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What Do People Really Want?

A Jewish story tells about a little boy who said to his schoolmates: “My father is terrible. Last night he wanted to hit me four times.” One of the boy’s friends asked: “How did you know he wanted to hit you?” “Well,” the boy answered, “if he didn’t want to hit me, why did he?”¹

In fact, I suspect the poor father in the joke was frustrated by job or marital worries and taking them out on his son. He probably felt no satisfaction, and a good deal of remorse, for hitting the boy repeatedly. But the boy’s inability to empathize with his father reflects a type of common nonsense that is all too prevalent — attributing to people the *wish* to do whatever it is they feel compelled to do under their current circumstances. If the wish we attribute to another person is an unpleasant one, this gives us an excuse to do her or him considerable harm.

For example, the 1980s and early 1990s saw some poor Americans without marketable skills choosing to remain on welfare as a lesser evil, rather than work at jobs that were dead-end, low-paying, boring, and kept them apart from their children. Instead of empathizing with the welfare recipients’ inability to find meaningful work, many affluent or working-class Americans (goaded by reactionary politicians out to reduce social spending!) decided these poor people *wanted* to be on welfare. This created the climate for the punitive mid-1990s “welfare reform” measures which limited recipients’ benefits but didn’t provide enough new jobs or job training to improve their long-term prospects.

For another example, some psychotherapists ask a client, “Why do you *want* to do badly on your job?” or “Why do you *want* to ruin your marriage?” For a client who is already facing some kind of difficult dilemma, being told that he or she actively wants to be self-sabotaging may aggravate the problem by either angering or demoralizing the client. And it’s also inaccurate and unfair. The psychologist Abraham Maslow said that neurosis is not unconscious self-destruction but an ineffective attempt at

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growth.² So a person engaging in a neurotic behavior is typically doing it not in order to engage in that behavior but in order to accomplish something else. For example, one can subconsciously do badly on a job in order to keep one's friends from resenting one's accomplishments. Psychotherapists are more effective when they can suggest to the client a substitute behavior that accomplishes the desired effect without some of the undesired side effects of the current neurotic pattern.

If we wish to move toward a partnership society and improve how people treat each other, we need to convince ourselves that people "are really good at heart" as Anne Frank said in her diary. We need to ask the seemingly trite but actually moot question: "What do people really want?"

Since Abraham Maslow provided one of the best descriptions of the optimal, most mentally healthy side of human beings, his work is a good place to start answering that question. The two best known of his ideas are *self-actualization* and the *hierarchy of needs*.

What is Self-Actualization?

Like most widely used terms, self-actualization is often misunderstood. To many people it has connotations of various psychological movements and cults (centered in California in the 1970s), of the "me generation," of being good to oneself and not worrying about the effect of one's actions on society. But that's not what Maslow meant. He intended the term to mean the development of one's full potential in a way that connects with the rest of the world:

Self-actualizing people are, without one single exception, involved in a cause outside their own skin, in something *outside of themselves*. They are devoted, working at something, something which is very precious to them — some calling or vocation in the old sense, the priestly sense. They are working at something which fate has called them to somehow and which they work at, and which they love, so that the work-joy dichotomy in them disappears. One devotes his (*sic*) life to the law, another to justice, another to beauty and truth.³

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Maslow also says that “self-actualization means experiencing fully, vividly, selflessly, with full concentration and total absorption.”⁴ It is, he emphasized, a state we all reach sometimes (in special times he calls “peak experiences”) but few reach regularly. Still, the drive toward self-actualization is universal, and people tend to feel frustrated when they are not self-actualizing. In social settings, self-actualization translates to synergy, or people working together in harmony,⁵ and people also feel frustrated when synergy is absent.

Seeing self-actualization as a *primary drive*, along with those for food, drink, sex, and safety, begins to suggest ways to understand it biologically. What could be going on in the brain of an apparently functioning individual, even one successful by society’s standards, who is saying to himself or herself: “I feel less than I could be”? The frustrated individual feels *incomplete*. The ideal of completeness has a history far older than Maslow; for example, the Hebrew word *shalom*, for peace, originally meant “completion.”

How “completeness,” or its lack, is represented in the brain is a difficult issue and hasn’t been resolved yet. As we will see in succeeding chapters, it seems to involve brain areas that integrate cognitive information with measurement of emotional value. Among these brain areas are the orbital part of the frontal lobes (see the discussion in Chapter 1 of Damasio’s work) and the amygdala (see Figure 1.1). Maslow’s belief, and mine, that self-actualization is a universal human need suggests some kind of hard-wired brain circuit for cognitive-emotional integration, including those areas, that produces a sense of harmony or completeness when functioning optimally. This notion fits into Maslow’s theory of the *hierarchy of needs*.

The Hierarchy of Needs and the Drive Reduction Concept

Maslow set out to challenge the common nonsense (shared by writers in fields ranging from theology to economic theory) that “good or happiness or pleasure is essentially the consequence of

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amelioration of this unpleasant state-of-affairs of wanting, of desiring, of needing.”⁶ Instead, he said: “different basic needs are related to each other in a hierarchical order such that gratification of one need and its consequent removal from the center of the stage brings about not a state of rest or Stoic apathy, but rather the emergence into consciousness of another ‘higher’ need.”⁷ The progression from “lower” to “higher” is, approximately, from survival needs (such as safety and food) through sexual needs, needs for love and belonging, curiosity, up to the self-actualization and growth needs. The most self-actualized people are aware, for example, of needs for a sense of purpose, and for realization of large-scale values such as truth, beauty, justice, and caring.

The word “hierarchy” in “hierarchy of needs,” like the word “self” in “self-actualization,” was probably a bad choice since it has generated some misunderstanding. Maslow has been misinterpreted as believing in a strict ordering whereby some needs always come before other needs, an interpretation he specifically denied.⁸

The sociologist Geert Hofstede confirmed that Maslow’s hierarchy is not a rigid one: the relative weights of different needs can vary across cultures.⁹ Hofstede compared attitudes toward work of employees from different countries working at the same multinational corporation. He found that at the same managerial level, people from the United States, northern Europe and Australia tended more than others to value autonomy and opportunity for independent thought, which are high on Maslow’s hierarchy, and tended less to value a feeling of security which is lower on the hierarchy. Moreover, within affluent countries we see people pursuing “higher” needs when “lower” ones aren’t totally met. Conditions of economic insecurity haven’t, for example, prevented many bohemian poets and intellectuals from pursuing artistic interests, nor many urban ghetto dwellers from spending time and money on religious rituals. And most people, even on the brink of starvation, value the love and warmth of other human beings!

