided a benefit but which has become so salty that they die. Not only do they have no way to know that their behavior has become inappropriate, but no way to change it even if they were aware of the change. They simply keep on doing what they have always done but now behavior that was once appropriate becomes inappropriate. The penalty for seriously inappropriate behavior is death. Innumerable species of creatures have come and gone because of changes in the environment.

However, a species usually contains some members that are somewhat different from their fellows. Most changes (i.e., "mutations") destroy the creature before it's born. Other changes cause the mutant's behavior to be inappropriate in some way so that it soon dies off. Occasionally, the mutation makes the new creature more suitable for the present conditions. As all of its "normal" fellows die in their new environment, the descendants of those mutants whose behavior fits the new conditions become a new species.

There's an important point hidden here. Every creature must change its behavior to that which is appropriate for it environment or suffer the consequences.

The next chapter will examine how the beginning of a brain in simple creatures led to a dramatic change in their behavior.

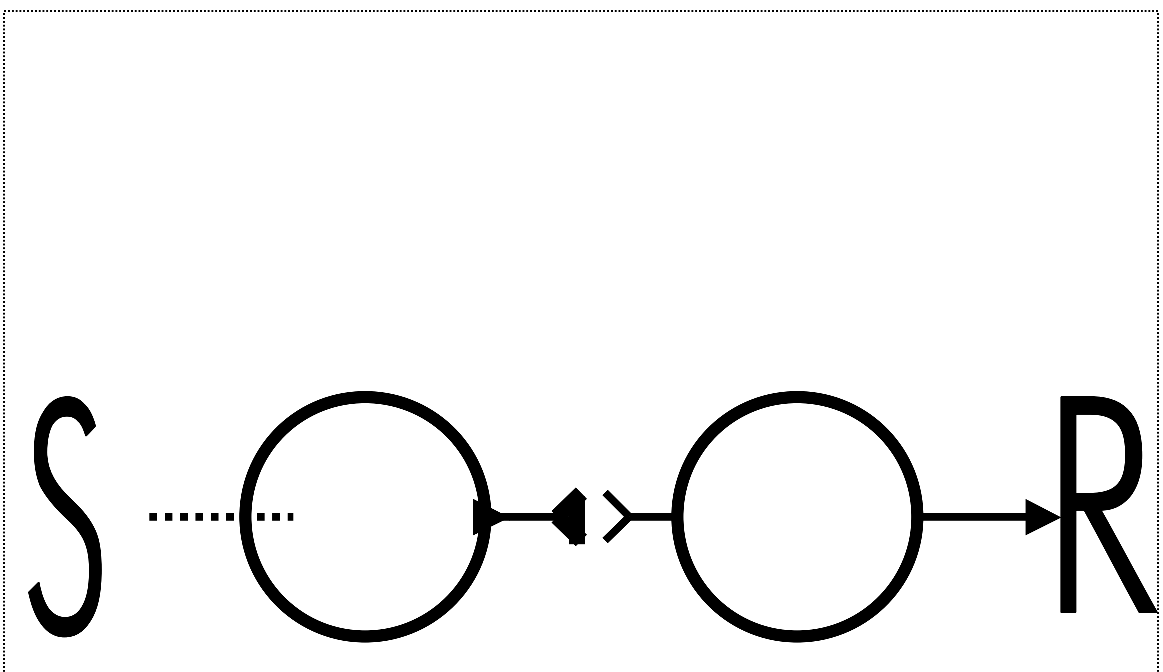
3. THE BRAIN BEGINS TO AFFECT BEHAVIOR

Let's press the Fast Forward button on our time machine. As millions of years roll by, we see the single-celled creatures evolve into the first multi-celled creatures. These new creatures are simply collections of cells, such as sponges and jellyfish, that react to stimuli in pretty much the same way the single-celled creatures do. They always move toward stimuli that represent benefits and away from those that are threats.

More millions of years go by. We examine each new creature as it evolves to see how it behaves, but so far, no big difference. Then, after hundreds of millions of years have gone by, we find a creature that behaves differently! Excited, we stop the machine for a closer look.

To understand what we have been looking for, you need to know a little about the way a primitive creature responds to a stimulus. Unlikely as it might seem at this point, this information will help you understand why you do what you do.

The part of a primitive creature that interacts with a stimulus is called a "detector" or "sensor." Each sensor interacts with only one kind of stimulus present in the creature's environment. The detector does not identify the stimulus for the good reason that it has no equipment to do so. It simply initiates an internal chain of reactions that reach a protein embedded in the creature's membrane. This chain of reactions will be called the "sensory signal." The sensory signal causes the protein to shift its position, causing a movement of all or part of the creature.

