A Brief History of Motivational Concepts

If you want new ideas, read old books.
—IVAN PAVLOV

There is no way to know, but it seems likely that questions about motivation were asked before humankind appeared on earth. Surely there were occasions when a *Homo habilis* or some such proto-human looked at his neighbor and wondered, "Why would he do a dumb thing like that?" We can only speculate as to how far back in prehistory, and how far down the animal scale now, the question of motivation was and is asked. Does my cat wonder *why* I pick her up? I'll probably never know.

What is certain is that by historical times, not only was the question "What makes people act as they do?" thoroughly familiar, but also some answers were taken for granted. The God of the Old Testament, having given the Hebrews a law to live by, did not depend solely on reverence to ensure their obedience. He promised:

> And it shall come to pass, because ye hearken unto these ordinances, and keep, and do them, that the Lord thy God . . . will love thee, and bless thee, and multiply thee; He will also bless the fruit of thy body and the fruit of thy land, thy corn and thy wine and thine oil, the increase of thy kine and the young of thy flock, in the land which He swore unto thy fathers to give thee. [Deuteronomy, 7:12–13]

But:

> . . . if thou shalt forget the Lord thy God, and walk after other gods, and serve them, I forewarn you this day that ye shall surely perish. As the nations that the Lord maketh to perish before ye, so shall ye perish; because ye would not hearken unto the voice of the Lord your God. [Deuteronomy, 8:19–20]

These promises and threats make it clear that an important behavioral principle was already well known: *What we do is affected by its consequences,* or its anticipated consequences. Our actions are initiated, selected, and maintained by what we expect their outcomes to be.

So, if we want a person to perform an act, we should arrange positive outcomes for him if he does it, and/or negative ones if he doesn't. Thus our principle has immediate application in politics, education, and criminal and civil law—anywhere the notion of *rewards and punishments* can apply.

PHILOSOPHICAL BEGINNINGS: ETHICS AND ACTION

Also early in history, people began wondering as they still do today: Is the notion of control by consequences an adequate theory of motivation in itself? If we assume that positive consequences are pleasant and negative ones unpleasant, the principle becomes: People (and animals) are motivated by the search for pleasure and the avoidance of displeasure. This is the point of view known as **hedonism.**

If that is true, then we know where to look for an explanation if we ask "Why did he or she do that?" We must identify the positive consequences of the action, and/or the negative consequences of other actions, for the behaving person.

Thrasymachus: Motivation as Self-Interest

About the fourth century B.C., the Greek philosopher Thrasymachus put forward a consistent defense of the self-interest theory and its social and political consequences. People are motivated by self-interest, he wrote; that is why rewards and punishments are set up by rulers and codified by law. The intent is just this: to make it in the self-interest of citizens to do the things the rulers want done. Of course society's rulers act in their own self-interest too. Their power is limited only by the fact that the subjects may rebel, if it is in their self-interest to do so. Any appearance of sympathy or altruism in the law is based solely on that kind of calculated, long-term self-interest. This view of **motivation as self-interest** is one that will recur over and over again as we survey this historical context—and the current scene.

Socrates: Motivation as Judgment

A very different point of view was held by Socrates, a contemporary of Thrasymachus. Socrates was unconvinced by the self-interest argument. In the first place, if *right* acts are those that benefit the actor and nothing else matters, then you and I could never agree on what acts are *right* or *good* and what ones are not. My self-interest is not always your self-interest. And we can sometimes agree that what X did was a good thing to do even if it harms both of us—for example, X did not show up when we needed him because he had to care for a sick child instead. This implies that there is some real standard of goodness, apart from our self-interests, that you and I are both in touch with.

Some actions, in short, are "really" good or "really" bad; and we know which is which, quite apart from our own self-interest. To Socrates, it appeared self-evident that people will do the right thing, if only they know what it is. He found it impossible to imagine that a person could ever say, "Now I can do A or B; A is the right thing to do; so I'll do B." Even if a person does a very wicked thing, we might say, he must have *thought* he was doing the right thing or he wouldn't have done it.

Here is another view of motivation that will echo down through the centuries. Motivation is based, for Socrates, not on the self-interested search for pleasure but on a judgment of what is right. If we know what is right, we will do it. Intellect is not the servant of our desires, as in Thrasymachus's calculating hedonist; rather what we desire to do is based on our intellectual grasp of what is right.

Some Points of Controversy

There are several things we should notice about this ancient argument. First, we already see taking shape the issue of *external versus internal* determinants of action (see pp. 9–10). The hedonist's pleasures and pains come from outside, in the environment; we seek to gain the one and avoid the other. This view is ancestral to the modern behaviorist's theory of motivation, *reinforcement theory* (Chapter 8). But Socrates' judgments are internal events, based on our internal store of information and wisdom. In this view, we see the faint outlines of a *cognitive* theory of motivation. Since the time of Socrates, questions of knowledge and questions of motivation have been closely intertwined.

Second, we see different conceptions of the relation of motivation to other influences on behavior. Socrates, we have noted, linked motives to *knowledge* and *cognition*. A Thrasymachan view, emphasizing pleasure and pain, links the psychology of motivation with the psychology of *feeling* and *emotion*. The relations between motivation and emotion on the one hand, and between motivation and cognition on the other, were controversial then and remain so today.

Third, these two views began with opposite assumptions, so they faced opposite problems of explanation. To Socrates, right action comes automatically from knowledge of the good; if we know what is right, we will do it. He then must explain why people sometimes do act foolishly or destructively. His answer is that they lack the knowledge they need to do better. Is that an adequate answer?

To Thrasymachus, we are selfish creatures, moved by our own pleasures and pains. He then must explain why we ever behave kindly or in the long-term best interests of others rather than of ourselves. He might reply that these actions too arise from self-interest, for we must consider the pleasures of society's approval and the pains of its condemnation. Is that an adequate answer?

Fourth: Implied in Thrasymachus's argument is that what we do depends heavily on what we have learned. We must be taught what actions a society rewards (or at least tolerates), and what actions it punishes. For Socrates, we are not taught to do the right thing. We may need a great deal of learning to know what the right thing *is;* but once we decide that, the tendency to do it is not taught to us. It is simply human nature. Socrates might have said that we are naturally, or *innately,* inclined to do what is good.

And so we see an early form of the persisting argument, variously described as nature versus nurture, or the innate versus the learned, or, we might now say, of heredity versus environment. How much of our mental apparatus, and how much of our behavior, is built in? How much is acquired through learning? Thrasymachus *might* have said (for we are putting words in both speakers' mouths here) that all we have by nature is the tendency to seek pleasure and avoid pain; the rest is a matter of learning how to do these things. Not so, Socrates might reply. What we have by nature is much more complicated: We have standards of goodness or rightness, and a motive to do what is right.

THE BEGINNINGS OF CAUSAL ANALYSIS

After our focus on these early conceptions of what motivates human beings, we must jump ahead quite some time to the next major developments. That is unfortunate, because much careful thought and much heated debate is to be found in the intervening period. But a chapter is only a chapter long.

