

# 10

## What You Get is More Than What You See

Nature or nurture? Are personality and mental ability determined by heredity or environment? People get emotionally wrought up on both sides of the debate. The “nature” advocates argue passionately that unless we recognize differences — not just between individuals but between groups, like races or sexes — people won’t be encouraged to develop their unique potentials (see the recent popular book *The Bell Curve*<sup>1</sup>). We need, they say, to recognize our best potential rocket scientists as well as our best potential care givers, and not try to make one into the other. The “nurture” advocates argue just as passionately that we must treat people equally and avoid oppressing people or groups. They say that anybody can become, as my Jewish immigrant ancestors would have said, “an anything” if encouraged by society.

There’s an old joke about a group of college students animatedly carrying on this argument about heredity and environment in one of the students’ homes. The host’s grandmother happens to be around and overhears the discussion. She butts in, “Back in my day it was simpler. When the kid looked like his father, we said it was heredity. When the kid looked like his neighbor, we said it was environment.”

Without taking the grandmother’s comment literally, we can use it to deflate the silliness of extreme positions that exclude either genetic or environmental influences. From the viewpoint of current brain science, both extremes — nature alone or nurture alone — look like common nonsense. The academic psychologist Warren Tryon suggested that the modern conceptual tools provided by neural network theory can be a basis for bridging the paradox between nature and nurture, along with several other paradoxes in psychology.<sup>2</sup> The current state of neural networks, neuroscience, and psychology leads us to two conclusions about nature and nurture:

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1. *Both nature and nurture are important, and neither is dominant.* Influences during the critical period of child development have lasting effects on the person's brain structure as well as personality. For an extreme example, the neuropsychiatrist Bruce Perry and others have shown that prolonged periods of abuse lead to a chronic stress reaction in children that alters the distribution and usability of some of the neurotransmitters in the brain stem.<sup>3</sup> Brain changes due to less extreme factors, such as the emotional and intellectual richness or poverty of the family environment, are less well established, but all evidence points to the existence of such changes. On the other hand, Perry also emphasizes that people have different genetic tendencies toward different types of mental disorders, and these tendencies will affect what happens to the abuse victim as an adult.

In the 1990s there developed a popular perception, at least in the United States, that scientists as a whole are viewing personality as mainly genetic and inborn. This was the cover story of a recent issue of *Life* magazine, for example. The reality is that recent scientific findings point to both nature and nurture, but some powerful corporations find it to their benefit to selectively emphasize nature. For example, the science writer and social activist Jeremy Rifkin discussed the growing biotechnology industry and its efforts to make massive profits from patenting and marketing particular human genes. Rifkin noted that the biotechnology industry depends on its scientific foundation: "a spate of new scientific studies on the genetic basis of human behavior and the new sociobiology that favors nature over nurture are providing a cultural context for the widespread acceptance of the new biotechnologies."<sup>4</sup> He went on to promote a growing movement for "genetic rights," involving both religious groups and human rights advocates, that is trying to place limits on profit making from human genes.

2. *Even nature and nurture together don't account for the sum total of personality.* Personality, skills, and mental tendencies come from dynamic interaction among many influences.

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Both nature and nurture play major roles, but so does the situation the person is in at the present time. Brain science suggests we should add to *both* nature and nurture a third set of influences: choice or context. This tells us that human possibilities are more variable and richer than our common nonsense makes them seem — that is, “what you get is more than what you see” (see the “bullets” in Chapter 1).

### **Nature and Nurture Revisited**

People who think personality is all genetic often draw analogies between mental function and function of other parts of the body. They use arguments such as: “just like some people are naturally taller or stronger than others, so are some people naturally more aggressive, more fearful, more contemplative, more extroverted, et cetera.” Since the brain is composed of living cells and subject to the laws of genetics like the rest of the body, these arguments are partially valid. However, there’s a major difference between the brain and the rest of the body which hints that environment should have more influence on brain function than on any other type of bodily function.

The difference has to do with the overarching function that the brain is specialized to perform. The brain’s basic purpose is to mediate between the organism and its environment. Our elaborate system of concepts, beliefs, thoughts, and feelings serves to translate sensory signals from the outside world into motor acts for us to perform — whether the ultimate purpose of those acts is mere survival or richness of experience. And in order to mediate most effectively with the environment, the brain should be able to *change* with the environment.

This type of brain change enables us to learn, both from parents and adult mentors during childhood and from other people and experiences all through life. The infant’s brain is *more* changeable than the adult’s, the critical period for development being about four to seven years. During this critical period, new cells and connections can form in the brain, as well as existing connections becoming stronger or weaker. So the young child is both more flexible and more vulnerable than the older child or the adult. But in the

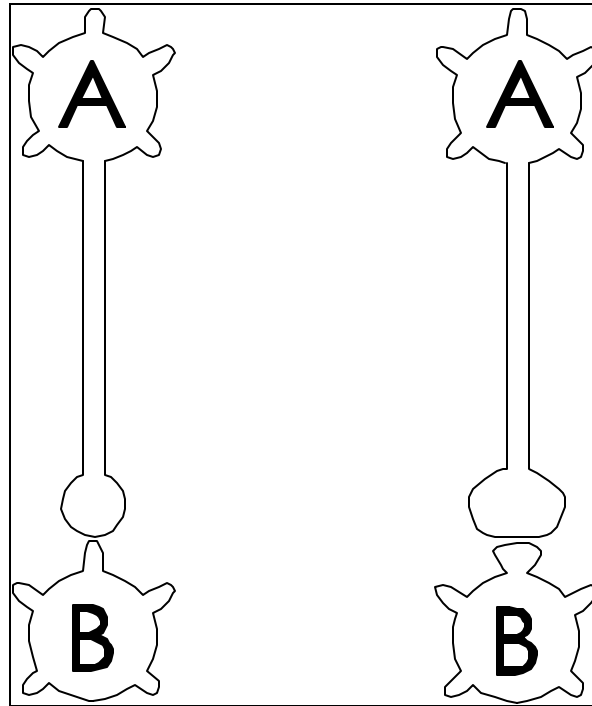
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adult, while no new cells are believed to form (and, possibly, no new connections), existing connections can still be made stronger or weaker by experience.

Both scientists and the public have taken a long time to accept that the environment actually causes changes in the brain at the level of single-cell neurophysiology and neurochemistry. But as early as the turn of the Twentieth Century, a few psychologists proposed such a cellular change as a way to account for their behavioral observations. Sigmund Freud, before his career became diverted to psychoanalysis, spent a lot of time pursuing biological explanations of behavior. Freud proposed that learning an association between two concepts (such as the sound of a person's name and the appearance of her or his face) involves strengthening a synapse between two neurons that encode those concepts.<sup>5</sup> Much later, in a seminal book published in 1949, the behavioral physiologist Donald Hebb proposed that some kind of change in the structure of the synapse between two neurons (see Figure 10.1) takes place if the two neurons are electrically active at about the same time.<sup>6</sup> This sort of learning in neural networks is in fact still often called *Hebbian learning*.

Many neurophysiologists resisted the idea of a change at the synapse until it was demonstrated by electrical recordings from single neurons. Whereas psychologists observe whole people or animals, neurophysiologists work with electrodes small enough to insert into neurons of diameter a thousandth of a millimeter or less. Placing these electrodes requires delicate control, and even in skilled hands they sometimes break. As a consequence, results of neurophysiological experiments typically come much more slowly than results of psychological experiments. Whereas Hebb's idea was based on Pavlov's conditioning results, published in 1927, the first laboratory observation that actual synapses could change in strength didn't occur until 1965 in invertebrates and 1973 in mammals. Hebb's hypothesis of an actual change in the shape of the synapse was not confirmed exactly, but more subtle biochemical changes at the synapse or the surrounding cell membrane were found that had roughly the same effect.