Even if Maslow’s hierarchical ordering of needs is inexact, however, this doesn’t contradict his main insight. His basic point is that there are *biological* needs not just for survival but for fulfillment, for richness in life, for connectedness to other people and to the universe. He contrasts this view with the traditional, naively Freudian view that our natural impulses are toward satisfying base, “animalistic” urges

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and that a superego of elaborate social codes is required to suppress such destructive urges. Maslow and others have spurred in psychotherapy a movement toward a more favorable view of human needs and desires.

Favorable views of human needs have also become popular in academic psychology and neuroscience since the 1950s. In psychology, the dominant view until recently was that positive reinforcement (psychological reward) can be defined as *drive reduction* (e.g., eating reduces hunger, drinking reduces thirst, sexual intercourse reduces lust). But in the last thirty years or so, the concept of drive reduction has been increasingly challenged by competing ideas that are supported by neuroscience and neural network models.

The drive reduction idea probably had its roots in the late Nineteenth Century, in the same controlled Victorian mind set that produced Freud. But the most forceful advocate of drive reduction was Clark Hull who wrote a classic psychology book published in 1943.¹⁰ The drive reduction theory has remained popular in some circles despite an apparent telling blow to it from neurophysiology. This blow was the accidental discovery in 1953 by the neuroscientist James Olds of “pleasure centers” in the *hypothalamus* at the base of the rat’s brain¹¹ (see Figure 1.1). Olds found that if rats could press a lever to electrically stimulate certain parts of the hypothalamus, they chose this brain stimulation over more conventional satisfactions like eating food and engaging in sex. Moreover, the drive for brain stimulation didn’t satiate in the manner of the hunger or sexual drives; the rats kept pressing the lever on and off for hours.

Further physiological discoveries hinted that strong drive can sometimes be associated with pleasure rather than pain. While Olds found that the lateral hypothalamus is one area whose stimulation is pleasurable,¹² Jose Delgado and B. K. Anand found that stimulation of the same area can lead to increased eating!¹³ From the point of view of understanding brain organization, the fact that a pleasure center is also a hunger center might sound like a paradox (if it isn’t the result of sloppy experimentation). But the paradox disappears if we remember the times we have been on the verge of eating a delicious meal or making love

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with a desirable partner. The experience is one of high drive combined not with pain but with pleasurable anticipation.

The experimental results of Olds, Delgado, Anand and others suggest that positively reinforcing events are not those events that *reduce* drive, but rather are those events that activate a positive feedback loop in the brain that *consummates* drive. Stimulation of the lateral hypothalamus does not produce “hunger” in the sense of physiological signs like stomach contractions and low blood sugar. Such stimulation *mimics* the effect of hunger by activating consummatory feedback in the absence of physiological signs which are normally necessary for this feedback to occur. The psychologist O. H. Mowrer called this process drive *induction*¹⁴ as opposed to drive reduction.

If human needs and drives are to be regarded more favorably, what does that mean for society? The implications are revolutionary. The partnership theorist Riane Eisler has described the common nonsense of a dominator society based on glorifying pain and denigrating pleasure.¹⁵ Come on, some of you may say, do we really do this in Western society now? Haven’t we in the enlightened late Twentieth Century outgrown the monastic flagellation of the Middle Ages? Eisler argues, and I agree, that we haven’t outgrown it enough, and points as evidence to many unpleasant aspects of modern culture that we take for granted as “human nature.” These include fear-based dominance hierarchies; male oppression of women; eroticization of violence; repression of sexual pleasure; overpopulation due to restrictions on contraception (because we think of sex as sinful); religious glorification of self-induced pain, and cultural glorification of war.¹⁶ This may seem to be countered by the large entertainment industry that mass produces images of pleasure, particularly sexual pleasure, in film and television. But Eisler points out that even the entertainment industry often supports a dominator ethic by associating sexual pleasure with violence or at least with unpleasant relationships (not just in pornography but even in movies based on “romantic” novels.)

How different society would be if the positive valuing of pleasure hinted at by many psychologists and hippies became universal! How different society would be if the belief that humans are motivated not only by survival and reproduction (the “selfish gene”¹⁷) but by pleasure and love came to be generally

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accepted. Partnership relations, lasting peace, and cooperation would no longer appear to be unattainable dreams.

A favorable view of human desires has also influenced neural network modeling. Since the 1970s, many network theorists have tried to reproduce the feedback loops in the brain related to drive satisfaction. Two pioneers in this effort are Harry Klopf and Stephen Grossberg.

Hedonistic Neurons and Maximal Utility

Mowrer's idea of drive induction can be restated, anthropomorphically, as the notion that organisms seek stimulation. Harry Klopf attempted to formalize this notion in neural network terms.¹⁸ He contrasted seeking maximum stimulation with the "drive reducing" tendency to seek a balanced or steady-state condition in other respects (such as blood sugar or hormone levels). Since seeking a steady-state condition is called *homeostasis*,¹⁹ Klopf coined the opposing word *heterostasis* for seeking a maximum condition.

In Klopf's theory, all parts of the brain independently seek positive electrical stimulation (the analog of "pleasure") and avoid negative stimulation ("pain"). In other words, brain areas are *goal-seeking devices*: they respond electrically to stimuli from elsewhere in the brain and test the consequences of their own responses. If responding to a given stimulus leads to "pleasure," the given brain area will respond more frequently to that stimulus in the future. This is analogous to B. F. Skinner's rats pressing a lever more often if that act has previously yielded them food.²⁰ If responding to that stimulus leads instead to "pain," the brain area will respond less frequently to that stimulus in the future. Klopf proposed that this capacity for testing the consequences of actions in terms of received stimulation is best explained by a hypothesis that the same capacity extends to *individual brain cells* — which is why he called his 1982 book *The Hedonistic Neuron*.

The idea of "goal-seeking" implies some purpose in our biology, and the idea of "device" implies that the brain is a mechanism. Both notions are likely to be uncomfortable ideas to some readers, and they

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may even appear to be incompatible with each other. But every complex system in nature is a mechanism, and purpose is something that appears at some stage in the development from cells to the conscious mind. Whether or not purpose appears at the level of subregions of the brain, as Klopff proposed, is not central to the main themes of this book.