The developments we will focus on next took place around the middle 1600s A.D. What was going on then in the Western world? First, printing had been invented—and not only printing but also inexpensive ways of making paper. Access to knowledge and ideas by way of books was far more widespread than ever before. Second, a new world was under exploration—and not only a new world but also a new conception of the universe and the world's place in it. Scientists such as Kepler and Galileo

were showing that the orbits of planets, like the trajectories of cannonballs, could be understood as the result of a few simple physical laws.

Finally, these observers had also shown—and people were hearing about it—that our own planet has no special status in this vast but intelligible system of nature. We are part of it, that's all. The physical laws that the planets obey must apply to all parts of the universe, the earth and its cannonballs along with the rest. And if the laws apply to its cannonballs, why not to its inhabitants? Living things as parts of nature could be studied and understood as products of natural laws. Finally, if this is true of living things in general, how about living human beings? Must not human behavior also be subject to the universal laws of nature?

Descartes and the Reflex

One of the leaders of this scientific revolution was a remarkable man: a philosopher, mathematician, scientist, and professional soldier. His name was Rene Descartes (1596–1650).

Besides inventing analytic geometry, setting the problems of modern philosophy, writing a textbook on scientific method to which later ones are footnotes, and performing fundamental experiments in physiological optics—among other things—Descartes left an idea that is still important to students of behavior. That was the concept of the **reflex.**

Descartes knew of the astronomers' work, showing that it is all one universe we live in; and of Galileo's work, which was increasingly leading toward the conception of the universe as a *machine.* The "laws of nature" were the laws of mechanics. If movement occurs, it is either inertial movement or the result of applied force. Now animals and their parts are material objects, and they move. What moves them? Forces applied to them must do so.

Rene Descartes (1596–1650)

Sometimes, at least, an input from the environment, or what we call a **stimulus**, may cause movement quite directly. For example, if a child's foot comes too near a fire, the child's leg will flex so that the foot is drawn back, away from the painful stimulus. There are many other such cases. Tap the patellar tendon and the knee jerks; shine a light in a person's eyes and the pupils constrict. Such reflex actions seem machine-like in their reliability, and they are caused by forces applied from outside the organism. But caused how?

Descartes knew that inputs from outside the body are transmitted to the brain and spinal cord by nerves, and that commands from the brain and cord are transmitted to muscles, also by nerves. He thought that nerves were tiny tubes filled with fluid—which they are, though not in the way he supposed—and so were part of a hydraulic system along with the fluid-filled cavities of the brain and spinal cord. Perhaps when the child's foot is stimulated by too much heat, fluid is forced up through the nerves into those cavities. Then that fluid pressure is *reflected* back out through the nerves leading to the muscle (hence the term *reflex*), causing the muscle to swell. That, Descartes said, is muscle contraction, and that is what moves the foot (Figure 2-1).

Figure 2-1.
Descartes' illustration of reflex action. Stimulation of the foot by the fire is transmitted by fluid pressure to the brain. The fluid pressure is reflected back to the muscles that move the foot.

The mechanics of the theory were wrong, but the idea was ingenious, and scientists learned a great deal in showing it to be wrong (see Chapter 5). It also provided a specific theory about the workings of some behaviors that, in modified form, has dominated our thinking right down to the present. Most important, it added force to the idea that the behavior of animals, like a cannonball trajectory, could be analyzed as the workings of a machine.

Here we have the beginnings of a *causal* analysis of behavior. Descartes was trying for an account of the causes of some behaviors, in some animals; and his hope was to relate them to the principles of mechanics that underlay the world-machine as a whole.

"Some behaviors," we have said, and "some animals." Descartes was quite willing to suppose that animal behavior, and some human behavior, could ultimately be explained as a collection of reflexes and nothing more. However, he believed that most human behavior is not reflexive. Rather it is willed by the mind. Moreover, he held that the human mind is not a part of the vast world-machine of matter and force. Since it is not, it is not bound by the laws of mechanics; it stands outside the chain of mechanical causality. That is why a person has free will; and that, to Descartes, is the fundamental difference between an animal, which is a machine, and a person, who is not.

Thus we have from Descartes a fundamental distinction between two kinds of actions. There is *reflexive* behavior on the one hand, and willed or *voluntary* behavior on the other. The first, Descartes said, is caused by physical events; all animal behavior is like that. The second is caused by mental events; these have no causes in the physical sense, but only the choices made by the will. Only voluntary human behavior is of that kind.

Not everyone, however, was content with that distinction.

Hobbes and Empiricism

Thomas Hobbes (1588–1679) disagreed with his contemporary and correspondent, Descartes. Bodies are matter, and that includes human bodies. Matter moves or is moved in accordance with the principles of mechanics; if the mind moves the body, then the mind, too, must be part of a mechanical system. What we call mental events must reduce to matter in motion. Thus we have the doctrine known as **materialism**. Matter is all there is; even mind is material.

This, said Hobbes, is not all that hard to accept. After all, sensations are mental events, but they are physically produced. We see because light hits the eye; we feel because objects touch the skin. Sensations may be simply movements of particles or fluids in the brain, responsive to the energy impacting from outside. True, the mind also has ideas, dreams, and the like. But these are simply the residues or aftereffects of sensory input, persisting like ripples in a pond after a stone hits the water.

This implies in turn that all events in the mind begin with an impact

from outside it. In the final analysis, said Hobbes, there is nothing in the mind—nothing at all—that did not first get into the mind by way of the senses. Let us try to imagine something we have never perceived. We can't. We can, it is true, create novel combinations, like a man's head on a horse's body. But we know what a horse's body and a man's head look like only because we have seen them before.

This important point of view is known as **empiricism.** An empiricist, in this sense of the word, is one who believes that all knowledge—indeed, all the furniture of the mind—begins with sensory experience. And if one believes that, then it is easy to accept the further belief that what we call mental events are really just part of a physical system. That is because mind is made up of sense impressions or their residues. And sense impressions are caused by physical stimuli.

How does all this bear on motivation? Very directly. The outside world, by its impacts, "furnishes" the mind with its ideas, memories, and so on. Stimuli cause the mind to be as it is. In turn, the mind causes behavior; the motion imparted by stimuli is transmitted, however faintly, to the muscles. If the motion is strong enough, the body itself is moved, toward or away from the stimulus. If toward, then we speak of *desire;* if away, we speak of *aversion.*

Thus, said Hobbes, movements in organisms, as in anything else, are caused by motion. Behavior is caused by stimuli; desired ones move us toward them, aversive ones move us away from them. Free will is an illusion. If we seem to deliberate and then make a choice, it really means only that we experience a mix of desire and aversion. The choice is simply the desire or aversion that first becomes strong enough to spill over into movement.

If all this begins to sound familiar, it should. A person, for Hobbes, is moved—literally—solely by his desires and aversions. This is the hedonism of Thrasymachus, linked to the mechanical view of the world and its creatures.

And of course the old problem arises again: If people are selfish to the core, how is a society possible at all? How can we restrain our urges and postpone our pleasures for the more general good, as obviously we do? Moreover, there is a new problem too—and it is a problem for any conception of behavior as part of a mechanical system. If stimuli move us this way or that, how can behavior have the foresightful, forward-looking character it has? How can we take account of future events, and not just respond to present ones?

