

AN

Argument for Mind

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Choice and Indoctrination

The second week of September 1950 was warm and humid when I arrived in New Haven, Connecticut, to begin graduate work at what the chairman of my psychology department at Rutgers had told me was the best psychology department in the world. I was twenty-one. That autumn the *New York Times* announced that President Harry Truman had threatened China with an atomic bomb if it attacked Formosa, the first modern credit card was introduced, and Senator Joseph McCarthy began his witch hunt of Americans suspected of being communists. Hundreds of thousands of men and women who had served in the armed forces during World War II were taking advantage of both the nation's gratitude and Congress's passage of the G.I. Bill of Rights, enabling them to choose careers that required a college education rather than returning to the blue-collar jobs held by their parents and grandparents. Americans felt confident of their egalitarian receptivity to reducing class distinctions without disrupting the economic philosophy and practices of competitive capitalism. Education, honesty, and perseverance would be rewarded with material comforts, a loving family, and, perhaps, a few moments of praise for discoveries, outstanding performances, or acts of kindness that struck some as commendable. Many different journeys in this version of Oz were possible. Although a few might be blocked by obstacles, many more would eventually capture the happiness they were told was the prize for sustained effort.

The five significant categories to which I belonged, and whose values I felt

obligated to honor, were male, Jewish, middle-class, American, and white in that order. Members of this symbolic quintet assumed that a mind exploiting its talents to gain financial security and status was the icon to bow before when deciding how to exploit the talents, desires, and energies that genes, family history, and schools had cobbled together. Medicine and law were two obvious choices. Writer, painter, or composer required special, somewhat mysterious abilities most adolescents assumed they did not possess, and their less certain economic futures moved them into the shadows. A scientist at a university seemed both attractive and realizable. I remember the glittering halo my adolescent imagination placed on the college professor's life after seeing Robert Donat in the film *Goodbye, Mr. Chips*. The gentle setting of academia and the opportunity to reflect and nurture the young struck a chord in my incoherently articulated sense of self, even though my later decision to apply to graduate school was discrepant from the preferences of the peers and relatives I had used as buoys when deciding where to place the next brushstroke on my bare mural.

I had rejected law as an option, even though an uncle, a relatively successful lawyer in my hometown, had urged me to do so and to join his office. I was not attracted to the law because it was made by people rather than by nature, but I could not articulate the deeper bases for this prejudice. For reasons I did not understand, nature roused my feelings, and it still does, whereas human artifacts, whether Roman ruins, Baroque churches, Chinese porcelain vases, jeweled swords, or the law, did not. This judgment was a bit inconsistent with my reverence for the human artifacts that took the form of books, poems, paintings, and symphonies. But the human mind has no difficulty rationalizing such inconsistencies. The artist, writer, and composer were trying to create objects of lasting beauty. This intention distinguished these products from the law, which I saw as devoid of beauty because its propositions seemed arbitrary declarations with short lives.

My attraction to nature was more passionate for living forms than for stars or fossils. Many leading cosmologists remembered that, as adolescents, they remained awake many nights staring at the stars with a profound curiosity and awe.¹ Adolescents who have had a strong emotional experience try to find ways to relive that precious moment. One undergraduate had his epiphany at a symphony concert when the audience applauded the conductor for many

minutes after the performance. So many people celebrating a single person generated a moment of envy. He wanted to be on that stage, washed in the admiration of so many strangers. No one understands why a small number of adolescents have such powerful experiences and why these feelings are restricted to such specific events. I attended concerts but never felt the desire to be a conductor; I often looked at the night sky but never had a feeling of *agape*.

My curiosity was pricked by things that were alive. I remember walking home one afternoon—I was about twelve—when I saw a dead squirrel that had recently been struck by a car. Here was an opportunity to look inside the animal to see what unknown things resided there. I wrapped the animal in paper and took it to my bedroom—I may have felt there was something illicit in this activity—and with a kitchen knife sliced open its belly to examine its moist viscera. I found the gentle probing of the life-giving organs exciting and, in a sense, sacred. The glistening intestines evoked a feeling that may have resembled the state of a future cosmologist staring at the Milky Way at two in the morning.