Klopff divided the brain into distinct subsystems, each seeking “pleasure.” These subsystems all interact, and sometimes are in conflict. The three large systems in his scheme, in order from the lower to the higher levels of the brain, are: the *reticular formation*, part of the midbrain (see Figure 1.1 for the location of the midbrain), which is the overall command and control center; the *limbic system* (see Figure 3.1), including the amygdala and hippocampus, and hypothalamus, which include drive and reinforcement centers that specify important subgoals, such as homeostasis and reproduction; and the *cerebral cortex* or outer part of the brain (see Figure 3.2), which provides plans relating goal realizations to specific sensory events, memories, and motor behaviors. In his theory, each of these subsystems independently seeks heterostasis (maximum stimulation), but the reticular formation is the final “arbiter” of all decisions.

Klopff’s theory provides a good alternative to the drive reduction interpretation of reinforcement.²¹ But his work also contains an implicit suggestion that seems hard to believe, a suggestion that there is a single organizing criterion (in this case, maximum stimulation of the reticular formation) by which we make *all* of our decisions. Various experimental psychologists have found evidence of “irrational” behavior in animals, which would seem to contradict the claim of a single decision criterion. For example, Richard Solomon, Leon Kamin, and Lyman Wynne found an experimental model of learned helplessness.²² They trained dogs to make a particular motor response to avoid electric shock, then later shocked the animals for making that very same response. As a result, these dogs exhibited a great deal of confusion and some self-punitive behavior. Jeffrey Gray and P. T. Smith reviewed experimental studies of rats taught to go down runways for food.²³ Under many conditions, once the response had been learned, the rats maintained the response more reliably if it was intermittently reinforced with food than if it was reliably reinforced every time they do it. The comparison with human gambling is obvious.

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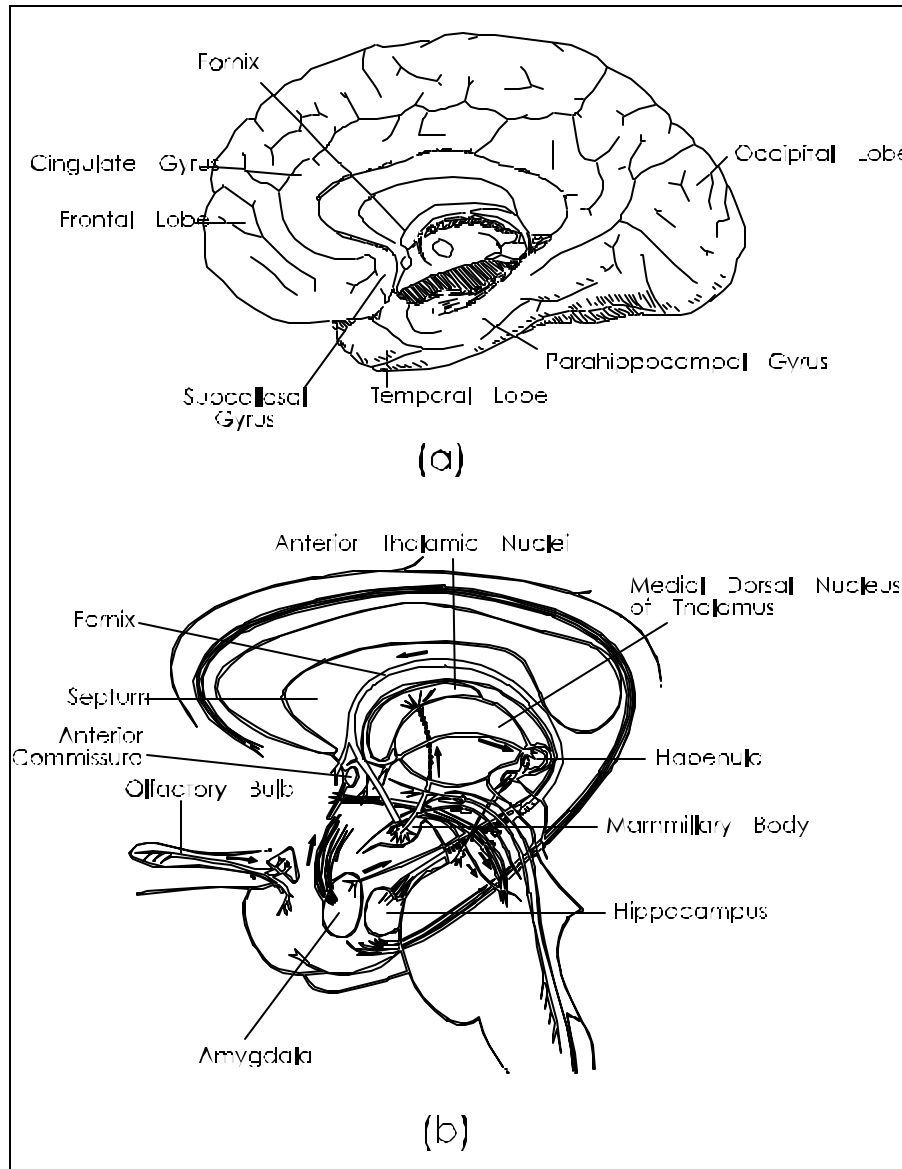


Figure 3.1. View of the brain from its center line, highlighting major structures in the limbic system. (a) Location of the limbic lobe, the primitive area of cortex which encircles the brain stem. (b) Location of deeper limbic structures (e.g., septum, hippocampus, amygdala) that lie under the limbic lobe. (Adapted by permission of the publisher from Kandel, Schwartz, & Jessell, *Principles of Neural Science*. Copyright 1991 by Appleton-Lange).