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**Figure 10.1.** Diagram of Hebb's structural change hypothesis. The knob at the synapse from *presynaptic* neuron A to *postsynaptic* neuron B gets larger after an impulse at A is repeatedly followed by an impulse at B. (Adapted by permission of the publisher from Levine, *Mathematical Biosciences* 66, 1-86. Copyright 1983 by Elsevier Science Publishing Co., Inc.)

The first significant result about learning at the nerve cell level was due to Eric Kandel and Léon Tauc, who in 1965 discovered in the California sea slug (*Aplysia*) a mechanism called *heterosynaptic facilitation*.<sup>7</sup> Heterosynaptic facilitation has been defined as “a change in synaptic efficacy (or cellular excitability) in one neuron as a result of release of a modulatory transmitter from another neuron.”<sup>8</sup> This work initiated a long series of detailed cellular studies of learning in *Aplysia* and other invertebrates, which is still taking place.

In mammal brains, the first significant result was due to Timothy Bliss and Terje Lømo, who in 1973 demonstrated in the hippocampus (see Figure 3.1) of the rabbit's brain a phenomenon they called

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*long-term potentiation* (LTP)<sup>9</sup>. LTP is defined as “a persistent enhancement of synaptic efficacy generally produced as a result of delivering a brief (several second) high-frequency train ... of electrical stimuli to an ... incoming ... pathway.”<sup>10</sup> In other words, an existing synapse becomes strengthened, in the sense that an electrical impulse to the incoming pathway becomes more likely to cause electrical activity in the neuron to which it connects. This increase in synaptic strength can last up to several hours in an interconnected group of isolated neurons grown in the laboratory, and up to several days in a living animal.

Bliss and Lømo didn't relate LTP directly to learning, but later physiologists did. Specifically, these physiologists showed that LTP can be enhanced while the animal is learning associations between concepts. The area of the brain where they observed it, the hippocampus, is heavily involved in learning such new associations and encoding them in memory. Many scientists now believe that the cellular changes related to LTP make the hippocampus uniquely suitable for its job of encoding learned associations between concepts and laying down memory traces.<sup>11</sup>

The findings in both slugs and rabbits, and later in other species, have been convincing. Because of these findings, most scientists now agree that day-to-day events, especially unexpected ones, cause changes in the chemistry of neural transmitters at some synapses. The exact biochemical mechanisms for these changes are not well worked out. Nor do scientists even yet have a clear idea which group of neurons in which part of the brain encodes a concept such as a particular friend's face. Results are coming quickly, however, both from biochemical studies of neural transmitters and from imaging that indicates which regions of the brain are metabolically active in the presence of specific stimuli.

The mounting evidence for the role of learning in the brain hasn't yet fully reached the public consciousness, at least in the United States. The media tend to play up the genetic side of personality more than the environmental. Partly this is because in a competitive market-oriented society, a belief in genetic tendencies is convenient and a belief that social change has an effect is inconvenient.

I often hear parents (some of them scientists themselves!) argue that behavior must be genetic, because they treated two of their children the same but their personalities came out totally different. But none of us ever really treat two people *exactly* the same, even if we have no *intention* to discriminate.

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Birth order and gender, for example, inevitably make a difference in the child's environment. Also, the parents may be at different stages in their own lives (vocational, interpersonal, or spiritual) when the two children are in their critical periods of mental development. Changes in the parents' income, job situations, quality of marriage, religious beliefs, or anything else can certainly affect, at an unconscious level, how they deal with their children. So these kinds of homespun observations of behavior are subject to many possible interpretations.

The conclusions we draw from observing behavior are heavily influenced by the cultural beliefs we bring to our experiences. The cultural belief that personality and mental tendencies are genetic, that people "have essential traits," seems to be stronger in the United States than anywhere else. One example has to do with beliefs about possession of specific intellectual talents. The educational psychologist Harold Stevenson and his colleagues have done a series of studies comparing American, Japanese, and Taiwanese elementary school children on mathematical performance.<sup>12</sup> These researchers found that Americans lag behind Asians in mathematical skills, but not in reading skills, even at the age of five. One reason, Stevenson and his colleagues discovered, is that Americans tend to believe people either are born with mathematical ability or can't acquire it. Both Taiwanese and Japanese, by contrast, tend to believe that while mathematical ability may vary significantly between people, anyone can learn basic skills and concepts in the subject with hard work.

The conclusions of Stevenson's group on mathematical skill are supported by the American concept of a "nerd" or "geek" as a distinct type of person, technically bright but inept at life in general.\* Some of my colleagues raised elsewhere (e.g., Western or Eastern Europe) have told me that this concept doesn't have an equivalent in the societies they grew up in. This mind set about mathematical ability leads to a cultural tendency to dislike quantitative pursuits, which is bound to have bad consequences for American technology.

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\* The nerd stereotype has been moderated in the 1990s by the rise of the class of computer entrepreneurs, but still persists.

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But is mental function all nurture and no nature? Certainly not! While training influences which of a range of possible behaviors we express, the range itself differs between people. Different talents and tendencies are stronger in different people, even if there is a lot of overlap. For example, almost everyone can learn basic math, its applications to other fields, and its implications for science and philosophy, but it is likely that fewer people can earn a living proving mathematical theorems. Moreover, in addition to inborn aspects of personality or mental skills that are unique to each individual, we also have a genetic endowment that is universal and includes basic needs and values. The set of values discussed by Abraham Maslow,<sup>13</sup> all the way from safety and nutritional needs to self-actualization, is probably inborn in each of us.

Ignoring either nature or nurture can lead to oppression. The anthropologist Melvin Konner pointed out that the Nazis emphasized nature but the Russian Communists under Stalin emphasized nurture.<sup>14</sup> The Nazis built their oppressive society around the “natural” superiority they believed Germans had over other races. But, Konner added, the Stalinists built an equally oppressive society around the belief that people could be nurtured to love the Communist system more than their own families and friends.

Maslow’s notion of universal needs argues that people have limits to their mental flexibility. People do sometimes accept violations of their basic rights when they feel powerless, as under the Nazis or Stalinists, but our own neural networks are constructed so that we can never be truly happy with those violations.<sup>15</sup> Even in the more superficially appealing dictatorship of *Brave New World*, or the potential future technological paradise offered by escaping into virtual reality, I believe we would on some unconscious level feel unsatisfied. The writers of the American Declaration of Independence may have had this aspect of human nature in mind when they spoke about our “inalienable rights” to life, liberty, and the pursuit of happiness.