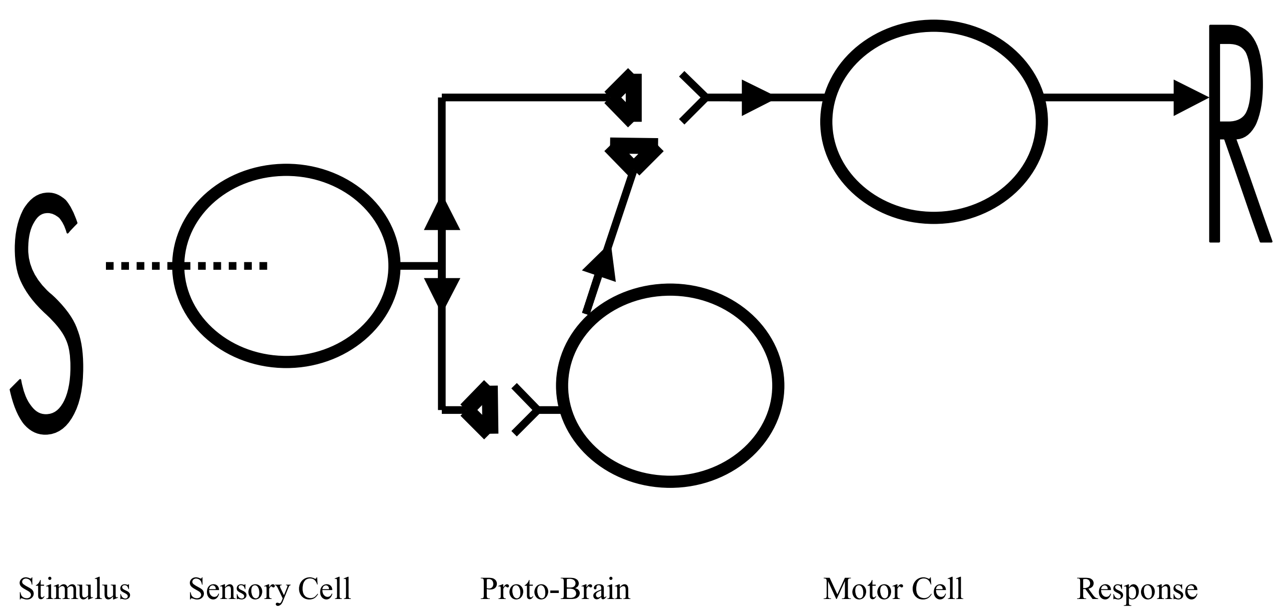


Stimulus   Sensory Cell   Motor Cell   Response

Detection of the same stimulus always forms the same sensory signal that always causes the same movement. This connection between the sensory and motor organs is strictly a one-way switch. No choice of any kind it possible. The automatic movement that occurs when a creature detects a stimulus will be called its “emotional response” to the stimulus. There is separate survival system for each type of stimulus the creature is able to detect.

Well, what’s so special about the behavior of this new creature that caused us to stop our time machine? This creature does something that no earlier creature could do. It doesn’t always respond to the same stimulus in the same way. Sometimes it responds and sometimes it doesn’t. Let’s see what’s different inside the creature that could account for this important change in its behavior.

This basic survival system works very well, as shown by the billions of creatures that still use it. Nevertheless, it has a serious shortcoming. It cannot distinguish among different sources of the same stimulus. For example, this mechanism has no way to know if a shadow represents a harmless rock, a hungry predator, or a desirable prey. So, at some point in the evolution of multi-celled creatures, a fourth element was added to the basic system, as shown in the diagram:



Our examination shows that this theoretical creature still has the basic survival system of its ancestors, that is, a detector, a motor unit, and a direct connection between them. However, it also has an additional element, another neuron. There's a direct connection from the detector to the new neuron and another one from the neuron to the motor unit. That's all there is to it, yet this is the survival system present in all advanced creatures, including people. No doubt you've already realized that this new neuron is the start of the modern brain. At this early stage of its development, let's call it a "protobrain."

This "advanced survival system" doesn't change anything in the basic system, but adds to it. As in the basic system, a sensory signal is formed when the creature's sensor detects a stimulus. Now, however, this sensory signal goes both to the motor unit and to the protobrain. The signal to the motor unit still triggers the same emotional response to the stimulus as it does in simpler creatures.