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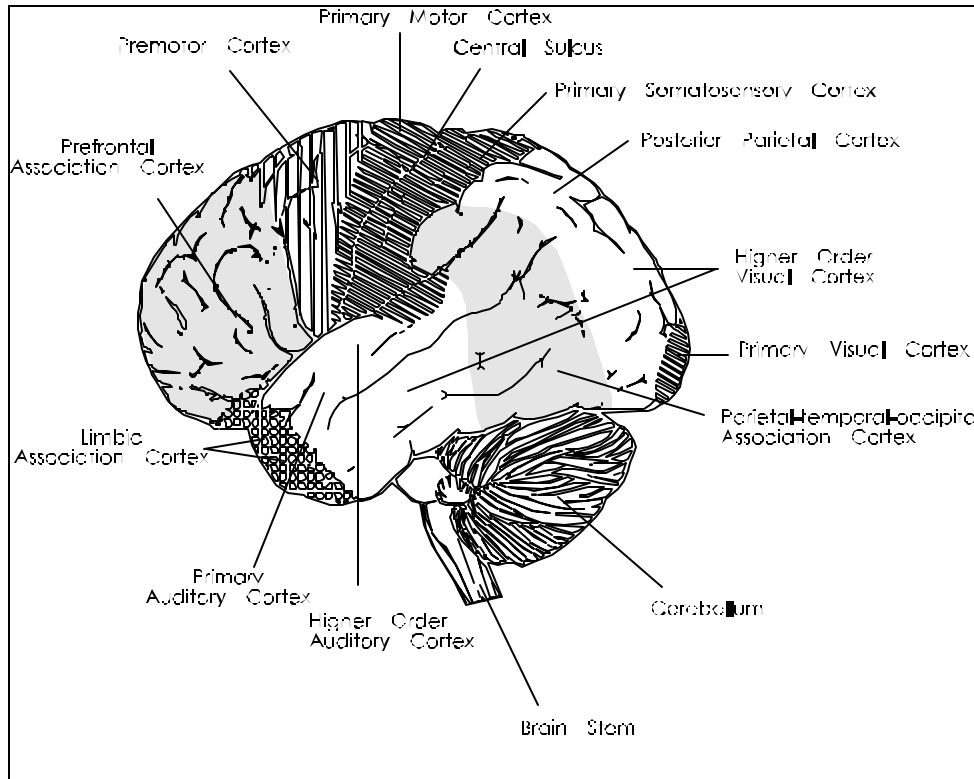


Figure 3.2. Schematic drawing of one side of the brain, highlighting subdivisions of the cerebral cortex. *Association cortex* refers to areas not primarily devoted to one sensory modality (vision, hearing, touch, etc.) but synthesizing information from all senses. *Primary* and *higher order*, for each sense, refer to processing stages, the primary being closest to the sensory input. *Primary motor* and *premotor* are motor control stages, the primary motor being closest to the motor output. (Adapted by permission of the publisher from Kandel, Schwartz, & Jessell, *Principles of Neural Science*. Copyright 1991 by Appleton-Lange).

Moreover, if *all* of our decisions are optimal from the viewpoint of maximizing pleasure, that means that when we are violent or domineering, we are acting optimally! Only if we acknowledge that some human behavior is in fact not optimal but self-defeating can we seriously entertain the likelihood that war, poverty, environmental destruction and other bad results of dominator behaviors can be improved on. So Klopf's statements that we are driven by pleasure, and not just by survival, are progressive and promote a partnership society. His statements that pleasure maximizing accounts for *all* behavior do the opposite

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— and in fact Klopff’s own later neural network models shifted away from the strict hedonistic neuron theory.²⁴

The controversy over whether there is an all-encompassing human decision criterion rages not only in psychology²⁵ but also in other social scientific fields, particularly economics. The orthodox view among economists is that there is some expected measure of happiness, which they term *utility*, that both consumers and producers maximize at all times.²⁶ Most current econometric models are still based on the idea of maximizing utility despite strong evidence against it. The experimental psychologists Amos Tversky and Daniel Kahneman (see Chapter 1, Case 3) did a series of experiments in which they gave people hypothetical monetary alternatives and found that people didn’t always make the “rational” choice between them.²⁷ One example would be “Which of two alternatives would you prefer: (A) certainty of earning \$240, or (B) 25% chance of earning \$1000 and 75% chance of earning nothing?” The easiest way to figure out a mathematical “utility” for such choices is to multiply earnings by the probability of getting them: so alternative (A) would have a utility of $100\% \times \$240 = \240 , whereas (B) would have a utility of $25\% \times \$1000 = \250 . So the “rational” person, who conforms to typical econometric models, would prefer (B). But Tversky and Kahneman found that most people preferred (A)! The reasons for that are intuitively clear: *certainty* itself has a positive value, and this more than makes up for the slightly smaller amount of money expected.

An opposing theory to the economic orthodoxy is that economic behavior is *predictable* (or at least explicable) without being *rational*.²⁸ For example, consumers will often stick with the “tried and true” even after a demonstration that a new product is superior in some way. One such case was the widespread rejection of the new taste that Coca-Cola introduced in the mid-1980s even though the new taste had been preferred by a two-to-one margin over the old one in blind taste tests.* The preference for the older product can be either out of emotional attachment or sheer habit. Paradoxically, some other products sell just because they are novel and for no other substantive reason. Sensitivity to affect, habit, and novelty is

* Sam Leven and I modeled “Coke buying” in a neural network; see Chapter 6.

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not confined to consumers; these factors also influence the behavior of international financiers and government negotiators. All this again argues against a single all-encompassing — and in some way “rational” — human decision criterion.

Even if he is wrong in some details of what various brain regions do, however, Klopff is correct in attributing importance to distinct neural subsystems. For example, St. Paul’s lament that “The good I will I do not” (see Chapter 1) is very understandable if the subsystem that “wills” and the subsystem that “does” are separate. Because these separate systems do interact strongly, we are aware of the gap between will and action and feel frustration about it. Will, in the sense of planning to maximize happiness, is one of several influences on action but not all-powerful. Some neural network theories by Stephen Grossberg and his colleagues clarify what the competing influences are.²⁹

Drive Representations and the Frontal Lobes

Grossberg constructed various interrelated networks of neural subsystems to explain animal conditioning experiments. He started with the classic experiment of Ivan Pavlov whereby the sound of a bell is repeatedly followed by presentation of meat powder to a dog until the dog salivates to the bell alone.³⁰ Some aspects of Pavlovian conditioning can be modeled in a simple network by means of an association between bell and food. But the details of conditioning models are far more complex than that. Grossberg’s version of a conditioning network included some subsystems that coded sensory events, or the memories of those events; these subsystems he (and others) called *sensory representations*. The networks also included other subsystems that coded motor actions or the intentions to perform those actions. But he found that the conditioning data could best be explained if in addition to sensory and motor representations, the network included what he called *drive representations*. That is, there were neural subsystems that simultaneously coded the level of a drive and the possibility of satisfying it. The hunger drive representation, for example, was highly active whenever the organism was hungry *and* there was either available food or a cue signaling future food. Grossberg’s theory hints the association Pavlov’s dogs

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make with the bell sound is not to the specific smell of meat but more broadly to satisfaction of the hunger drive.