Even nature and nurture *combined* don’t tell the whole story about what aspects of human personality are expressed and when they are expressed. Nature and nurture usually provide us with more than one choice of possible behavior. Since two behaviors in our repertoire may be mutually incompatible (say, standing up or sitting down), there needs to be some way for the context to help us decide which one to express. There seems to be some evidence that the neural circuits for many choices of behavior exist

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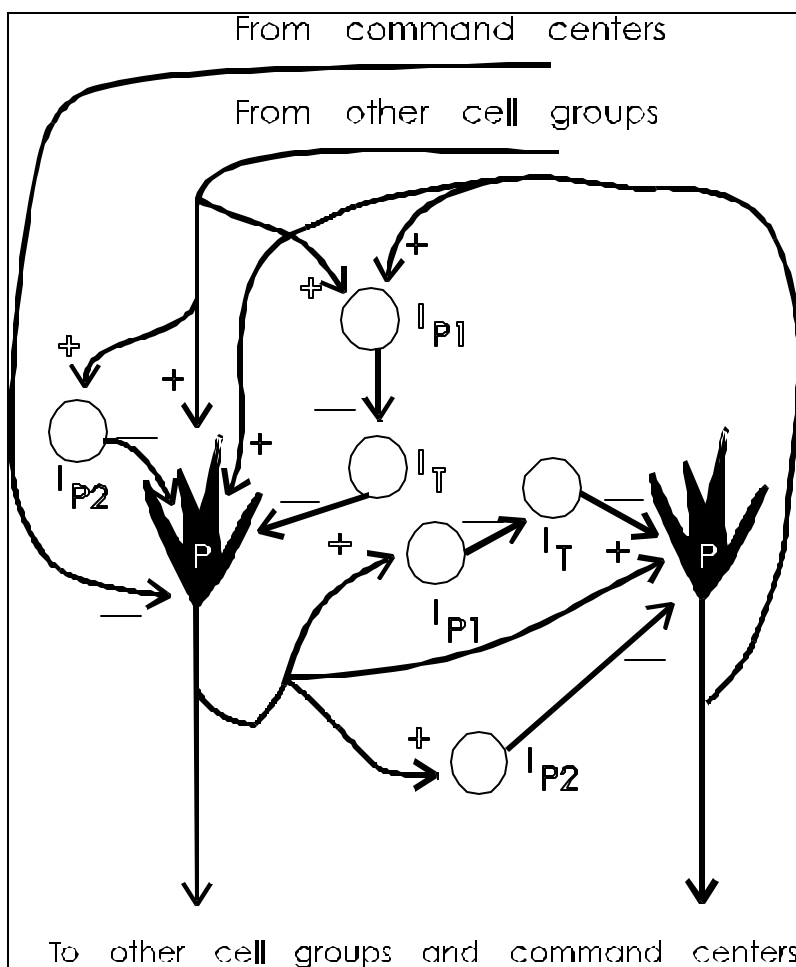
all the time and are ready to be released at the proper moment. Most of the time any given behavior is held in check (in biological terms, *inhibited*), awaiting the proper neural signal that inhibits the inhibition and so disinhibits the behavior.

### **Add Disinhibition**

A biological basis for disinhibition has been suggested by the neurochemist Eugene Roberts.<sup>16</sup> Roberts has extensively studied the distribution in the brain of various neural transmitters, such as acetylcholine, norepinephrine, and gamma amino butyric acid (GABA). He showed that GABA is an inhibitory transmitter; that is, a signal caused by release of this chemical substance tends to reduce the electrical activity of the neuron to which the signal is sent.<sup>17</sup> Some GABA neurons when active inhibit certain complex patterns of neural activity that involve large numbers of neurons and may relate to specific behavioral tendencies. These GABA neurons are in turn inhibited by neurons that use some other transmitter, such as acetylcholine, dopamine, or norepinephrine. Inhibition of GABA causes release of a neural activity pattern that has already been programmed and leads to some set of behaviors.

Figure 10.2 shows a generic scheme for disinhibition of some complex behavioral pattern. This is mediated, in Roberts' theory, by areas of the brain that he calls *command centers* because they send "command signals" that may determine which of several possible behaviors is expressed. These command centers are in widely scattered areas of the brain (e.g., the cerebellum, brain stem, basal ganglia, and cerebral cortex) and even the spinal cord. Different centers control a wide variety of neural activities — possibly including neural activities that support beliefs as well as those that support motor actions. Therefore, the particular anatomy in Figure 10.2 actually has a great many variations in different parts of the nervous system. Also, the exact neural transmitters used could vary in different brain regions. But there appear to be some common features, including the role of

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**Figure 10.2.** Disinhibition that occurs, with many variations, in different brain areas and cell groups. P denotes principal neurons, or largest ones in the area; in the cortex they are called *pyramidal cells*. P neurons are controlled by various smaller neurons that are inhibitory. “Command centers” are explained in the text. The subscript “T” on I<sub>T</sub> means *tonic*, or active essentially all the time unless inhibited. The subscript “P” on I<sub>P1</sub> and I<sub>P2</sub> means *phasic*, or active only some of the time. Activity patterns generated by the P cells are inhibited by tonic inhibitory neurons that probably use GABA (see text) as a chemical transmitter. Phasic neurons I<sub>P1</sub> become active in selected contexts, inhibiting I<sub>T</sub> and releasing the behavior generated by the P cell. I<sub>P2</sub> is another kind of inhibitory neuron that one P cell can use to turn off another one, leading to competition between the behavior patterns those two P cells generate. (Adapted from Roberts, 1986, with permission of Academic Press.)

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the inhibitory transmitter GABA and selective disinhibition, that are common throughout all these different examples.

Roberts speculates that disinhibition provides an efficient way to keep behavior flexible. If contexts change and radically different sets of behaviors become necessary, the brain doesn't have to generate the required behavior pattern anew each time. Rather, the pattern can be stored permanently, inhibited most of the time (in technical terms, *tonically* inhibited), and disinhibited by signals representing the appropriate context for its release. This context could either be a demand from the environment (social as well as physical) or a strong internal desire.

In his most recent work,<sup>18</sup> Roberts has referred to the pattern being released as a *local optimizer*. What criterion it is using for optimization (see Chapter 4 of this book) depends on the context. This allows for variability because it means that the person or animal (or society) can optimize different things at different times. For example, a person may have moods where she or he wants to be very social and maximize the number of possible friends. But the same person may have other moods where she or he wants to be contemplative and maximize the quiet time needed to think through a deep thought or work out a personal emotional problem.

Roberts' broad theory of disinhibition has, I believe, implications for mental function and social interactions that go beyond the scope of his own articles. Disinhibition theory strengthens the idea that "what you get is more than what you see." How people are acting at any one time represents not their "traits" but only one of many possible patterns in their behavioral repertoire. Consider, for example, the case of mathematical ability mentioned earlier. People who do well in college mathematics courses don't necessarily have a "special talent." They may simply be people whose math phobia has been *inhibited* and whose abstracting and calculating abilities have been successfully *disinhibited*.\*

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\* One thing that helped me to be good at math was learning to play with numbers in childhood *before* being told that math was supposed to be hard!

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Often, behaviors that are *not* currently observable need to be considered as possibilities. From this viewpoint, a criterion for judging human interactions is: what part of a person's overall behavioral repertoire do those interactions selectively disinhibit, or bring out?

A good metaphor for this kind of selective disinhibition is education. The Latin word *educare* means, literally, to "lead out" or "draw out." The best educators see their work not so much as sharing new knowledge or wisdom, but as bringing out the capacity of students to develop their own skills, that is, to teach themselves. Good psychotherapy, also, can serve to selectively disinhibit desirable behavior patterns that are held in check by the client's fears or cognitive habits (see the last chapter).