Hobbes's answer was enormously influential. Ideas, for him, are the movement of particles in the brain; and as these move, they affect each other. In particular, if two sensory inputs enter the brain together, there will be a bond, or *association,* formed between their corresponding images or memories. Then, as one of the ideas occurs, the other is likely to occur as well. When we think of a person, our image of her is likely to include the image of other things that we associate with her—the sound

of her name, for instance. In short, ideas tend to be thought together if their corresponding sensations occur together; that is the **principle of association.**

Suppose then that some action would bring pleasure, but that we also have been punished for doing it. Then if we think of the action we may be moved to perform it; but by the principle of association, we will also think of the punishment that has followed the act before. That gives rise to aversion, which moves us away from the action.

That is how the *anticipation* of punishment suppresses the punished behavior. Anticipation of rewards acts in the converse way, of course, to encourage the behavior that is rewarded. And that is what makes societies possible. We become socially acceptable beings, simply because society arranges that acceptable behavior will be rewarded and/or that unacceptable behavior will be punished. And when we think about performing an action, we think also of its consequences; and thus our acts are encouraged or suppressed by the consequences society has set up.

None of this was really new. As we have seen, the use of reward and punishment is very ancient indeed. What Hobbes added was, first, an attempt to explain *how* rewards and punishments work. His achievement was to relate these concepts to a systematic causal theory of the mind. Second, he made explicit the role of association, as a psychological principle, in the motivation of human behavior.

Kant and the Organization of Mind

Hobbes's empiricism, the theory that all knowledge derives from the senses, did not have things all its own way by any means. Of the various objections and alternatives, the most influential were those of the German philosopher Immanuel Kant (1724–1804).

Kant pointed out that there are in fact concepts in our minds that sensory input does not account for. An important example is the notion of *causality.* We see causal sequences, Kant admitted, but the sequences are all we actually perceive. We see, let us say, one billiard ball moving and striking another billiard ball, and then the second one moving. In such cases, all that comes in through the senses is the succession of events. The idea that one *causes* the other is simply not part of the sensory input.

Where then does the idea of causality come from? It must be supplied by the observer. As we experience sensory inputs, we must bring with us certain concepts—and causality is only one—by which we interpret and organize the inputs from the sensory world. These concepts are like theories about the world, or about what events have to be like. Kant called them *categories of the understanding.* They are not derived from experience, but are necessary to permit us to make sense out of what we experience. If the "furnishings" of our minds were wholly the result of sensory input, Kant argued, then the concept of cause-and-effect could never have occurred to us.

At first glance, this argument is directed only at Hobbes's theory of knowledge, not at his theory of motivation. But consider this: If we have certain theories about the world that are not derived from experience, might these not include the theory that certain actions are right and others wrong—and that we ought to do the right thing? Kant thought so. Thus, just as Hobbes revived the Thrasymachan "selfish philosophy," so Kant argued for a variant of the Socratic view: We know, without being taught, that there are right and wrong actions, and we know that we ought to do the one and avoid the other.

Empiricists were not silent in the face of this challenge. Much effort was expended then, as it continues to be, in attempts to demonstrate that the seemingly inherent aspects of mind really are derived from experience after all. Once again we see the heredity-environment, or nature-nurture, controversy. What aspects of the human mind are unlearned or innate? What aspects are acquired by experience? "All are acquired," would be Hobbes's reply. "No, some are innate," would be Kant's; and he would add, as would Socrates: "Those that are innate are by far the most important."*

THE THEORY OF EVOLUTION

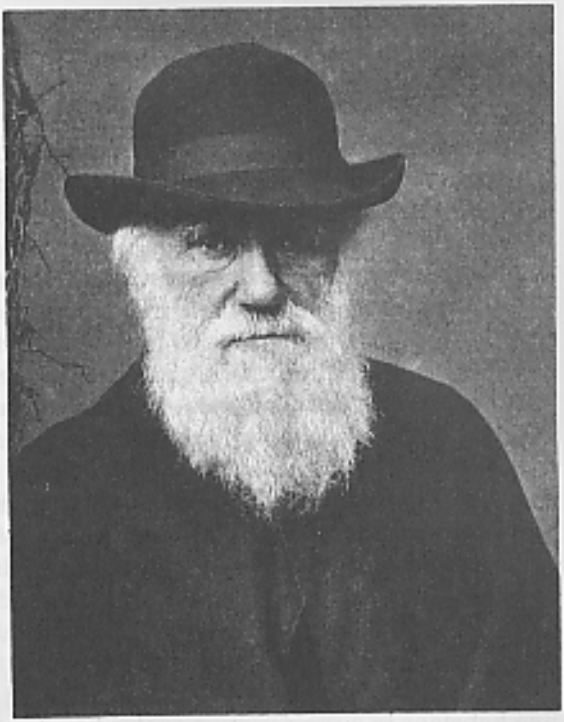
The 1800s saw an explosion of findings and ideas in the field of biology. Isaac Newton, in the seventeenth century, had shown that Galileo's laws of mechanics and Kepler's laws of planetary motion were the same laws. The universe *really* was all one system. It was time for the scientific analysis of living creatures, their structure and their behavior, to move past the talking stage. In the nineteenth century, it did so.

By the middle of the century, physiology was advancing with giant strides. Scientists were working toward a clear understanding of the mechanisms of reflex action, and were beginning to assign different behavioral functions to different parts of the brain. Then came one of the most powerful ideas in all the history of science—one that showed *how* the vast world-machine could produce living, behaving creatures.

Darwin and Evolution

The developing conception of animals as machines posed a problem for nineteenth-century biologists. The machines worked! Most species of animals, it appeared, were remarkably well suited to the habitats in which they lived. If behaving animals are bundles of reflexes as Descartes supposed, how is it that they have just the reflexes necessary to perform their

*Actually, Kant himself never said that his categories were "innate." Indeed, he said specifically that he was not concerned with that issue at all; his concern was with what categories there were and what they implied about human thought, not with where they came from. However, many commentators have written as if Kant had held the categories to be innate, and certainly he could have done so without changing his argument in any important way.



Charles Darwin (1809–1882)

full-time jobs of finding food, avoiding becoming food, finding mates, and caring for the young?

The machines we build, of course, work because they are designed to do so. It was therefore natural to look to a Designer to explain the workings of the animal-machines as well. Another and quite different answer exploded on the world in 1859, with the publication of *The Origin of Species* by Charles Darwin (1809–1882).

Fearfully oversimplified, Darwin's idea was this: Animals "work" because, if they did not, they would not be here. And species that did not "work" are not here anymore. Animals had to have the structural and behavioral characteristics required to survive and to breed within their habitats. Those that lacked these requirements left no descendants. And living animals today *are* the descendants of those that possessed these requirements.