Grossberg's networks include positive feedback between sensory and drive representations. Such feedback determines which stimuli, and which actions, a person or animal will find rewarding or punishing. (In addition to representations of "positive" drives like hunger, these neural networks also contain representations of "negative" drives like fear.) It also strongly influences which events in a complex environment will be attended to, because the most attention is paid to events that are important for satisfying drives. Grossberg and his colleagues have done computer simulations of some of these networks, reproducing detailed experimental data on Pavlovian conditioning and selective attention.³¹

Returning to the actual brain, feedback between sensory and drive representations tends to be weakened by frontal lobe damage in humans or monkeys. So let us discuss the data on frontal lobe damage, with the cautionary note that the wiring diagram of this part of the brain is far from being fully worked out. Also, different functions have been identified for parts within the frontal lobes (as well as between the left and right lobes). But to a first approximation, treating the frontal lobes as a unified whole provides some useful insights into how motivation and cognition interact. Also, the behavior of many people with frontal damage is, I believe, just an exaggeration of an effect that often occurs in normal people without brain damage. This effect is the control of behavior either by entrenched habits (including much of our societal common nonsense!) or by impulses, rather than by plans or will.

One common consequence of frontal lobe damage — particularly damage to the *dorsolateral* frontal area, which is separate from the orbital part that Antonio Damasio studied³² — is persistence of behavior that was originally reinforcing or useful but no longer is. This is often called *perseveration*. The neuropsychologist Brenda Milner studied frontal lobe patients on a card sorting test.³³ Subjects could classify cards on the basis of one of three criteria (color, shape, or number shown on the card; see Figure 3.3). At each card placement, the experimenter said "Right" or "Wrong" without telling why. At first, responses based on color were reinforced. But after the

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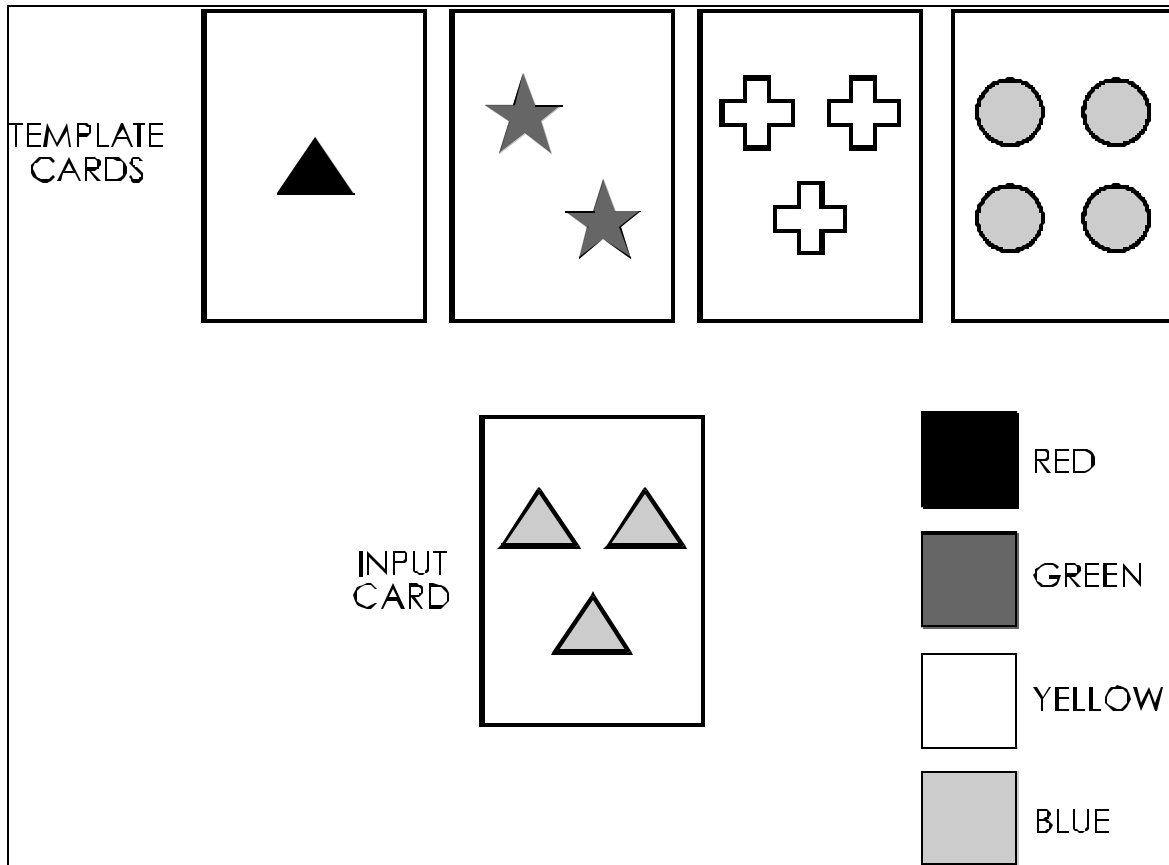


Figure 3.3. Cards used in the Wisconsin Card Sorting Test. The input card is matched to one of the template cards. (Reprinted from Levine and Prueitt, 1989, with permission of Pergamon Press.)

subject had achieved ten correct responses in a row to color, the experimenter switched the criterion to shape without warning; after ten correct responses on a row, the criterion switched to number, and so on. Normal subjects and patients with non-frontal brain lesions could learn to make the switch (and other, subsequent, switches of criterion). The frontally damaged subjects, while they could learn the color classification as quickly as normals, could never make the switch to shape but persisted in classifying cards on the basis of color even when repeatedly told they were wrong. Another example of perseveration,

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observed by the neuropsychologist A. R. Luria, occurred when frontal patients were asked to draw, in order, a cross, two circles, and a triangle.³⁴ Often, these patients simply drew four crosses.