The protobrain has no way to detect any sensory information. Its function is to extract additional information from the sensory signal it receives. For example, it might learn that a sensory signal is short or that it continues unchanged for some time. This additional information would distinguish a rock from a living creature. Nevertheless, the protobrain has no way to identify this difference in sensory signals. It simply sends a signal containing this information to the motor unit. This will be called the "intellectual signal," even if there isn't much intellect yet.

Both the direct sensory signal and the indirect intellectual signal reach the same motor unit, but not at the same time. The sensory signal, passing over a short, direct route, always reaches the motor cells before the protobrain forms the intellectual signal. So the emotional response always gets started before the intellectual signal arrives.

When the stimulus represents a threat or an opportunity, the creature carries out its emotional response before the intellectual signal arrives. You can still see this automatic response when you touch a hot object. You withdraw that part of your body before your brain decides how to respond to the stimulus.

Even when a response to the stimulus is not urgent, the emotional response always starts first. By the time the intellectual signal arrives, all it can do is modify the emotional response. It does this in a way that increases the creature's chances of success in responding to the stimulus. To use a modern example, a male sees a female he wants. His emotional response is to grab her before she can get away. Then his intellectual signal arrives to modify his emotional response with, "Hold up! Bring her some flowers (or, for birds, a juicy worm) first."

So, at this stage of evolution, behavior is primarily an automatic emotional response to a stimulus. All the protobrain can do is send a late, weak signal to try to modify the emotional response in a way that increases that creatures chances of survival.

As we examine this new creature's response in more detail, we find it still has no choice. Yes, it can respond differently to the same stimulus. But it still always responds in the same way under the same conditions. It always flees from the shadow of a predator, but it also always ignores the shadow of a rock. So the process is still completely automatic. The same conditions always result in the same response. The protobrain permits the creature to respond differently under different conditions, but there is still no choice involved in its behavior.

When we start the time machine again, we can see that some creatures have grown both in size and complexity. Simple detectors have become sophisticated sense organs. The motor cells have evolved into muscles that can wink an eye or move a dinosaur. But the most dramatic change is occurring in the protobrain. It contains a lot more cells. Yet when we examine the protobrain of creatures of the same type, they all contain the same number of neurons interconnected in the same way. The protobrain permits the creature to take more external conditions into account in responding to a stimulus, but there is still no choice involved. The creature still always responds to the same stimulus under the same conditions in the same way.

Eventually we can see that another momentous change in behavior has occurred. These more advanced creatures seem to be making a conscious choice in how they respond to a stimulus. That is, they seem to be responding to a stimulus differently even under the same conditions. Is this a conscious choice or it the larger brain taking something else into account? Excited, we examine the creature's brain, but it now has so many neurons in its brain that we can no longer trace everything that is going on in there. We still believe that no choice is involved, but now we can't prove it. This process of purposely selecting a response to a stimulus is "thinking."

While we were busy examining how the thinking process works, we missed the development of another important influence on behavior, that of "feelings." Although thoughts and feelings are usually considered to be distinctly different, they are both internal responses that occur when a stimulus is detected. Your thoughts work out a response to the stimulus while your feelings inform you of its effect on your survival. You feel good when you detect a potential benefit as this could contribute to your survival. You feel bad when you detect a threat as it reduces your chances of survival.

All creatures feel good when they succeed in obtaining a benefit they detect, as in capturing food or reaching a region with a more comfortable temperature. In humans, these feelings occur in every activity that affects survival, even remotely. You feel good when you achieve any objective, as when you find a mate, get a raise, or solve a puzzle. You feel bad when you fail to achieve your objective, as when someone turns you down for a date, when you don't get the raise you expected, and when you can't solve win a game or solve a puzzle.

The intensity of your feelings depends on how much the stimulus affects your survival. You get some minor satisfaction from eating a sweet or solving a puzzle, but get intense pleasure from surviving a major operation. You are mildly annoyed when you break a fingernail, but feel dread when you encounter a poisonous snake.

Your feelings have a profound influence on your behavior. When a simple creature doesn't respond appropriately to a stimulus it usually pays for its error with its life. You don't die every time you don't respond properly to a stimulus, but you don't get away free, either. When your behavior isn't appropriate for the circumstances, at the very least you don't achieve your objective, so you feel bad. No normal person wants to feel bad, so your bad feelings warn you to change your behavior in ways that will make you feel better.