This theory explained not only why modern animals "work," but also where modern species come from, and how different species may evolve from a single common ancestor. There are three key ideas here. First is *variability:* within a species, animals vary one from another. Second is *heritability:* Animals pass on their inherited characteristics to their offspring. Third is *selection:* Variation means that some members of the species are better adapted than others to the ecology in which they live. Those that are well adapted are more likely to have offspring, to which

they will pass on their characteristics. Those that are poorly adapted will have fewer offspring, and so their characteristics will diminish over successive generations. This is known as *selection pressure* by the environment in which the species lives.

To take a somewhat threadbare example: Some members of a species will have longer necks than others. Now, suppose climatic changes or migration by the animals places them in an ecology where food is scarce on the ground and plentiful high in the trees. Here, the longer-necked animals will be more likely to go on eating long enough to have babies. If this goes on long enough, and if length of neck is a heritable trait such that long-necked parents tend to have long-necked offspring, the average neck length in the species will gradually increase.

There we have Darwin's **theory of evolution**. It is often presented as a struggle for survival among the animals of the world, but in fact that is not quite what Darwin said. It is not so much a struggle for *survival* as a race for *reproductive success*—that is, number of descendants. Animals that were well adapted to their environments left more descendants than those that were not. Therefore, modern animals are well adapted to their environments, because they *are* those descendants.

The long-neck example concerns the anatomical structure of a species. But the theory has fundamental implications for behavior as well.

First, it implies, as Darwin saw clearly, that the mechanisms controlling behavior in a species must evolve hand in hand with the anatomical structure of that species. Chickens peck at grain with their beaks. Tigers catch their food in their claws and bite it with their teeth. But the anatomical structures—teeth, claws, beak—would be useless if the controlling systems in the respective brains did not program the appropriate movements, and couple them to appropriate stimuli. Imagine a tiger trying to peck at grain, and the point will be clear.

Second, the theory implies continuity between humankind and other animals. Darwin drew back from this conclusion in *The Origin of Species*. But it was clearly implied there, and in his *Descent of Man* he spelled it out explicitly. Up to then one could argue, as Descartes did, that humankind's ability to reason made our species fundamentally different from others. Animals had built-in reflexes and instincts, but not minds. Mind was reserved for human beings.

But if the human species is a product of evolution like any other, this separation can no longer be maintained. If humans and other animals have a common ancestry, then our minds, like our bodies, should be related to those of animals. Our minds may be better than a badger's, as a badger's paws are better for digging than ours. But they ought to differ only in degree, not in kind.

If we abandon the dichotomy—animals have instincts, humans have minds—then two ways of bridging the human-animal gap are at once apparent. We may ask, first: Do humans have instincts? Second: Do animals have minds? Let us take the second first.

Do Animals Have Minds?

If human have minds, and if there is continuity between human and animal, then animals ought to have minds. And if we could discover how animals' minds worked, then we should better understand the human mind as well.

Animal Learning

And so, scientists began setting problems for animals to solve, and the study of learning in animals began. Prominent among the early investigations was the work of Edward Thorndike (1874–1949) in America.

Thorndike's experiments showed that in animals, as in humans, behavior is affected by its *consequences.* Animals are not fixed bundles of instincts; rather, their behavior could be modified by rewards or punishments. In that sense they do have minds of a sort; they could do things that would be called intelligent if humans did them. And so Thorndike titled his monograph *Animal Intelligence.*

The Law of Effect

Thorndike summarized his conclusions in what he called the **law of effect.** He spoke of "effect," because the effect of an animal's actions determines what the animal will learn to do. If a response is followed by a reward, or what Thorndike called a "satisfying state of affairs," then that response is strengthened and likely to be repeated. If followed by punishment (an "annoying state of affairs"), the response is weakened and less likely to be repeated. Those are the two parts of the law of effect.

This strengthening or weakening is, of course, a learning process. But it is a motivational process too, inasmuch as satisfaction or annoyance is involved, and inasmuch as an animal's history of reward helps us understand its actions now. This line of work held forth the promise that these important processes could be studied in simpler creatures, under controlled conditions, and thus be understood.

The law of effect had one other important implication. It implied that the animal mind is not all that complicated. Thorndike saw the effects of rewards and punishments not as something his subjects thought about, but as an automatic strengthening or weakening of responses by their consequences—that is, *by the environment.* Clearly this idea takes us to the threshold of behaviorism.

Thorndike's law of effect is very much with us today. We call it the **reinforcement principle.** If a rat presses a lever and gets a bit of food, the rat will continue pressing; and we speak of pressing the lever as *reinforced* by the food. To some modern behaviorists, reinforcement is so important that they say: "Human behavior obeys the law of effect, *and nothing else.*"[1] Other writers take sharp exception, as we will see.

[1]Brown and Herrnstein, 1975, p. 169; italics in original.

Do Humans Have Instincts?

While some writers were exploring the question of animal intelligence and reason, others were bridging the human-animal gap from the other side. Since we have space to consider only one of these, let it be the American philosopher and psychologist William James (1842–1910).

When James published his *Principles of Psychology* in 1890, many were saying, as many say now, that humans have no instincts. We don't need them; our intelligence and our capacity for learning make instinct superfluous. Not so, said James. We probably have more instincts than any other species, not fewer. Certainly we often act without, or even in the face of, rational considerations.

The Nature of Instincts

Instincts, to James, shade into simple reflexes. Like them, they are called forth by "determinate sensory stimuli." And "every instinct is an impulse." Unless inhibited by something else, it eventuates in action of a determinate kind. Thus distinguishing reflexes and instincts is "a somewhat arbitrary matter . . . it is best . . . to call an activity instinctive [if it is] *naturally* provoked by the presence of specific sorts of outward fact."[2]

By an "outward fact" James means something very similar to what we now call a *releasing stimulus* (see Chapter 4). And the "naturally" seems meant to imply that the act must *not* have come about as a result of learning. By an instinct, then, James means a complex unlearned response (more complex than a simple reflex) to a characteristic stimulus, which also may be complex.

Human Instincts

Moreover, James argued, instincts are by no means confined to animals. Humans have powerful instincts. Take *sympathy,* for example. James says:

> [Some psychologists argue] that it is no primitive endowment, but . . . the result of a rapid calculation of the good consequences to ourselves of the sympathetic act [Thrasymachus again!]. . . . It is hardly needful to argue against the falsity of this view. Some forms of sympathy, that of mother with child, for example, are surely primitive, and not intelligent forecasts of board and lodging and other support to be reaped in old age. Danger to the child blindly and instantaneously stimulates the mother to actions of alarm or defence. . . . In man, then, we may lay it down that the sight of suffering or danger to others is a direct exciter of interest, and an immediate stimulus, if no complication hinders, to acts of relief.[3]

[2]James, 1890, p. 403; italics in original.
[3]Ibid., pp. 410–411.