Frontal lobe damage, which promotes perseveration in unsatisfying habits, also paradoxically promotes excessive attraction to novelty. An example occurs in the experiment of Karl Pribram on rhesus monkeys with damage to the *orbital* frontal area.³⁵ In this experiment a peanut was placed under a junk object, unobserved by the monkey. Each time the field of view was hidden from the monkey, a new junk object was added and the peanut placed under the novel object. Normal monkeys tended to look (in the early part of the experiment, until they caught on to the system!) under the object where the peanut had been previously. Frontally damaged monkeys, by contrast, tended to look immediately under the novel object (although they didn't always stay with that object). So in this experiment, unlike Milner's, the brain-damaged subjects initially made *fewer* errors than the normals.

Why should frontal damage promote perseveration of choices where there is no change in the sensory environment, but excessive attraction to novelty when there is change? Walle Nauta hypothesized that habit and novelty not only compete with each other, but both compete as choice criteria with reward or penalty based on drive satisfaction. ("Drive satisfaction" can be interpreted in a broad sense, not necessarily having to do with an innate physiological drive such as hunger or sex. For example, in Milner's experiment, the reinforcement was verbal and came from the experimenter's statements of "Right" or "Wrong.") Frontal damage breaks connections between exteroceptive (outside-sensing) and interoceptive (inside-sensing) areas of the brain. So the choices made by frontally damaged people and monkeys are

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less influenced by reward or penalty than are choices made by normal people or monkeys. Because there is still *some* effect of reward, in Milner's card sorting test, the color classification can be established at the start if there are no competing habits yet. But if a competing criterion (whether habit or novelty) is operative, the much weakened penalty or reward signals are overwhelmed. Nauta's hypothesis was supported by computer simulations of a neural network Sam Leven, Paul Prueitt, and I developed.³⁶

In neural terms, persistence of habits can be thought of as inertia: the tendency for connections that are strong to remain strong. It is related to the tendency toward self-fulfilling prophecy (see Chapter 1, Case 1, of this book). So why is there an attraction to novelty at all? This is because inertia can be overcome by a curiosity drive, a dislike of boredom; this is what forms the basis of heterostasis or stimulation-seeking in Harry Klopf's neural network model (see above). The experimental psychologist D. E. Berlyne found, in fact, that caged rats would press a lever to obtain a *change* in the light intensity of their surroundings, regardless of whether the change made the cage lighter or darker.³⁷

The basis for attraction to novelty is related to the fact that a reward or punishment value of a stimulus is enhanced when that stimulus is unexpected. This is also the basis for the preference for intermittent over continuous reinforcement described above.³⁸ The brain mechanisms proposed for this to occur have involved depletion or habituation at the neuron level of chemical transmitters, the substances that "carry" nerve impulses across synapses.³⁹ This suggests that a stimulus that is presented continuously tends to fade in importance to the observer, unless it carries a strong emotional message. Pribram's frontally damaged monkeys illustrate that if novelty is present and is not ignored, it tends to override habit.

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In normal people with no brain damage, decisions among possible actions involve complex, partly unconscious, cognitive processes which consider habit and novelty as well as our deepest emotional desires. This makes it clear that like the Jewish father who hit his son in the joke, we don't always do what we want to do. In spite of this, a lot of common nonsense is based on the belief that everything we do *is* what we want to do.

Neurosis Versus Long-term Reinforcement

What are some of the regular patterns in neurotic or non-self-actualized behavior? Further insight into many neurotic patterns can be obtained from an extension of Harry Klopf's ideas. Recall that Klopf distinguished heterostasis (pleasure, or maximum stimulation) from homeostasis (survival, or maintenance of a biological steady state). Since survival is a necessary precondition for pleasure, homeostasis is a subgoal of the overriding goal of heterostasis.

One common form of neurosis is for the subgoal of homeostasis to become so overriding as to turn one's mind away from heterostasis. This happens with emotional insecurity, or unwarranted fear that an action will result, if not in death, in loss of a job or status or a relationship. People frequently choose security ("homeostasis") and unnecessarily deny themselves much of the richness ("heterostasis") of life.

Some classic neurotic patterns can be viewed as exaggerated needs for "security blankets" of some sort. That interpretation can be given, for example, to obsessive-compulsive rituals, avoidance phobias,

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and many cases of drug or alcohol addiction. (In extreme cases, the sub-subgoal of preserving the obsessive pattern of action overrides homeostasis itself!) What is more unsettling, though, is how much seemingly normal behavior is motivated by fear of bad consequences that may or may not be likely. In fact, Abraham Maslow spoke of life as a continuing struggle between safety and growth.

Not only can excessive obsession with safety interfere with enjoyment of life; it can even, at least in the long run, interfere with safety. For a good analogy, I am indebted to the neuroanatomist Walle Nauta for a story about engineers in the early days of airplanes. Flying needs to build in “homeostasis” in the form of correcting the angle of inclination of the wings if it gets outside a certain allowable range. But engineers found, somewhat to their surprise, that if the tolerable range was set to be too narrow, then overcorrection could set the airplane wildly off course. It was better to allow for some degree of “play” in the wing inclination.

Overcorrection due to intolerance of deviation is common, and often destructive, in the behavior of individuals. Consider people trapped in their own houses during fires because they have erected an elaborate security system against burglars. And this general type of behavior spreads from individuals to the large groups they form. Consider corporations whose productivity suffers because they lay off workers or break labor unions in fear of a self-sufficient, motivated, and independently powerful work force. And consider nations that live in mortal fear of the nuclear arsenals they have created to ward off the threat of terrorism, communism or capitalism.

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Short-term and long-term reinforcement, like short-term and long-term profit, aren't always the same. This is part of the "good I will I do not" paradox. Overcoming excessive need for safety requires something akin to religious faith, an ability to take risks and see the long view of things. Sticking to "tried and true" patterns has legitimate uses in some situations. But as the complexity and interdependency of society grows, the need for being open to unconventional solutions (without worshiping novelty for novelty's sake) grows, in politics, science, and every other enterprise.

People do a curious mixture of what they want to do and what *they think*, accurately or inaccurately, is possible to do. Often, people acting on their own needs and desires are more benevolent than those that sacrifice their needs in the name of some higher "duty." As Bertrand Russell said: "The ascetic depreciation of the pleasures of sense has not promoted kindness or tolerance ... On the contrary, when a man tortures himself he feels it gives him a right to torture others, and inclines him to accept any system of dogma by which this right is fortified."⁴⁰

So our needs and desires aren't the villains that Western folk psychology often makes them. They have been widely demonized because of our common nonsense that (a) reason and emotion are opposites and (b) reason is superior to emotion. By contrast, neuroscience, experimental psychology, and neural networks point to a common sense view of reason and emotion as equal and cooperating partners.