The next great change in the brain will only be touched on here and described in more detail in later chapters. As the brain of advanced creatures increased in size and complexity, it began to retain some of the information in the sensory signal. Each creature's "memory" is an incomplete record of its experiences with the stimuli it detected in the past and most of it was retained for only a short time. Nevertheless, this development had great value for a creature's survival, and so was not only retained, but also expanded. As a result, when a stimulus is detected again, all the information still in that brain about the stimulus and how to deal with it is assembled. This information becomes part of the intellectual signal. All the information in the intellectual signal, including the memories, then modifies the emotional response in a way that improves that creature's response to the stimulus. This is the process that permits you to modify your behavior through what you learn from your experiences in life.

There's something puzzling here. All these factors affecting behavior evolved long, long ago. Our ancestors had as many brain cells as we have and all our brain mechanisms at least 100,000 years ago. Yet we live relatively secure lives in large groups, while life for them was a solitary, brutish struggle for survival. Why this dramatic difference?

The next chapter will describe how cooperative behavior finally got started. And now that you know how your equipment affects your behavior, we'll start to examine how your personal experiences determine why you do what you do.

4. THE BEGINNING OF COOPERATIVE BEHAVIOR

Let's press the Fast Forward button to move from the time of the first single-celled creatures, about 3.5 billion years ago, to the appearance of the first human-like creatures about 3.5 million years ago. We've just skimmed over 99.9% of the time that life has existed on earth.

We'll stop here only briefly to salute the presence of our earliest direct ancestors. We know very little about them because all they left were a few incomplete skeletons. We'd like to know how they behaved toward each other but behavior doesn't leave much evidence except an occasional crushed-in skull. So we'll leave the evolution of mankind to the anthropologists and set the Fast Forward button for about 35,000 years ago. Although even this might seem a long time ago, it's just one percent of the time from the existence of those human-like creatures to the present.

While we weren't looking, some single-celled creatures evolved into many kinds of plants, from blades of grass to giant redwood trees. These green plants, brightened up here and there with colorful flowers, now cover most of the earth. As plants do not move from place to place, it's easy to forget that they are living creatures, struggling for survival. The trees that gather more sunlight survive while their shorter neighbors die. Some plants send out poisons from their roots so that even their own descendants cannot grow too close to them.

Some single-celled creatures evolved into mollusks and fish and then into amphibia, which crept out of the sea onto land to become reptiles, birds, and mammals. Various kinds of life now occupy every conceivable living niche from undersea sulfur vents to torrid deserts and frozen poles. All sorts of strange creatures from dust mites to huge dinosaurs have come along, killed or been killed, and died out.

The behavior of all living creatures is affected by the way they get the food they need to stay alive. "Plants" are able to manufacture all the molecules they need from inorganic materials, using energy they obtain from sunlight. "Animals" cannot manufacture all the reactants they need for survival, so they must eat plants or animals that contain them. The herbivores get their reactants by eating plants. The carnivores get their reactants by killing and eating herbivores. A relatively few creatures, including humans, can get the reactants they need from either plants or animals.

All creatures produce others like themselves, forming a species of their offspring, their cousins, and their cousins' cousins. Yet despite this close relationship, very few members of a species cooperate with each other. It's still every worm, bird, or leopard for itself.

Obtaining food would be a lot easier if members of the same species worked together at it. Yet most predators can't stand to be with their own kind. When two tigers meet, it's either the beginning of some new tigers or a hell of a fight. Except for lions, this absence of cooperation is true for all cats, bears, most fish, and all amphibians and reptiles.

The only cooperation these creatures show is that of parents toward their offspring. When the young are born, the parents feed them, protect them, and teach them to be whatever animal they are until they are the equivalent of teenagers. Then their parents drive them away, just as a lot of modern parents would like to do.

Some types of dogs, such as the coyote and the jackal, are also loners. Others, like the wolf and hyenas, form small hunting packs. Working together they can bring down prey that they could not get individually. This statement that some animals form cooperative hunting groups is unlikely to have startled you, yet it describes a momentous change in behavior. It's the first example of creatures, other than insects, working together to improve their chances of survival.

Despite its advantages, this type of cooperative behavior occurs only in a few species, only among members of the same species, and usually only among members of the same family. Unrelated members of the same species are driven away, except during mating season. Moreover, this cooperation is limited to hunting. As Desmond Morris points out in his book "The Human Animal," chimpanzees hunt for meat together but do not help each other to find fruit or prepare a bed for the night.