James discussed a number of other human instincts ranging from crying and sucking in newborns, through such things as aggressiveness and the hunting instinct, to such things as secretiveness, cleanliness, and modesty. He concluded the chapter: "These are the most prominent of the tendencies which are worthy of being called instinctive in the human species. It will be observed that *no other mammal, not even the monkey, shows so large an array.*"[4]

Thus, just as Thorndike and others were showing that animal behavior could be modified by learning, so James was arguing that a great deal of human behavior does not require learning. We notice that what James was saying bears a distinct resemblance to what Kant had argued two centuries before. Kant said it about perception and knowledge; James said it about actions and the feelings that go with them. But what both were saying is this: There are complexities in our mental apparatus, and *the environment did not put them there.* They are innate. For Kant, we have knowledge of the principle of causality (for example), even though we never perceive causes as such, only events. For James, we react to an infant's distress with feelings of sympathy and actions of help or rescue, without regard for our own gain and, he argues, without having been taught to do so. Here again we meet the nature-nurture issue. Are our minds furnished wholly by experience, or is some of the furniture already there?

James's criteria for instinct seem perfectly reasonable. In practice, however, they proved difficult to apply. Can we really rule out the possible role of learning in the development of sympathy? Are aggressiveness, modesty, and the like really instinctive, or can we show that they are acquired after all? That problem also makes it hard to know how many instincts there are. Other writers drew up other lists of human instincts, some much shorter than James's list, some much longer. Whose lists were too long? Whose lists were too short? Whose were the most accurate? There was no good way to decide.

Worst of all, the vagueness and arbitrariness of the instinct label was an invitation to circular reasoning. Some later writers accepted the invitation, with the result that the label *instinctive* was used to "explain" any and all behaviors that seemed puzzling. This way of doing science has been summarized neatly: "If a man seeks his fellows, it is the instinct of gregariousness; if he walks alone, it is the solitary instinct; if he twiddles his thumbs, it is the thumb-twiddling instinct; if he does not twiddle his thumbs, it is the thumb-not-twiddling instinct. Thus everything is explained with the facility of magic—word magic."[5]

For these reasons, and others, the concept of instinct became an unpopular one for quite some time. It has made a strong comeback in recent years—but that story is for a later chapter.

[4]Ibid., pp. 440–441; italics in original.
[5]Holt, 1931.

In the meantime, the concept of human instincts, though suspect, at least had been proposed. It was a part of the intellectual atmosphere of the late nineteenth and early twentieth centuries. It alerted us to the possibility that, despite the reasoning power we humans are so proud of, our actions may have causes that are rooted in deeper and more primitive levels. We may be impelled to actions that are not based on reason and may even fly in reason's face.

This possibility received further support from an unexpected quarter. Five years after James published his *Principles,* a Viennese physician published, with a colleague, a book called *Studies on Hysteria.* The physician's name was Sigmund Freud.

FREUD AND PSYCHOANALYSIS

Now we come to the man who probably had more influence on subsequent thought than any other single person. Sigmund Freud's ideas are so very influential that we will be meeting them many times again in this book. Here we can give only the barest sketch.

Unconscious Motivation

Sigmund Freud (1856–1939) was trained as a physician, at a time when research on brain mechanisms and reflex physiology was in the air. Be-

Sigmund Freud (1856–1939)

havior, as a part of nature, was becoming intelligible! But as a clinical neurologist, Freud found himself confronted with patients whose problems did not fit what was known or believed about the functioning of the brain. Prominent among these were *hysterical* disorders. These are physical symptoms, such as blindness or paralysis, for which no organic basis can be found. Anna O's paralysis (see p. 14) was a hysterical disorder.

Such symptoms seemed quite irrational and senseless. Certainly they made no sense to the patients themselves. Yet Freud was convinced that they happened for a reason, that they must have intelligible causes.

Well, if hysterical disorders really are not disorders of the body, are they disorders of the mind? Some early investigators of hysteria had begun treating these disorders by hypnotizing the patient, and, in effect, "commanding" the symptoms to go away. Sometimes it worked. This showed Freud that a body ailment could indeed have a mental cure, suggesting that it was really a mental ailment all along.

To Freud, however, it was not enough to send the symptoms away; this was treating the symptoms, but it did not get at what had caused them in the first place. Anna O's case was a turning point, showing that the symptoms were actually related to, or *associated with,* life events and the emotions that went with these events—even though the patient could not remember the events. Moreover, the symptoms were relieved when the events were remembered and the emotions expressed. This suggested to Freud that the symptoms were caused by the energies of pent-up unconscious emotions, and would go away when the emotions were released, made conscious, and expressed. Here we have one of the fundamental principles of psychoanalysis: **unconscious motivation.** We are powerfully affected by thoughts, wishes, and memories of which we have no conscious awareness.

Urges from the Past

Freud eventually ceased to use hypnosis in treatment, partly because it was unreliable but also because it was unnecessary. In its place, Freud developed his method of **free association.** In this procedure, still in use by psychoanalysts, the patient is required to talk freely, without censorship or attempt to direct the flow of thought. He simply lets thought follow thought, describing his thoughts to the analyst as they come. Freud saw the mind, much as Hobbes had seen it, as a network of ideas and memories linked together by associations. By letting thoughts follow one another freely, a patient could show the therapist what associative bonds there were, and just what was linked with what in the patient's mind.

A patient might begin an analytic session by talking about a dream he had had the previous night. Then, as his continued talking revealed what ideas were linked to the content of the dream, and what ideas were linked to those in turn, the seemingly irrational dream would begin to make sense. The same could be said of irrational obsessions and fears. Freud

found these to be connected, through a chain of ideas that might be long and indirect, to unconscious wishes or urges that could not be expressed directly. And thus came another fundamental idea that runs through all of Freud's work: Neurotic symptoms, dreams, slips of the tongue, and the like are *disguised or symbolic expressions of wishes.*

Why were the wishes disguised? Because they were highly threatening to the patient—too threatening even to be allowed into consciousness. As described above, free association sounds like an easy matter—the patient just talks along—but it is far from easy. Here is how Freud described it:

> The patient attempts to escape . . . by every possible means. First he says nothing comes into his head. . . . At last he admits that he really cannot say something, he is ashamed to. . . . Or else, what he has just thought of is really too unimportant, too stupid and too absurd. . . . So it goes on, with untold variations, to which one continually replies that telling everything really means telling everything.[6]

It was as if the unconscious wishes were pushing to be expressed, but, at the same time, another part of the patient's mind was fiercely resisting any such expression. The patient was at war with himself. We have another cornerstone of psychoanalytic theory: **unconscious conflict.**

Freud would persist, until the shameful, absurd, childish thoughts were expressed. And very often, they were indeed literally childish, for the chain of thoughts would work its way back into early childhood—to things that had happened, or that the patients unconsciously *wished* had happened, when they were children. Well then, there must be a reason for the importance of these early memories or fantasies. They must be expressions, Freud concluded, of persisting childhood desires.

This is another cornerstone of Freud's theory: the **persistence of infantile urges** into adult thought and action. Freud emphasized what Hobbes had only hinted at: If urges are inhibited, they do not just go away. If denied direct expression, they will seek expression in some other way. Like steam under pressure, the urge will flow along the pipes provided by the network of associations, until a pathway is found that permits the pressure to be released. Hence the roundabout expression of the urge in symbolic form, in dreams and in neurotic symptoms. The symbolism might be complex and sophisticated, but the urge was as primitive and infantile as it had ever been.