Reason and Emotion Revisited

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The myth that reason is superior to emotion is supported by our language. Colloquially, we say that a person “acts emotionally” if he or she does something in the heat of emotion, destructively, and in an ill-considered manner. For example, the expression is used for a person who commits a crime of passion, or falls in love with an unsuitable partner, or votes for a candidate based on superficial appeals. But actually, a person who works hard and steadily to support a family is acting out of the emotion of love for her or his family members! Moreover, a person who discovers a new treatment for a disease is acting out of at least two emotions: concern for sick people and enjoyment of the scientific creative process. The common use of the expression “acting emotionally” is sloppy; more accurate use of the term would include the last two people mentioned, whose actions most of us admire, as much as those who commit crimes of passion.

Many experimental psychologists have manipulated the emotional states of their subjects and observed how these emotional states influenced cognitive processes. For example, Alice Isen and her associates induced positive emotions in several ways — showing five minutes of a comedy film, passing out a small bag of candy, and mentioning words which have positive meaning.⁴¹ They found that people in a positive mood were better than those in a neutral mood at tasks that required creative solutions. They also found that these people could make more flexible categorizations than people in other moods. The happier people were more likely than others to identify atypical members of a category as part of the category, if the category was a favorable one. For example, the subjects in a positive mood were more likely to identify bartenders as nurturers.

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Flexible categorization is very important for generating compassionate attitudes toward other people. Empathy, as many social psychologists and clinical neuropsychologists have noted, doesn't just have a feeling component. It also has a cognitive component: to "put oneself in your neighbor's shoes" also requires breaking down preconceptions about what might motivate the other person. Also, empathy involves the cognitive act of drawing some type of analogy between another person's feelings and how you would feel in the same situation.⁴² The neuropsychologists Lynn Grattan, Paul Eslinger, and their colleagues have begun to study how cognitive flexibility and empathy are related in the frontal lobes.⁴³

The truth is that reason and emotion perform different functions, and both are necessary for a rewarding life. Emotion provides the sense of what we need and want, whereas reason provides the techniques and strategies for achieving our needs. The neuroscientist Antonio Damasio gave much clinical evidence that detaching decision from emotions (as with damage to the orbital part of the frontal lobes) leads to dysfunctional decision making, such as endless indecision about where to eat out.⁴⁴

How might emotion and reason be expressed in the brain? The separate but interacting nature of these two sets of functions is hinted at by the neuroscientist Paul MacLean's theory, dating from the 1960s, of the *triune brain*.⁴⁵ The triune ("three-in-one") brain theory says that reason, emotion, and instinct are roughly encoded by three different areas of the brain, and these areas function as separate but sometimes interacting systems.

From extensive behavioral studies of lesions or electrical stimulation of different brain areas, MacLean developed a theory that the human brain is divided into three "layers" that arrived at different

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stages of evolution. At the deepest levels are the midbrain, pons, and medulla (Figure 1.1) and other areas forming the “reptilian brain” which has changed little from reptiles to lower mammals to humans. The reptilian brain is responsible for species-specific, almost automatic, instinctive behavior. Such behavior is needed for the basic maintenance of the organism, but also extends to habitual patterns such as dominance hierarchies. This part of the brain has been described by MacLean as “neurosis-bound by an ancestral superego.”⁴⁶

Just above the reptilian brain, in MacLean’s theory, is the limbic system which is the center of the “old mammalian brain” (also sometimes called the “visceral brain”) which he identifies with the limbic system (see Figure 3.1). It is responsible, in this scheme, for emotions such as fear, love, and anger which attend the needs for survival of the individual and survival of the species.

Finally, at the very top is the cerebral cortex (Figure 3.2) which is called the “new mammalian brain” (because it is not well developed in vertebrates other than mammals, and some of it — the frontal area — is only well developed in primates). The new mammalian brain is the “thinking cap” over the rest of the brain, the part that is responsible for our rational strategies and our extensive verbal and intellectual capacities.

MacLean’s scheme is open to, and has received, significant criticism of its scientific details.⁴⁷ His assignment of functions to specific subregions of the brain is imprecise. For example, as the neuropsychologist Karl Pribram has pointed out,⁴⁸ the limbic system deals not only with emotion but also with memory, and many other parts of the brain are also involved with emotional expression. His connection

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of brain regions with particular species is also imprecise. For example, the hippocampus, a part of the limbic system or “old mammalian brain,” is well developed in reptiles. But in spite of these missing details, MacLean’s scheme is a fairly good simplification of some more detailed schemes about brain regions and functions by other neuroscientists. Pribram and Diane McGuinness,⁴⁹ for example, identified three brain systems involved in the control of attention to new stimuli from the environment. One system, relating to identifying “What is it?,” is centered in the amygdala (see Figure 1.1) of the limbic system. A second system, relating to identifying “What’s to be done?” is centered in the *basal ganglia* (see Figure 1.1), part of what MacLean calls the “reptilian brain.” A third system, relating to processing of changes in the emotional significance of stimuli, is centered in the hippocampus of the limbic system.

Moreover, MacLean made a major contribution to psychological theory by adding to the traditional reason-emotion dichotomy a third category for instincts or habits. The distinction between emotions and habits is also supported by results of experiments performed on macaque monkeys by the neuroscientist Mortimer Mishkin and his colleagues.⁵⁰ Mishkin and his co-workers showed that extensive damage to the limbic system prevented monkeys from being able to remember the emotional importance of sensory events, for use in future cognitive tasks. The same limbic damage did not, however, interfere with a more primitive capacity, learning an invariant motor response to a rewarded stimulus. Seemingly, these monkeys remembered the motor response they had developed on the basis of reward while forgetting about the reward itself.

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These researchers concluded that there are two separate neural systems for encoding memories and habits. The memory system, centered in the hippocampus and amygdala, stores representations of how rewarding or punishing are specific sensory stimuli or motor actions. The habit system, centered in the basal ganglia, stores representations of the motor actions themselves, regardless of their current reinforcement value. Since 1984 when Mishkin and his colleagues wrote, this view of the function of the basal ganglia has been shown to be somewhat simplistic: they actually are involved extensively in cognitive-emotional interactions.⁵¹ But most cognitive neuroscientists still believe in the functional distinction between memories of the emotional consequences of actions and habits of performing the actions.