Selective disinhibition needs to be considered as well in structuring organizations. In government or business organizations whose work involves flexible responses to diverse and rapidly changing situations, it is important that a wide range of possible actions be discussed. Under some circumstances, ideas that are normally inhibited by standard organizational policy should be disinhibited. This suggests a loose command structure, in line with the studies of Chris Argyris on flexible management patterns (see Chapter 9).<sup>19</sup> That is, the structure would encourage, and not punish, feedback from any member of the organization to any other. Threats which inhibit employees, for example, from criticizing those of higher rank in the organization, would be removed as much as possible. This also suggests giving prominent roles to people with an innovative, risk-taking, hunch-playing decision style.<sup>20</sup>

The importance of disinhibition sheds a new light on the old nature-nurture controversy, and also on the more recent sociobiology debate. There are three, not two, major components to the individual's behavioral repertoire. First, there is genetic endowment, partly universal for our species and partly unique to the individual. Second, there is early development, which depends on events during the critical period in which new neural connections can be formed. Finally, there is selective disinhibition, throughout life, of competing behavior patterns. The patterns being selected may themselves be either genetic or developmental in origin (or a mixture of both). Disinhibition involves modification of neural activity (in adults, not by forming new connections in the brain but by strengthening or weakening existing connections).

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Selection of which patterns to disinhibit may be mediated from the outside, by the social and physical environment, or from the inside, by our own decisions.

The overarching message of Roberts' neurochemical model is that we aren't stuck with whatever our current behaviors are. This is because seemingly entrenched behavior patterns — including dysfunctional ones like neuroses, psychoses, and addictions — can be altered by environmental events that selectively disinhibit competing patterns. Neural networks provide a theoretical way to study these kinds of selective disinhibition. Sam Leven and Joanne Luciano, for example, have suggested neural network approaches to in modeling the genesis, and possible treatment, of learned helplessness.<sup>21</sup> These models involve complex interacting effects of learned helplessness on all major chemical transmitter systems — norepinephrine, dopamine, serotonin, acetylcholine, GABA, and others.

Roberts is joined by many other theoretically inclined neuroscientists. Gerald Edelman hypothesized that we have a repertoire of competing behavioral patterns. He called his theory “neural Darwinism” because he believes in “natural selection” among patterns.<sup>22</sup> Tentatively, Edelman identified specific biochemical substances that mark boundaries between groups of neurons that code particular patterns, groups that can “capture” cells from each other during development. George Mpitsos and his colleagues related variability of behavior to mathematical chaos.<sup>23</sup> These researchers observed chaotic electrical impulse patterns in invertebrate nerve cells and speculated that the chaos serves to make it easier for animals to move from one behavior pattern as the demands of their environments change.<sup>24</sup>

All this means that humans are far richer in possibilities than they may appear to be under some kinds of temporary stresses. Since social systems are at least as complex as individual nervous systems, societies are also richer than they appear to be under temporary stresses. But “temporary” can mean either a short or a long time. In fact, some writers have hinted that many of our cultural and religious mores come from temporary stresses under which Western society has labored for thousands of years!<sup>25</sup> The work of Riane Eisler<sup>26</sup> in fact suggests that societies that preceded most of recorded history may have been organized with vastly different assumptions about partnerships and hierarchies than are our own. (Is this

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the true meaning of these words from a Christian hymn: “A thousand ages in thy sight are like an evening gone”?)

If we are aware of a wider range of human possibilities, it can help us reexamine our habits, as individuals and as societies. Any pattern of action that we casually label “human nature” or “the way things have always been” may in fact be just one of many possible ways to deal with a situation. This suggests that conventional cynical beliefs that limit the possibilities in society are usually common nonsense. Let’s look a bit more at our cynical common nonsense and the harm it causes.

### **Prophecies of Doom**

At the start of this book we showed how self-fulfilling prophecy can shape behavior. This has a positive side: teachers led to believe that certain children had great potential treated them that way and made it come true. But self-fulfilling prophecy, of course, also has a negative side. If our view of human nature is too cynical, we destroy other people’s faith that they can act courageously or ethically.

The psychoanalyst Anna Freud talked about *identification with the aggressor*.<sup>27</sup> This means that people who feel powerless under another person’s or group’s control start seeing the world through the eyes of the controller. This change in the controlled person’s perception further increases the other person’s control and the controllee’s powerlessness. Identification with the aggressor is common in prisoners of war or hostages (such as Patricia Hearst becoming, briefly, a propagandist for the Symbionese Liberation Army which had captured her). It often leads to loss of will among people who might otherwise have a chance to resist or escape their oppressors. For example, many victims of Nazi brutality avoided resisting the regime or the police even in the early stages when they had a chance to get out of the country alive.

In our normal day-to-day society, many people undergo a more subtle but just as insidious identification with an aggressor that is not an individual or a government but a set of social forces. Many of us often succumb to the belief that impersonal technology is inevitably overtaking our sense of

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community. Moreover, we feel that the few who have access to mass communications dominate us, and worse yet, that there is nothing we can do about it. This is more indirect than yielding to a Hitler or Stalin but, in the long run, almost as deadly. The large size of nations and corporations, the increasing homogeneity of mass media, make many of us lose faith that our own voices can be heard. But losing faith can only make the problem worse. Recognizing these cynical beliefs for the common nonsense they are (an updated version of “you can’t fight City Hall”), and keeping faith in the power of change, can make the problem better.

Sometimes, for our own economic survival, we must serve forces that we believe are destructive. Many people who do research on neural networks, for example, have been consultants for the military on the uses of brain-like structures for recognizing radar patterns or controlling the flight plans of “smart” missiles. Military power can be used constructively, as it was in World War II to defeat an aggressor who threatens genocide or destruction of one’s home. The point remains, though, that people in every profession have to make some compromises with the existing power structure. If we must do that, we should try to keep in mind the Hindu ideal of transcendence, the ideal of being “in the world and not of it.” If we must compromise with the power structure in parts of our professional lives, at least we should try not to make the compromise total or permanent. Let us instead keep sight of the humane purposes which helped to determine our choices of work — those of us who were American students in the 1960s called it “relevance.”

If we lose the sense of higher purpose behind our employment — the old fashioned sense of “vocation,” from its Latin meaning of “calling”<sup>28</sup> — we are in danger of becoming spiritually corrupted. At worst, we can actively serve evil like the *ringwraiths* of J. R. R. Tolkien’s classic fantasy, *Lord of the Rings*.<sup>29</sup> In Tolkien’s tale, the ringwraiths are servants of Sauron, the lord of death. They try to destroy Frodo, the hero who bears the ring their evil lord needs to rule the world. The wraiths wound Frodo with a knife that breaks from its hilt and sends splinters deep inside his shoulder. Without the healing arts of the good elves, the knife splinter would work its way to Frodo’s heart and change him into another servant of the lord of death.

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Ingmar Bergman's film, *The Seventh Seal*, depicts service to evil as a death dance. The story of this film (which is named after an episode in the Biblical Book of Revelations) takes place during the plague epidemic of the Middle Ages. Throughout most of the story, a family named Bloch wanders through the countryside trying to escape from the disease. Their quest to live is symbolized by the ongoing chess game one of its members plays against a personal Death. Finally, Death overtakes the Blochs and many other people. The film ends with these people performing a dance at Death's command.

The small compromises and little deaths of mundane life don't seem as creepy as ringwraiths or death dances. But their corrosive effects on our spirits, while slower, are nearly as great.