The Irrationality of Mind

Here, then, is the picture of the human mind that emerges. We humans are very proud of our ability to learn and to reason. But deep in our minds is an important part of ourselves—the **id**, Freud called it—that does not

[6]Freud, 1917, p. 289.

reason, and has learned nothing. It does not think, it only wants. It is the bundle of urges we met in Chapter 1 (p. 11). And these urges seek gratification with the kicking, screaming, irrational, and uncompromising intensity of the small child. So, if our dreams or our neurotic symptoms are senseless and childish, it is because a senseless child is still part of us.

Freud's Impact

So wrote Sigmund Freud. The physicians of his day, and many laypersons as well, at first greeted his ideas with ridicule or revulsion or both. Partly this was because Freud saw many of our unexpressed urges as sexual, even in young children; this was an idea many found hard to accept. It was partly too because scientists found it hard to evaluate Freud's ideas with solid evidence. Precisely because the theory was so complex and rich in its possibilities, many felt that it could explain any conceivable action, and so could not be tested. Many people raised these objections then, and many still raise them today.

And yet, many other readers have found that Freud's ideas hit home; they ring true. Freudian concepts—id, ego, superego, repression—have become part of the educated person's everyday vocabulary. Perhaps above all, we respect Freud's intellectual courage. He faced squarely the manifest fact that we do act without knowing why, and in ways that our vaunted rational powers cannot account for. At the same time, he insisted that the irrational side of the human mind is a part of nature along with the rest; it must be respected, but need not remain mysterious. He held out the promise that even the irrational can be understood.

We may agree or disagree with what Freud says, but we cannot ignore him.

THE EMERGENCE OF BEHAVIORISM

By the early decades of the twentieth century, the science called *psychology* was a going concern. It was an academic department separate from philosophy, and psychological laboratories had sprung up over Europe and America. And it was generally agreed that the subject matter of psychology was the mind.

Any consensus about that, however, ended abruptly in 1913, with the publication of a paper titled "Psychology as the Behaviorist Views It."[1] The author's name was John B. Watson (1878–1958).

Watson's Challenge

Watson began his psychological career as a student of animal behavior. In his investigations, he naturally fell in with the tradition of trying to

[1]Watson, 1913.

John B. Watson (1878–1958)

infer, from what animals did and how they went about solving problems, what their mental apparatus was like. Thorndike had pioneered that enterprise; after all, he had titled his monograph *Animal Intelligence.*

The problem was that conclusions about the animal mind were necessarily inferential. One could never observe directly what, if anything, was going on in an animal's mind. As a result, disagreements were hard to resolve, and solid conclusions about the animal mind were few. Impatient with this state of affairs, Watson said, in effect: Why make inferences? One cannot see what an animal *thinks, knows, or perceives,* but anyone can see what an animal *does.* Why not talk about that?

> The psychology which I would attempt to build up would take as a starting point, first, the observable fact that organisms, *man and animal alike,* do adjust themselves to their environment . . . secondly, that certain stimuli lead the organism to make the responses. In a system of psychology completely worked out, given the response the stimuli can be predicted; given the stimuli the response can be predicted. . . . The time seems to have come when psychology must discard all reference to consciousness; when it need no longer delude itself into thinking that it is making mental states the object of observation.[5]

[5]Ibid.; my italics.

Therefore, said Watson, let us begin again; and his new beginning was nothing less than a re-definition of psychology. Psychology is to be the study of *behavior,* and of nothing else. It will relate what organisms do to the circumstances under which they do it. It will determine by direct experiment the laws relating stimulus to response.*

Moreover, this is to be so not only in animal psychology but in the psychology of human beings as well. The objections to making inferences about the animal mind apply, with equal force, to making inferences about the human mind. True, a human can speak to us, and thus describe his or her mental state. Even then, however, we do not observe the mental state itself. What we observe is what the person *says*—and verbal behavior is still behavior.

The Case against Consciousness

Watson's aim, then, was to get rid of the concept of consciousness altogether, as something unknown and unknowable. This includes *all* mental events—instincts, wishes, pleasures, and other motivating forces along with the rest. Our first reaction may be that this is much too radical; we do know something about other people's consciousness, their wishes, their feelings. But do we?

Consciousness as Unobservable

Think about this for a minute. Is your red the same as my red?

If we see a patch of a certain color, we will both *call* it red, because we both have been taught to do so. But how do you know that the color I see, looking at that patch, is not the color you would call "green," and vice versa?

If you worry seriously about that possibility for a while, I think you will conclude that the question is unanswerable. Even if we could somehow hook up your eyes to my brain, still it would be *my* brain that would "have" whatever color experience the patch gave rise to. You still would know only what I call it, not what it really is like for me.

On the other hand, you probably will not worry about the issue for very long. Not only is the question unanswerable; the answer simply *does not matter.* You and I both *call* the patch red; we both behave the same way when that color appears at a traffic intersection; we agree that it is not stylish for a man to wear a tie we call "purple" against a shirt we call "dark green." And so on. The knowledge that you and I make corresponding *responses* to color *stimuli* is all the knowledge we need. And that is fortunate, for it also is all we're going to get.

If the example strikes home, you have gone a long way toward sympa-

*A modern behaviorist would not express the matter this way, as we will see later. Behaviorism, like the rest of us, has changed quite a bit since it was born. Historically, though, this was its original program.

thizing with Watson's argument. Questions about what another human's experience is really like cannot be answered, and need not be asked. And Watson did not invent that circumstance; he only pointed it out. It has always been so.

Consciousness as Superfluous: Pavlov and Conditioned Reflexes

There are other arguments on Watson's side. For one thing, his version of psychology is excellent Darwinism. In the last analysis, it is what an animal *does* about a situation, and not what it thinks about before doing it, that determines whether the animal survives that situation to leave descendants. Its thoughts and feelings, if any, are simply superfluous.

Finally, Watson thought that the clinching argument against consciousness was simply this: Psychology can do the job without it. The complexity and richness that we assign to "mental life" can be explained in a better way: by assigning it to the relation between behavior and its environment. To see why Watson was so optimistic about this, we must digress for a minute to pick up another major historical figure: the Russian physiologist Ivan Pavlov (1849–1936).

What Pavlov showed was this. Suppose we evoke a reflex action in a dog; say, we put a bit of food in its mouth, to elicit salivation as a reflex. While doing so, we present some stimulus that is wholly unrelated to food, and does not evoke salivation in any sensible dog—a bell, let us say. If we do that a number of times, we will see a new reflex forming: The dog will begin to salivate at the sound of the bell alone. Now, in addition to the **unconditioned reflex**, salivation in response to food, the dog has a **conditioned reflex**, a learned reflex—salivation in response to the bell (Figure 2-2).