The advantages of forming a cooperative hunting group seem obvious to us now. The members have something to gain and very little to lose. So why don't more types of predators behave this way? Before exploring the behavior of these predators, let's have a quick look at the behavior of the other party in this life-and-death encounter, the prey.

Many different kinds of creatures, from rabbits to elephants, get the nourishment they need for survival by eating plants. Although some plant-eating mammals live in large herds, no member of the herd helps another member to obtain its food. Cooperative defense occurs even less often than cooperative hunting. Musk oxen and elephants form circles to defend their young against predators, but most herd animals never band together to defend each other against a predator. Although zebras, with their superior numbers and powerful kicks, could easily break the jaws of predatory lions, none of them ever helps another zebra under attack. In fact, no herd animal ever risks its life to defend one of its fellows. The only exception is a mother protecting her offspring, and even she gives up when her own life is at stake. Herd animals associate rather than cooperate.

Why do several kinds of animals form cooperative hunting groups and so few form defensive groups? It's much easier to form cooperative hunting groups because each predator continues its natural response when it detects a stimulus by attacking it. The situation is fundamentally different in defensive groups. When a prey animal detects a predator, its natural response is to run for its life. The sooner it flees from the stimulus, the better its chances of surviving.

For a defensive group to succeed, each member must control its natural impulse to flee when it detects a predator. This is risky business. If most other members of the herd do not control their normal response of running away, at least one of those that stay will probably die. You can see this behavior when a predator attacks a herd of prey animals that form a defensive circle. The defenders hold their position only until the predator breaks through it. Then they abandon the common defense and flee.

This information so far is straightforward enough, yet something about it doesn't seem to fit, so let's examine it again:

1. Every creature behaves in a way that promotes its chances of survival.
2. Formation of either a cooperating hunting group or a cooperative defensive group increases the chances of survival of its members.
3. The vast majority of all kinds of creatures, past and present, do not form either type of cooperative group. A few types of prey creatures associate in herds, flocks, schools, etc. which might provide some indirect defense but none of these creatures ever helps a fellow creature being attacked by a predator.
4. All creatures of all sizes that do not form groups always respond normally to the stimuli they detect. They attack prey and flee from predators.
5. A small number of creatures form cooperative hunting groups, usually among members of the same family. These creatures respond normally to stimuli in that they continue to attack prey. These cooperative predators are relatively large creatures with relatively large brains, though other predators of similar size and type do not form hunting groups.
6. Only a few types of creatures form cooperative defensive groups. These behave differently from almost all other creatures, as they sometimes do not flee from predators.
7. Some primates, notably chimpanzees, form cooperating hunting groups as well as occasional defensive groups, at least against other chimpanzees.

An analysis of this information is puzzling. A few kinds of animals have found a new way to increase their chances of survival. All the other creatures would also benefit by forming groups, but don't do it. Why not?

To find out, let's examine the brains of creatures that form groups and those that do not, to see if we can learn what's different about them.

Creatures with a basic survival system always respond emotionally for the very good reason that it's the only equipment they have for responding to stimuli.

All advanced creatures also generate an emotional signal in response a stimulus. However, in contrast to primitive creatures, they also generate an intellectual signal that arrives a fraction of a second later to modify the emotional signal. As result, the response to the stimulus is a combination of the emotional and intellectual signals.

The strength of the emotional response is based on how much effect, good or bad, the stimulus might on the creature's survival: the greater the effect, the stronger the emotional response. For example, your emotional response to detection of a snake is stronger than to detection of a mouse.

The strength of a creature's intellectual signal depends primarily on the volume of its information on how to deal with the stimulus. Creatures with a small brain generate a weak intellectual signal that is not strong enough to control their emotional response. Creatures with a larger brain generate a stronger intellectual signal that has more influence over its emotional response. A tiger, for example, can control its movements in ways that increase its chances of killing its prey.

Creatures with a moderately strong intellectual signal are able to control their behavior when the stimulus does not immediately affect their survival. As an example, a musk ox can join a defensive circle when it detects a predator. Nevertheless, when it's own survival is threatened; its emotional response breaks through its weak intellectual control so that it flees. Happens in a lot of modern soldiers, too.

So all advanced creatures have some balance between the strength of their natural emotional response to stimuli and that of their intellectual signal. At some size of the brain its intellectual signal is strong enough to control its emotional response to some stimuli, at least under some conditions. We have found the mechanism for cooperative behavior!

The next section will show the struggle to achieve control of the emotions that is required for the formation and growth of a cooperation group of people. You'll begin to see the reasons for the way you behave today.