### **What Sometimes Passes for Common Sense**

Much of this is captured by the term *crackpot realism*, coined by the sociologist C. Wright Mills.<sup>30</sup> In discussing issues like the environment, war, and social welfare, we have developed the habit of using words like "practical," "realistic," and even "common sense" for policies that in fact are destructive to society and so don't make any sense. We use terms like "practical" because these policies seem *politically* feasible and don't threaten habitual modes of action.

There are often bold, innovative, constructive alternatives available to the current policies, alternatives that actually make more sense to implement. So why do we get into the habit of thinking that these alternative policies aren't feasible, even when they really are? This is partly because each of us often underestimates other people's flexibility and tolerance. If conventional wisdom (which is more conventional than wise) is strong in an organization or community, the force of conformity can make dissenters feel and act invisible. A person with a dissenting view may act as if *everyone else* has the conventional view, and may even be unaware of others that share his or her opinion. An example was cited by David Riesman (personal communication, from a social relations class at Harvard). Sociologists asked random people in Elmira, New York, about the town's political views and kept hearing "All of us on Main Street are Republicans." But further probing revealed that a third of the people asked were Democrats!

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Breaking the “lowest common denominator” habits of social policy takes patience. It takes a willingness to experiment and accept temporary criticism in return for possible long-term success. Without this kind of courage, we drift into a maladaptive positive feedback loop, one that is similar to the behavioral feedback loop of a person with frontal lobe damage (see the “MART” network of Figure 4.2). In this case the feedback loop is at the level of society, and the “nodes” of the loop are politicians, media, and the public. Politicians and media don’t offer serious discussion of issues because they don’t believe the public is ready for it. The public, on the other hand, feels powerless to resist the process and then gets disgusted because real issues aren’t addressed.

The history of politics and societies *should* tell us, by contrast, that the “way things always are” doesn’t last, that the “immutable” is mutable.\* In the mid-1970s, who would have thought that in twenty years there would be a non-Communist Russia, a multiracial government in South Africa, or peace talks between Israelis and Palestinians? In early 1991, who would have thought that in two years the President who triumphed in Desert Storm would be out of office? We now accept these changes as having happened, which should open up our faith in the possibilities for politics and society. But we still persist in believing that a more basic and broader change to a genuinely cooperative society is impossible because human nature is too selfish. We retain this disbelief even though many psychologists, anthropologists, and animal behaviorists now state that this view of human nature as selfish is incorrect.<sup>31</sup>

Our cynical putting down of human nature and of each other has terrible consequences. It often leads, for example, to unnecessary wars (see Chapter 4). While the historian Barbara Tuchman described drift into war as the result of policy makers being irrational and “woodenheaded,”<sup>32</sup> a more systematic set of cynical beliefs about human nature probably contributes much to this drift. People on each side of a

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\* The “immutable” is even mutable in the cosmos. Ralph Abraham in *Chaos, Gaia, Eros* (Harper, San Francisco, 1994) reviews the failed attempts by physicists and mathematicians to prove that the solar system is stable, that is, that the sun will always rise tomorrow. Even though the sun not rising tomorrow is extremely *improbable*, the possibility of chaos in the system is such that it isn’t *impossible*. (Recall the discussion in Chapter 5 about confusing improbability with impossibility.)

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conflict project their general cynicism into a specific distrust of people on the other side. This makes them shun a negotiated settlement that might prevent war from occurring.

Our underestimation of people also leads to neglect of human concerns, and of the environment, in the name of “practicality” or “the bottom line.” We all pay the price for our lack of faith. Common nonsense masquerades for a while as common sense, but in the end, “God is not mocked” (*Galatians 6:7*).

### **“There are More Things in Heaven and Earth ...”**

Modern American and European common nonsense includes many loose philosophical statements about social roles, gender roles, hierarchies, and human nature. That there should be haves and have-nots, that honesty and decency should ultimately fail, that men and women should have separate and unequal spheres, and so forth, is often said to be “natural” or “the way things must be.” But such beliefs may stem from an unconscious assumption that Western cultural mores of the last three thousand years represent immutable laws of the human personality.

These assumptions about human personality are now being seriously challenged. The common nonsense of seeing human personality as flawed and hierarchical social organization as inevitable, or as the only way to deal with imperfect humans, is being seen as a psychological barrier to dealing with the challenges of a chaotic world. Increasing numbers of writers, in history, anthropology, and fiction, are suggesting that societies have been or can be organized in ways that are radically different from current ways. This lends hope to the possibility that radical change is possible for the future of the Earth. Whether or not the historical speculations I will mention prove to be accurate, the fact that they are being seriously considered bodes well for the variability of human social behavior. This in turn encourages our creative potential in designing new mores to fit our changing ecological and technological conditions.

One of the best sources of alternative visions has been the feminist movement and feminist scholarship. This is to be expected because women are a majority of people in Western society but are underrepresented in historical accounts, both as writers and as actors. In particular, many feminist authors

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have gathered evidence supporting the notion that in ancient times, goddesses were the major objects of worship in much of Europe, Asia, and Northern Africa. The archaeologist Marija Gimbutas found a great many ritual objects in an area she called “Old Europe” (mostly within the current territory of Greece, southern Russia, the Ukraine and the former Yugoslavia) compatible with a well developed goddess religion that flourished between 7000 and 5000 B.C.<sup>33</sup> The goddess religion continued in the artistically and technically advanced Minoan culture of the island of Crete, which was ultimately conquered by Greek worshippers of male gods between 1500 and 1000 B.C.

Gimbutas’ and other archaeological findings are incomplete, but numerous enough to suggest to many authors that earlier societies were organized in a manner very different from the norms of the last three thousand years<sup>34</sup>. The goddess religions, these authors argued, went along with women holding power, owning property, and controlling family descent to a much greater degree than in most modern societies.

Also, some authors have suggested that these goddess-centered societies were based on partnership instead of domination. These authors believe the goddess-based societies were more peaceful than modern ones, or than other societies contemporary with their own.<sup>35</sup> The archaeologist Jacquetta Hawkes noted that the Sumerians, Babylonians, and Egyptians, centered around male supreme gods, \* went in for sculptures depicting male rulers triumphing in war or in hunting. But she said the Cretans were different:

It would seem, then, that in the first growths of civilization where both economic forces and the human imagination created royal theocracies, it was almost inevitable that the kings would show their godlike power in triumph over foreign enemies, and their godlike strength in killing wild beasts. Yet in Crete, where hallowed rulers commanded wealth and power and lived in splendid palaces, there was hardly a trace of these manifestations of masculine pride and unthinking

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\* Merlin Stone (*When God Was a Woman*, Harcourt Brace Jovanovich, New York, 1976) gives evidence that Sumer, Babylon, and Egypt were also originally goddess-centered, in an era before the height of Minoan culture.

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cruelty. There are no great statues or reliefs of those who sat on the thrones of ... any of the palaces. ... Nor are there in Minoan Crete any grandiose scenes of battle or of hunting.<sup>36</sup>

This early history and its meaning for us today are summarized well by Riane Eisler in two books, *The Chalice and the Blade* and *Sacred Pleasure*.<sup>37</sup> Eisler reviews archaeological evidence that societies such as Old Europe and Minoan Crete were, while not always perfect, more egalitarian and less violent on the average than modern societies. In particular, she argues that while these societies worshiped goddesses and were *matrilineal* (ancestry was reckoned from the female line), they were not *matriarchal* (women dominating men). Rather, the evidence pointed to a roughly equal partnership in these societies between men and women.