This discovery raised the hope that the psychological phenomenon of *learning* might be brought into articulation with the physiology of reflex

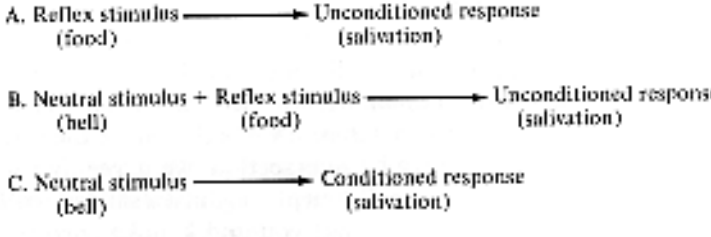


Figure 2-2.
The conditioned reflex. (A) Food evokes the unconditioned response of salivation. (B) A neutral stimulus is pared with the food. (C) After several such pairings, the neutral stimulus comes to elicit the response by itself. That is a conditioned reflex. In all cases the *response* is salivation; the term *reflex* applies to the whole stimulus-response relation.

action. It seemed indeed to be a physiological embodiment of Hobbes's *association.* For Hobbes, sensations (the units of mind) are associated with each other because they occur together. For Pavlov, reflexes (the units of behavior) are associated with stimuli because *they* occur together. Thus in Pavlov's experiment, the bell caused the dog to salivate because the bell, and a stimulus for salivation (food), occurred together. So important is this experimental demonstration that the procedure has come to be called **classical conditioning**, or **Pavlovian conditioning.**

Like Hobbes's association, it seemed that the classical-conditioning mechanism could, in principle, provide for almost unlimited complexity and richness. For Hobbes, *any* two ideas could become associated if their corresponding sensations occurred together. So for Pavlov. One could condition salivation as a response to a bell, or a light going on, or a light going off, or the sound of bubbling water—the response could, it appeared, be attached to any stimulus whatever. Conversely, we could condition any of a number of responses to a bell; we could condition salivation if we pair the bell with food, or a change in heart rate if we pair the bell with shock. What response we make, to any stimulus, depends upon what has been paired with that stimulus before. It becomes clear how Pavlov's ideas clicked into the behavioristic view like a key into a lock.

Where is the limit? How much of the causation of human action, including its diversity and richness, might be understood in conditioning terms? This object you are holding could be called *a book,* or *ein Buch,* or *un libro*—vastly different responses to the same stimulus, depending on one's learning history. Or the same response could be attached to different stimuli in different individuals. One person fears heights, one fears exams, one fears members of the opposite sex, one fears failure. If we think of fear as a response, then we are saying: Different stimuli evoke the same response. Are different conditioning histories at the bottom of it?

No wonder so many behaviorists thought that the key to the causation of complex human behavior had come from Pavlov's research! If our various behaviors are complex and diverse, perhaps that's because our various learning histories are complex and diverse. Thus the behaviorist's emphasis on the *environment,* past and present, as the cause of action. The stimulus situation—the environment—accounts for what we do. And if different people react differently in the same present environment, says Watson, it is because of differences in the *past* environment—that is, in the conditioning they have had. And on the old nature-nurture issue, the behaviorists come down squarely on the "nurture" side. Simple reflexes are innate; but *all the complexity of behavior is learned.* Learned how? Through conditioning.

The "Ghost in the Machine"

There is one more argument we must consider if we are to understand the impact of behaviorism on psychology. Watson's rejection of mental

explanations for behavior was given added force by what he took the term "mental" to imply.

Descartes had argued that the human mind stands outside the physical chain of cause and effect. It was not part of the physical world at all. In modern everyday speech, the word "mind" often does carry the connotation of something non-physical. It can even sound like something mystical, something extra-natural or even supernatural. Certainly it sounded that way to Watson, and he was having none of it:

> The behaviorist . . . holds . . . that belief in the existence of consciousness goes back to the ancient days of superstition and magic[9] . . . the behaviorist began his own formulation of the problem of psychology by sweeping aside all mediaeval conceptions.[10]

The modern behaviorist B. F. Skinner implies something similar when he says that in turning from the mental events to the environment for our explanations, we turn "from the miraculous to the natural."[11]

It comes down to this. According to behaviorists, those who speak of the *mind* are flirting with downright superstition; they must believe that there is a mysterious spirit inhabiting the body, a "ghost in the machine." Psychodynamic and cognitivist theorists are most emphatically included in this accusation.

I have mentioned this argument because its historical importance requires that something be said about it. It is still sometimes used to argue against some concepts we will need in later chapters, for example, cognitive maps and search images (Chapter 9), beliefs (Chapter 11), and other such mental or cognitive terms.

But to me, it simply is not a serious argument and never was. Hobbes wrote about the mind, as did James and Freud; all three would have been surprised to hear that they were talking about something supernatural! Mind, to them, was part of nature, to be studied as such. Today, most cognitivists take it for granted that the events we call "mental" have something to do with events in the physical nervous system. Many modern scientists are busy investigating how images or feelings reflect the actions of the material brain.

We simply do not need to regard mental events as non-physical—much less as supernatural or mystical. Once we recognize that, the issue disappears, and we have spent time on it here only to make that clear.

The Impact of Behaviorism

What are we to think of the behaviorist challenge?

[9]Watson, 1924, p. 2.
[10]Ibid., p. 5.
[11]Skinner, 1971, p. 201.

On the positive side, the behaviorists' emphasis on *observable data* was distinctly beneficial. Behaviorists gathered, and continue to gather, solid facts about behavior. Even those who disagreed with them—scientists who were convinced that such things as purposes, goals, and likes and dislikes existed and were important—had to demonstrate that they were important by offering the kind of objective evidence a behaviorist could accept.

In one sense, therefore, we are all behaviorists now. For we all—or almost all—accept the propositions that our conclusions must be based on evidence, and that the evidence must be observable, so that any observer can see and verify it for himself. That is what *objective evidence* means.

And yet it must also be said that as it became the dominant force in academic psychology—and it did—behaviorism imposed severe limitations on its subject matter. The study of cognition, of imagery, of wishes, preferences, likes and dislikes, goals and purposiveness in behavior—all of these were ruled out of scientific court by behaviorists, simply because they had once been called "mental" phenomena. As a result, their investigation by scientists was long delayed.

But, though delayed, it was not abandoned. It has come back strong in recent years. Let us look briefly at what happened.

THE RESURGENCE OF COGNITIVE PSYCHOLOGY

Through the 1930s and 1940s, the study of cognition had somewhat the flavor of an underground movement. Thought, beliefs and knowledge, purpose and goal-seeking—all these were considered unobservable and perhaps superfluous concepts. Those who wished to study them were confronted with the "ghost in the machine" argument; they were accused of wishing to drag some mystical "mind-stuff" into a psychology that was well rid of such superstition.

The Dissenters

There were dissenters, even within animal psychology. Wolfgang Köhler[12] argued with vigor (and with data) that to understand even an animal's behavior, one had to know how the animal *perceived* the world, not just what the stimuli were. On the response side, Edward Tolman[13] showed, with good behavioral data, that rats did not just make the responses they were trained to make. They might make a brand-new response, never made before, to get to where the food was—implying that they *knew* where it was. And Donald Hebb[14] tried to show how thoughts,

[12]Köhler, 1925.
[13]Tolman, 1932.
[14]Hebb, 1949.

concepts, and even expectancies could be formed by the interaction of messages within the brain.