While Mishkin and his colleagues were talking about *motor* habits, I conjecture by analogy that the neural architecture he discusses also encodes *cognitive* habits. In the Milner card sorting experiment discussed above, classifying cards on the basis of color is an example of a cognitive habit. The term “habit” doesn’t necessarily refer to repeating the same action, but might also refer to repeating the same rule for organizing information, a rule that generalizes to different events. Other examples of cognitive habits include some of our common unconscious patterns for how we choose leaders or objects of sexual attraction. In this outlook, the traditional ethical question of “How do we make reason triumph over emotion?” should be replaced by “How do we put our reason to the service of healthy emotions like love and enthusiasm rather than to the service of blind habits?”

Recent computational theories of neural networks support the idea that emotion and reason both perform necessary functions. Stephen Grossberg went through a thought experiment which outlines the

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theoretical steps necessary to understand typical conditioning data such as Pavlov's.⁵² These steps involve neural representations of external sensory events (such as lights or bells), internal drives (such as hunger), and motor behaviors (such as salivation). He embodies this thought experiment in a generic neural network that can simulate results of a conditioning experiment. The network consists of interacting *nodes* or functional units (each corresponding, probably, to many thousands of neurons in the brain) encoding sensory stimuli, drives, and motor behaviors.

Referring to previous work by the neuropsychologist Donald Hebb, Grossberg said that “every sensory event has two quite different effects: its *cue* function and its *arousal* or *vigilance* function. The cue function represents the information in the event that selectively guides behavior. The arousal function energizes the behavior. Hebb suggested that learning without arousal is not possible.”⁵³ Specifically, if a bell, say, has been repeatedly paired with food that activates the drive (emotion) area, the animal comes to selectively attend to the bell and attach positive value to it. Emotion and reason are both part of this simulated animal's learning process. Emotion tells the animal what it wants (food) and drives it to focus its attention on watching or listening for signals of future food. Reason tells it *which* of the things it sees or hears are in fact signals of future food.

Grossberg went on to discuss some intellectual history which suggests the harm done by treating reason and emotion as opposites:

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Actually, the distinction between information, or reason, and energy, or passion, is a very old one that was already embraced by the rationalists ... in their efforts to construct a comprehensive philosophical framework by which to understand human behavior. This distinction has even been a force guiding social policy as in Vienna during the time of Wittgenstein ... where men were supposed to embody the principle of reason, and women the principle of passion that was considered to be destructive of reason. This belief was used to justify various unpleasant social policies. By contrast with the Viennese notion, the thought experiment [of Grossberg's theory] requires both principles to compute the simplest memories, reasonable or not.⁵⁴

The “three brains” within us led MacLean to be somewhat cynical about whether the human personality can achieve healthy integration. He described our three brains by the colorful metaphor of a person, a horse, and a crocodile in the same room, unable to communicate easily with each other.⁵⁵ But the role of the frontal lobes — when we use them effectively — leads me to be more hopeful. As the neuroanatomist Walle Nauta hinted,⁵⁶ the frontal lobes perform precisely the function of communication between the “person, horse, and crocodile.” We can take comfort in the fact that the frontal cortex is *both* the area of cortex capable of the most complex cognitive associations (such as associations of events across time) and also the cortical area most directly connected to the “emotional brain” (limbic system and hypothalamus).

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We must distinguish, though, between optimism about what *can be* and optimism about what *is*. We will now further explore and refute ideas (from biology, psychology, and economics) based on the belief that all our actions are optimal in some meaningful sense. I will indicate that, in fact, actuality and optimality are not the same, not by a long shot. My conclusions will not lead to despair, but to a deeper optimism about human potential.

In the world view arising from modern science, selection among traits is often thought to be based on evolution. So now let's see if evolution can provide the perspective we need on optimality.

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Chapter 3: Actuality Versus Optimality

1 Ausubel, 1948.

2 Maslow, 1968, 1971.

3 Maslow, 1971, 43.

4 Ibid., 45.

5 Benedict, 1970.

6 Maslow, 1968, 28.

7 Ibid., 30.

8 See the discussion of this point in Maslow, 1968, 26.

9 Hofstede, 1980.

10 Hull, 1943.

11 Olds, 1955.

12 Olds, 1977.

13 Delgado and Anand, 1953.

14 Mowrer, 1960.

15 Eisler, 1995.

16 Levine, 1997a.

17 Dawkins, 1989.

18 Klopff, 1982.

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19 Cannon, 1929.

20 Skinner, 1938.

21 Levine, 1983a, 1983b.

22 Solomon, Kamin, and Wynne, 1983.

23 Gray and Smith, 1969.

24 Klopff, 1988

25 Levine and Elsberry, 1997.

26 Lancaster, 1966; Weintraub, 1979.

27 Tversky and Kahneman, 1974, 1981.

28 Heiner, 1983, 1985; Leven, 1987.

29 Grossberg, 1975, 1982.

30 Pavlov, 1927.

31 Grossberg and Levine, 1987; Grossberg and Schmajuk, 1987.

32 Damasio, 1994.

33 Milner, 1963, 1964.

34 Reviewed in Nauta, 1971.

35 Pribram, 1961.

36 Leven and Levine, 1987; Levine and Prueitt, 1989.

37 Berlyne, 1969.

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38 Gray and Smith, 1969.

39 Grossberg, 1972a, 1972b; Klopff, 1988.

40 Russell, 1950, 150.

41 Isen, 1993.

42 Barnes and Thagard, 1997.

43 Grattan, Bloomer, Archambault, and Eslinger, 1994; Eslinger, in press.

44 Damasio, 1994.

45 MacLean, 1970.

46 MacLean, 1964.

47 Pribram, 1984.

48 Ibid.

49 Pribram and McGuinness, 1992.

50 Mishkin, 1987; Mishkin, Malamut, and Bachevalier, 1984.

51 Houk, Davis, and Beiser, 1995.

52 Grossberg, 1982.

53 Ibid., 295.

54 Idem.

55 MacLean, 1962, 289.

56 Nauta, 1971.