But the question inevitably arises: if these societies were really idyllic, why didn't their social organization last? Gimbutas, Eisler, and other scholars answer by pointing to a prolonged, successful invasion of these societies by male-dominated, warlike peoples, mainly from the steppes of Russia and the Caucasus, known variously as Indo-Europeans or as Kurgans. Changes in the climate of their home areas forced the nomadic Indo-European herders to leave their homes in search of food for themselves and their animals. In their search for food, they conquered some peaceful goddess-worshipping agricultural societies, in Old Europe, Egypt, Mesopotamia, and elsewhere, where food was plentiful. Then the conquerors imposed their warlike ways and patriarchal organization on the conquered. This was a gradual process, starting in the first wave of invasion around 4300 B.C. and ending with the last Cretan resistance around 1100 B.C.

Were invasion and superior weaponry the only reasons the goddess-worshipping societies broke down? Perhaps some of these societies weren't so idyllic after all and had developed internal weaknesses that made them vulnerable. Despite the evidence that men and women were equal partners in at least many of these societies, a female-centered power structure can become entrenched and corrupt just as a male one can. It seems plausible that in some societies in decline, worship of a goddess with a subservient male consort (who often was also her son) should degenerate into male subservience. In some cases, like the

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Greek city-state of Eleusis, the ruling queen's male consort was sacrificed every year. The feminist author Elizabeth Davis argued that many men were dissatisfied with their roles in those ancient times, and that these men's rebellion against the old order ultimately contributed to the warlike Indo-Europeans' takeover.<sup>38</sup>

My guess is that ancient goddess-worshippers varied as much in the effectiveness of social and political organization as did worshipers of male gods. This means some of these ancient societies, at least at some times, were exceptionally harmonious but not all. But whether or not those societies represented a "paradise lost" is not the important issue from our modern point of view. What is more important is that their history stretches our minds because they embodied customs and social patterns that most contemporary Westerners have found inconceivable. As Riane Eisler argued, while these ancient societies were not free of violence and inequality, they at least were free of some systemic cultural beliefs — some of what this book calls common nonsense — that actively *encourage* violence and inequality. In *Sacred Pleasure*,<sup>39</sup> Eisler points to many unpleasant aspects of modern society (not just in the West but all over the globe) that we often take for granted as human universals, but are the product of historical factors and can be changed without destroying social stability. These include, for example, fear-based dominance hierarchies, male oppression of women, eroticization of violence, repression of sexual pleasure, overpopulation due to restrictions on contraception, religious glorification of self-induced pain, and cultural glorification of war. Instead, the goddess-centered societies tended to glorify pleasure rather than pain, and life rather than death, at least in their official religious and political customs. So while we have different technological conditions and so can't "go back" to those societies, we can learn much from their patterns about what's possible for human beings.

What does this have to do with the biology of our brains? A lot! The findings from Old Europe and Minoan Crete show that social violence and social and gender inequality are not universal. This puts the lie to the sociobiology-based theories that such social patterns are rooted in the human brain.

People with an investment in our cultural common nonsense have trouble accepting that another society could be differently organized. Gimbutas, Hawkes, and the art historian Merlin Stone document that many traditional scholars, based in the paradigm that male domination was universal and natural, tried

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very hard to explain these findings away. But the idea of universal patriarchy had already been seriously challenged by the anthropological findings of Margaret Mead.<sup>40</sup> Mead studied three New Guinea cultures with sex roles that were different from each other and different from traditional Western roles. In one culture, men and women were equal partners and both peaceful. In a second, men and women were equal partners and both warlike. In a third, women dominated men economically and were the sexual aggressors.

The existence of past or present alternatives helps us to explain some irrational beliefs that Western culture generally takes for granted. Merlin Stone, for instance, looked in a new light at one of our major religious myths, the myth of Adam and Eve and original sin.<sup>41</sup> Stone interpreted the forbidden fruit in the Garden of Eden as related to sexual customs associated with the goddess religions, symbolized by the serpent (because it sheds its skin and regenerates every year). This interpretation was suppressed in the Bible, she said, because the priests of a patriarchal religion had to argue that male domination was the primal, natural order decreed by a male god. In order to do this, they hoped to eventually put the very idea that a goddess could be worshiped out of people's minds — and, over the centuries, they largely succeeded. This is why some parts of the Bible, instead of directly mentioning the goddess customs, contain many veiled references to “abominations” and things too horrible to contemplate. Stone suggested that much of the clergy, or at least the hierarchy, of the dominant Western religions has participated in a massive, centuries-old coverup of an alternative world view. The guilt that many Christians and Jews have learned to feel when discussing sex, and the hush-hush surrounding it, make her theory believable.

Another alternative view of our ancient past comes from the popular writer Erich Von Däniken, who argued that the Earth was visited in ancient times by astronauts from other planets.<sup>42</sup> These aliens, he said, were more technically advanced than the Earth people of their time and so were worshiped as divine. Von Däniken is a self-taught amateur, not an archaeological scholar, and tends to write in a sensational style. So his theory is less well supported than those of Eisler and Stone mentioned above. In spite of this, I believe his theory shouldn't be dismissed out of hand because it provides one possible explanation for some ancient technical achievements that are otherwise hard to understand. For example, some ancient monuments and other structures were made, often in huge blocks, of some kind of stone not native to the

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area where the monuments appeared. This means that someone must have had the technology to move these stones a considerable distance. Examples include the pyramids of Egypt, the season-based circles at Stonehenge, the pre-Inca fortress of Sacsahuaman in Peru, and the statues on Easter Island in the south Pacific.

Also, Von Däniken provides explanations for some occurrences mentioned in the Bible or in mythological books of other cultures that are hard to explain. These are events that otherwise seem miraculous enough to be dismissed as figments of a collective imagination. Examples from the Bible include the flying machines witnessed by Ezekiel; the Ark of the Covenant, which if built according to specifications could serve as a loudspeaker to transmit the voice of “God”; and the tumbling of the walls in the battle of Jericho, which is credible in the presence of high-intensity sound. I haven’t studied Von Däniken’s evidence in enough detail to have a firm opinion about its validity. However, his explanations are appealing because other parts of the Bible and ancient myths have fairly good track records for historical accuracy. The success of archaeological findings based on following directions from the Bible (such as King Solomon’s mines) or from other mythological classics (such as Troy) makes it tempting to find scientific explanations for other, yet unexplained, passages in these books, including passages that sound miraculous.

For this book’s quest to understand scientifically the limitations and possibilities of human nature, Von Däniken’s message is that the limitations are less severe and the possibilities greater than we often think. Our mainstream beliefs about the sacred, which influence our thinking about everything else in society, might in turn be influenced by specific events from ancient times. Common nonsense tends to identify “religion” or “spirituality” with the patriarchal/dominator idea of a god who is “up there” and ruling “over” us. This is a god whom we must obey in order to have a good life or a good death. But Von Däniken suggests that such a belief was the accidental result of social and technical conditions in the Earth’s ancient past.