In human research, we must mention the great social psychologist Kurt Lewin.[15] Lewin insisted that to understand actions, we must consider the situation *as the person perceives it.* Lewin also pioneered the experimental study of practical human problems. He showed how such complex processes as people's reactions to thwarting, or democratic versus authoritarian organizations of social groups, could be modeled in the laboratory and studied there. It was he who said, "Nothing is so practical as a good theory."

Purposive Machines

A major breakthrough for cognitive psychology came from developments in engineering—the development of guidance systems and servomechanisms during and after World War II and, later, the development of computers. In a word, *purposive machines* were built, and that changed things a very great deal.

A heat-seeking missile, for example, could home in on a target by detecting whether one of its sensing devices was receiving more heat than another and, if so, correcting its course until all sensors were stimulated equally. Thus it kept itself aimed at the target, whatever unpredictable evasive action the target might take. *A machine could seek a goal,* with no guidance from a human operator. A chess-playing computer could extrapolate the consequences of its possible moves and choose the move which, against best play by its opponent, would give it the best position five or ten moves later. *A machine could anticipate future events.*

The effects of these developments were twofold. First, they meant that the "ghost in the machine" argument had lost whatever validity it might once have had. Here were machines—literal, physical machines with no ghosts in them—performing the very kinds of operations the cognitivists thought important. They were seeking goals, anticipating the future, choosing the best course of action. If machines made of silicon could do these things, there was nothing mystical in supposing that machines made of flesh and blood could do them too.

The second effect was this. True, the fact that machines could accomplish these things told us nothing whatever about how humans accomplished them. It did, however, lead to a wealth of new ideas about how humans *might* accomplish them. New theories and hypotheses sprang up to be tested by research. And these were theories about what was going on *inside* a thinking, judging, choosing system—not in the environment. We could say that they were theories about the sequence of events shown in Figure 1-2B (p. 10)—theories, in other words, about how mental operations affect behavior. What some of these theories look like, we will see in later chapters.

[15]Lewin, 1935.

Economic Theory

These developments in technology came together with advances in a quite different field. Economists had always thought of human beings as (semi) rational decision-makers. And rationality could often be seen as a matter of *calculation*. A shopper in a grocery store calculates the costs and values of different combinations of purchases, so as to get the most value for his money. A manufacturer calculates where to set the price for her product so as to maximize profits. By the late 1940s, economists had developed quite sophisticated mathematical models of how a rational decision-maker would, or should, behave. These ideas, especially in the writings of John von Neumann,[16] came to the attention of psychologists who also were interested in decision-making—and in rationality.

We see how ideas are falling together here. Economists were showing how rationality could reduce to calculation and prediction. Engineers were showing how machines could calculate and predict. Put these ideas together, and we have cognitive psychology's conception of a living creature—a biological machine, but a thinking, judging, reasoning one, within whatever limits its design imposes. As a result, modern cognitive psychology has borrowed heavily and profitably from economic theories of decision-making, as well as from computer sciences.

And here we are today. In this chapter, we have sketched out the antecedents of the modern points of view summarized in Chapter 1: behaviorism and the two main branches of the mediationist view, psychoanalysis and cognitive theory. We see where the diversity comes from, and what some of the persisting issues are: inner versus outer determinants of behavior, nature versus nurture, and emotion versus cognition in human conduct. With this background in mind, we should find the modern scene much easier to understand.

SUMMARY

The principle that behavior is affected by consequences was taken for granted even at the beginning of history. A popular form of this theory is the doctrine of *hedonism*—people and animals seek to obtain pleasure and to avoid pain. Such a theory points to the environmental determinants of action, because pleasurable and painful consequences of action come from the environment; and it links the study of motivation with the study of emotions and feelings.

Among the Greeks, Thrasymachus believed that that principle was in itself an adequate theory of human action: Humans are motivated solely by self-interest. Socrates disagreed: Humans are basically virtuous, and will do the right thing if only they know what it is. Socrates' theory points to inner as opposed to outer determinants of action—there is an inherent

[16]von Neumann and Morgenstern, 1944.

tendency to seek the good. And it links motivation with cognition rather than with emotion—action is guided not by what pleases or displeases us, but by what we think is right. The controversy still echoes today.

The scientific analysis of behavior began with Descartes' concept of the *reflex*. Some environmental stimuli drive movements mechanically, by way of the nervous system. Descrates restricted this idea to animals and involuntary movements in humans. But Hobbes showed how something like it could account for voluntary human behavior as well: We move toward pleasurable stimuli and away from painful ones. In addition, Hobbes's concept of *association* showed how these movements could be guided by anticipated consequences as well as present ones. We move toward stimuli *associated with* pleasure. Hobbes thus was led to a theory of motivation somewhat like that of Thrasymachus. In response, Immanuel Kant took up a position somewhat like Socrates'. We know more than what incoming stimuli there are or have been; and among the things we know is that certain actions are right, and that we ought to do them.

In the nineteenth century, Darwin's theory of evolution showed how natural processes could produce the good fit between animals' structures and the environment in which they live, through *natural selection* of well-adapted life forms. Animals poorly fitted to their environments left fewer descendants than those well adapted; and so modern animals, which *are* the descendants, are the well-adapted surviving forms. His theory recognized that mechanisms of behavior must evolve along with the structure of the body, so that an animal can use its body structures appropriately.

Darwin's theory also broke down the rigid distinction between animal behavior, guided by instinct, and human behavior, guided by the mind. Perhaps animals have minds, too. Scientists began to study learning and problem solving in animals under controlled conditions. This work led, among many other things, to Thorndike's *law of effect*, an early statement of the *reinforcement principle*. On the other side, William James argued that humans, like animals, had instincts. Instincts were thought of as complex reactions to complex stimuli, reactions produced by evolution and not by learning or by reason.

Soon thereafter, Sigmund Freud began the work which convinced him that much of the causation of behavior had little to do with reason. He saw much of neurotic behavior, and much of normal behavior, too, as symbolic expressions of unfulfilled urges and wishes, dating back to early childhood. These urges, with attendant fear and guilt, operated as powerful *unconscious motives*.

The program of psychology took an abrupt turn under John B. Watson and *behaviorism*. Watson objected to talk of conscious *or* unconscious mental events. He doubted that such events could be studied scientifically, for they could not be observed; and they seemed to him to represent mystical, supernatural "ghosts in the machine." He argued instead that psychology should concern itself with relations between observable re-

sponses and observable events in the environment—stimuli—that evoke them. Then Pavlov demonstrated that learning could be studied by observing such stimuli and responses, that is, by the *conditioned-reflex* method. In light of the importance of learning in behavior, Pavlov's work added to the early behaviorists' conviction that behavior could be understood in stimulus-response terms. Modern behaviorism has moved away from the stimulus-response framework, but it continues to insist that the causes of behavior are *in the environment.*

The study of cognition was rejected by behaviorists, and so it was delayed for a while. After World War II, however, it was stimulated by developments in guidance and computer technology, and by economic theories of rational behavior. Though it accepts the behavioristic insistence on objective data, cognitive theory today uses such data to test theories about *internal* mental operations as part of the causation of behavior.