Profound historical accidents are also suggested by Riane Eisler’s belief that our patriarchal view of God — in fact, our whole patriarchal system — arose from changes in climate in the ancient Near East.<sup>43</sup> The human need for transcendent spiritual experience is almost universal. But both the goddess scholarship

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and the ancient astronaut theories suggest that the range of possible *types* of transcendent experience is much wider than we usually assume. This is also suggested, of course, by living religious traditions different from the Judaeo-Christian-Moslem, such as Oriental, Hindu, Native American, and Druid traditions. (I don't believe, however, that any of those religions is globally "superior" to Judaism, Christianity, or Islam!) To people whose imaginations are limited by the common nonsense of Western conventional wisdom, we can say with William Shakespeare:

There are more things in heaven and earth, Horatio,  
Than are dreamt of in your philosophy. (*Hamlet*, Act I, Scene IV)

In order to transform society to bring out the best in human nature, we can't rely exclusively on any one culture, present or past, for our ideal. Instead we should try to synthesize the most desirable parts of different outlooks (for example, the social ethics in Judaism or Christianity with the celebration of nature in goddess religions). We need to seriously study those authors, both fiction and non-fiction, who create innovative social structures that are not exactly like any from the past or present. Contemporary fiction writers who have created desirable alternative societies include Ernest Callenbach, Ursula LeGuin, Doris Lessing, Marge Piercy, and Kim Stanley Robinson. Non-fiction writers who suggest desirable (and believable) futures include Ralph Abraham, Patricia Aburdene, John Calhoun, Riane Eisler, Marilyn Ferguson, Marilyn French, Elinor Lenz, David Loye, Barbara Myerhoff, John Naisbitt, and Alvin Toffler. Some ideas of these futurists will be discussed at the end of this book.

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### **An Attitude of Hope**

St. Paul's lament, "The good that I would I do not: but the evil that I would not, I do," appears to speak of tragic human limitations. But this same statement can be turned on its head and made into a message of hope. "The good I will I do not" can be restated as "I will (and can do) more good than I am currently doing."

The mathematical language of nonlinear dynamical systems provides clues for understanding Paul's lament. A person, or society, lives in a dynamical system that has the potential to approach more than one possible stable equilibrium state, or attractor. Just because it is currently moving toward a particular attractor doesn't mean that state is the only one it can settle in, or even the optimal one.

Consider, for example, Riane Eisler's description, given above, of the process whereby the predominant model in European and Middle Eastern societies shifted from a goddess-worshiping, nature-oriented pattern to a patriarchal, dominating pattern.<sup>44</sup> If society is treated as a mathematical dynamical system,<sup>45</sup> the matrilineal and patriarchal patterns constitute two competing attractors for this system. Eisler and others argue that this was a "wrong turn" taken by society, away from a partnership model to which we should return. This may be so, or else, as the mathematician Ralph Abraham suggests,<sup>46</sup> there is a third attractor, not yet reached, which synthesizes the best of both patriarchal and matrilineal societies into a fuller partnership than was ever achieved in ancient times. Figure 10.3 summarizes some possible paths of society in a system that includes all three attractors.

Some readers might object to Figure 10.3 on the grounds that it seems to reinforce the culture's common nonsense that "chaos is bad, order is good." But the positive uses of chaos in neurobiology, and the Discordian religion's doctrine of creative disorder as well as creative order, argues against that view. The "gender equality" equilibrium is listed as a single-point, static attractor in that figure, but this is only true if we are confined to a single dimension of experience (and a single dimension in the mathematical sense). The dimension is the one of value, or rootedness. Many people in both the East and West now miss the stability of values and roots they had before the postmodern (even more, before the modern) era. Their

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unhappiness about instability is drawing many back to fundamentalist and authoritarian reforms that promise a return to “family values” or the like. But a new rootedness can be achieved if we evolve toward a new set of values. These are values that include creativity and depth of experience as well as community, love, and compassion. The equilibrium point in the value dimension is compatible with constant activity and ferment (even chaos, at times) in other dimensions: personal relationships, job status, location, and artistic production, and so forth.\* The stable state envisioned for society is not an authoritarian one, but a state of peace, loose command structures, and mutual trust among people in different positions. The end of the book will describe this state in much more detail.

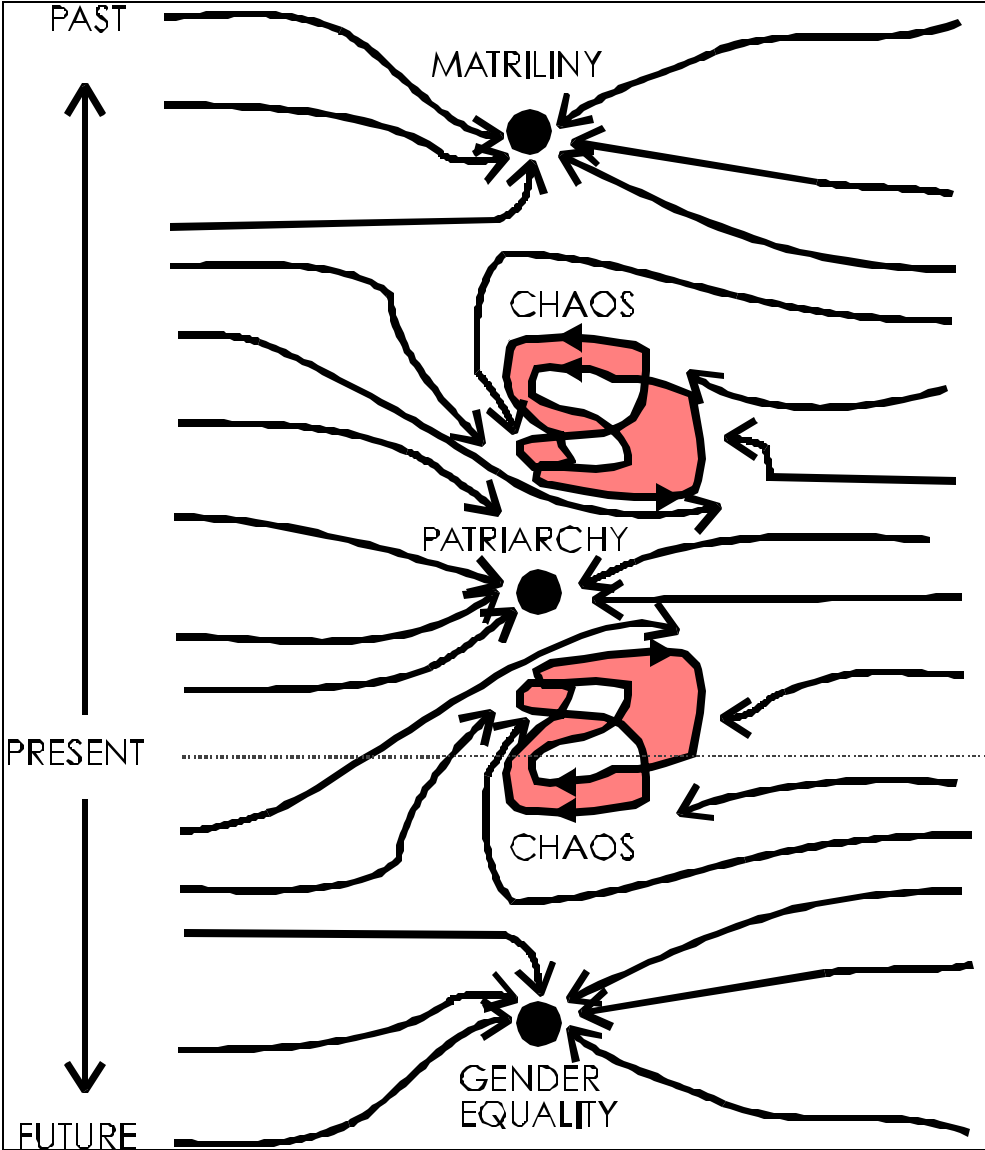
We can add more dimensions to the “gender equality” equilibrium, dimensions not shown in Figure 10.3. This equilibrium can then be seen as one that is richer and more exciting than previous equilibrium states. This fits the idea from my fantasy novel in progress (*The Ptutites*) that the divine state is one of perfect serenity combined with perfect excitement.\*\* It also fits Ralph Abraham’s idea of history as a progression between stages of a dynamical system. Abraham described the Neolithic agricultural period as a *static* era, the period since the invention of the wheel as *periodic*, and said that now with the advent of chaos theory (and many other changes) we are embarking on a *chaotic era*.<sup>47</sup> But he emphasized that “chaos” is a word of Greek mythological origin that has had a variety of other meanings than disorder, and the word is now recapturing some of its more favorable, creative connotations:

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\* Raymond Bradley and Karl Pribram (in Daniel Levine and Wesley Elsberry, Editors, *Optimality in Biological and Artificial Networks?*, Lawrence Erlbaum Associates, Mahwah, NJ, 1997) identify two interacting variables that influence the stability of social groups: in their example, urban communes. These variables are *flux*, defined as the density of interactions between people, and *control*, the extent to which rules or hierarchies govern these interactions. Bradley and Pribram identify optimal levels of both flux and control that make a commune likely to survive the longest.

\*\* Serenity versus excitement is yet another apparent dichotomy to be bridged as in Chapter 8!

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**Figure 10.3.** Paths for the predominant patterns of world society, with later times toward the bottom. The three stable attractors are matriliney, patriarchy, and (in the near future) gender equality, with periods of chaos while society is making transitions. People who live in a chaotic time and cannot imagine a novel future can only long to return to the previous stable equilibrium (for the current time, patriarchy).

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Although “chaos” today means “disorder” to most people, in the older myths there are important variant meanings. In its first occurrence, in Hesiod’s *Theogony*, Chaos meant the gap between heaven and earth. The biosphere, the atmosphere, the sociosphere, and the noosphere all occupy this gap. We live in Hesiod’s Chaos.<sup>48</sup>

Abraham’s rendition of the concept of chaos can be interpreted on many poetic and mathematical levels. But on one level, there is a striking similarity between Abraham’s notion of “gap between heaven and earth” and the gap between optimal and actual energy levels in the self-actualization neural network” in Figure 7.2 of this book! Perhaps, then, the “negative affect signal” of that figure, which drives us toward a more optimal mental state, can be interpreted more favorably, as a source of creative discontent. In the words of the poet Don Marquis (made into a Unitarian Universalist hymn):<sup>49</sup>

A fierce unrest seethes at the core  
Of all existing things:  
It was the eager wish to soar  
That gave the gods their wings.  
There throbs through all the worlds that are  
This heartbeat hot and strong,  
And shaken systems, star by star,  
Awake and glow in song.

But for the urge of this unrest  
These joyous spheres were mute;  
But for the rebel in our breast  
Had we remained as brutes.  
When baffled lips demanded speech,

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Speech trembled into birth;  
One day the lyric word shall reach  
From earth to laughing earth.

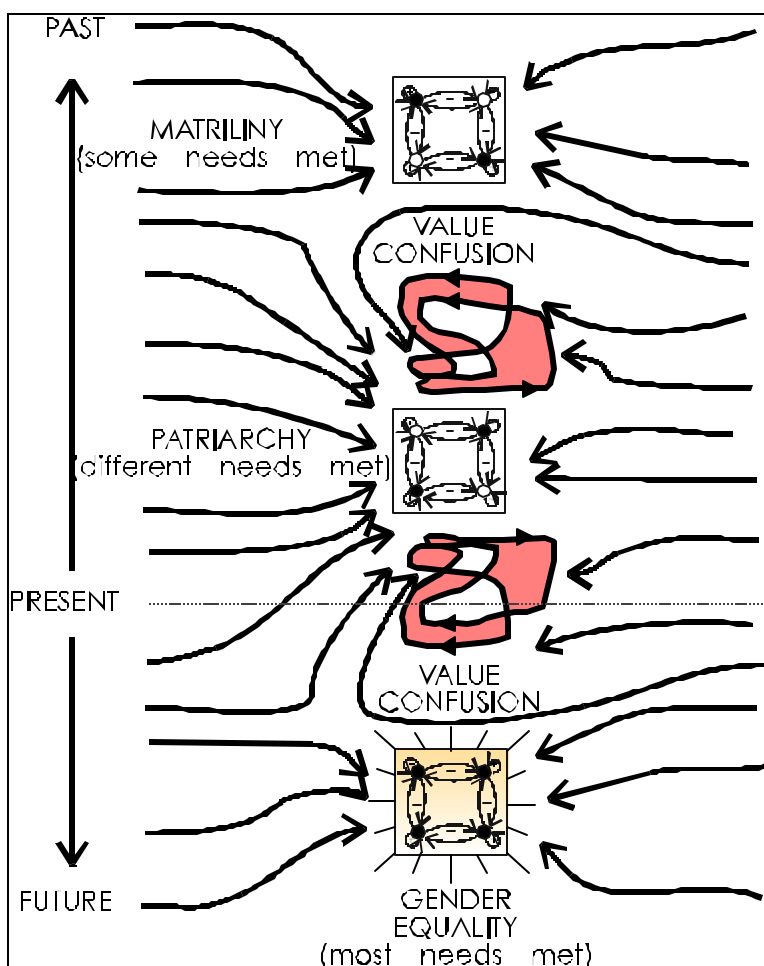
From deed to dream, from dream to deed,  
From daring hope to hope,  
The restless wish, the instant need,  
Still drove us up the slope.  
Sing we no governed firmament,  
Cold, ordered, regular;  
We sing the stinging discontent  
That leaps from star to star.

Figure 10.4 gives a little more (still not nearly enough!) possible mathematical detail about the gender equality attractor, which Ralph Abraham called “chaotic.” This figure suggests how gender equality might differ from the patriarchal (Abraham’s “periodic”) or the matriarchal (Abraham’s “static”) attractors.<sup>50</sup> The more optimal, or self-actualizing, of the possible attracting states are those which meet more of a person’s needs (see Chapter 7). For society as a whole, the gender equality state is an example of a state that will hopefully meet most of our needs: the needs for excitement, delight, and adventure *as well as* the needs for emotional security, food, shelter, and love.

These diagrams illustrate not final truths, but stages of an ongoing process of trying to understand an extremely complex system. Further work will enormously increase the detail in all these diagrams of human history and make them more realistic. This will lead to decades of exciting intellectual problems — at the interface between mathematical dynamical systems theory, neural network theory, neuroscience, psychology, and the social sciences. But the early ventures discussed in this chapter already hint strongly at the shape of things to come. Specifically, they hint that our brains contain the potential for all the individual and social behaviors described in Figure 10.4!

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Now we have begun to outline the task for world society in the near future, a task that our global ecological and nuclear crises have forced on us. We need to understand not only how to make better use of our natural resources, but how to make better use of our human resources. What role can brain science, in particular the scientific study of human attitudes and beliefs, play in helping us perform this task successfully? The next chapter discusses how we might draw on neuroscience and neural network theory to help humanity move closer toward its cherished goals.



**Figure 10.4.** Further elaboration of the historical scheme in Figure 10.3. Boxes in “matriliney,” “patriarchy,” and “gender equality” represent needs of the organism or society. Dark circles indicate needs that are being met. The shaded box at the bottom signifies a state close to self-actualization or synergy.

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