I am not certain why life-forms possessed this power. Each time I silently pose that question, the same voice, whose source seems to lie midway between head and heart, whispers sexuality. One need not be loyal to Freudian ideas, of which only a few remain roughly correct a century after their announcement, to suggest that boys find the unselfishness of mothers puzzling and the female body mysterious. Why are women gentler and kinder than men, and what was hidden beneath that mound of hair that was always covered? Today's parents worry over the Internet pornography their adolescents might be watching. My father, and the fathers of my friends, hid sexually explicit paperbacks in the top drawer of a dresser beneath a high pile of handkerchiefs. When a boy was lucky enough to find one of these treasures, he immediately shared it with his friends, like an early forager bringing back to camp a gazelle he had managed to kill. Sex excites, and only living forms engage in sex. Although I might be wildly wrong, perhaps my exploration of the moist organs of the squirrel lying on the floor of my bedroom brought me closer to understanding the mystery of women. François Jacob, a Nobel Laureate in biology, recalls his mother: "Tender, sweet perfume, warmth. Safe harbor from all fears and all violence . . . maman, who rocked me to sleep,

bathed me, wiped me, blew my nose, disciplined me, tucked me in, caressed me, scolded me, watched over me . . . maman . . . who, when I was a medical student and would get back late at night, always left a snack on the table with a note as tender as a kiss.”²

A career in medicine, which promised economic security, status, and an understanding of human bodies, seemed the right choice. The imagined routines of this role, however, competed with a penetrating interest in human thought and, especially, the puzzling roots of prejudice. Rahway, New Jersey, a town twenty miles south of New York City, with a population of about twenty thousand in my childhood, had a relatively large working-class population and a small group of Jewish merchants, including my father. Like many Americans during the 1930s, some adolescent boys could be virulently anti-Semitic, hurling muted versions of Hitler’s harsher rhetoric. I did not understand why I, who had white skin, broke no laws, did my homework, bullied no one, and lived in a modest home without ostentation, should have been selected as a target of hatred. What illogical ideas were tumbling around in the minds of those who disliked me without provocation? Could it be only the arbitrary symbolic category to which I belonged?

A second, quite different foundation for my curiosity about mind had a more internal origin. I was conscious of frequent feelings of uneasiness that today’s clinicians would call generalized anxiety. The persona I displayed to others—a good school record, close friendships, and passable skill at touch football—did not rest on a firm foundation. It seemed that these thin outer layers would dissolve if challenged by my friends’ more forceful personalities. John Widemann, an African-American writer who grew up in a poor black ghetto in Pittsburgh, combined great talent, a warm, encouraging family, nurturing teachers, and a little luck to become a respected writer and beloved professor. In his memoir, *Brothers and Keepers*, Widemann revealed that each morning when he awoke he feared that this would be the day others would discover that he was a fraud.³ George F. Kennan, one of America’s most influential diplomats, confessed to a similar unsureness, for he was shy, without athletic talent, and embarrassed because his family was less wealthy and his childhood experiences were less worldly than most of his friends in Princeton’s Class of 1925.⁴ My feelings were not as strong as those of Widemann or Kennan, but they lay on that continuum. I was a shy six-year-old who

stuttered and occasionally woke with my sheets wet with urine—a fact that worried my mother, who was told by a pediatrician that I would outgrow it.

It is hard to ignore the uneasiness that pierces consciousness in the minutes between assignments, and I wondered why I felt this way. What crooked thoughts produced a gnawing doubt that none of my friends seemed to harbor. Adolescents who have these feelings today might be told that they were born with a temperamental bias. But the popular explanation in the 1940s was that parents were the unwitting villains. My mother was protective, emotionally labile, hypercritical of her husband, and effective at generating guilt. My father was bitter over his crippling arthritis and failure to make as much money as his younger brother and some of his friends. On occasion, his frustration could be ignited by a slightly critical comment from his wife. Thus, I attributed the uneasiness to a mother who restrained my independence, a father who could become unpredictably angry, and the jeers of my Christian peers. The desire to understand how these events came together, like the elements of a perfect storm, to create these tensions in a fourteen-year-old was as strong as was my interest in human bodies.

One more fact made psychology attractive. Despite a resentment of my mother's restrictiveness, I felt confident in her love for me, and I held a deep affection for her. She reminded me regularly that her father, whom I never knew, was always reading books, many concerned with human nature. I was told hundreds of times that, as a late adolescent returning home, my mother found her father dead of a heart attack, an open book on his chest. The mother whom I desperately wanted to please revered a man who loved to read books on human nature. If I were able to find out how the mind worked I would be carrying on his tradition and, perhaps, replacing him in my mother's eyes. George Kennan chose the Foreign Service because a close relative with the same name and birthday was a celebrated statesman who specialized in the politics of Russia. Kennan became a Russian specialist.

Because my interest in the mind was nourished by penetrating emotions, I was vulnerable when a professor teaching abnormal psychology asked me to walk with him across the Rutgers campus at the end of class. As we strolled he said, "You know, you would make a good psychologist," because of a comment I had made in class that afternoon. I have no memory of the comment, only his suggestion that, in his opinion, there was the possibility of my achiev-

ing a creative career in this profession. No stranger had ever told me that I might be an unusually skilled physician, chemist, lawyer, or astronomer. Most young people live with continual doubt. So when a stranger who has no reason to flatter offers a heady prediction of the future, a rational analysis of the accuracy of the prophecy is foolish. Relish it and run.

Most college seniors wondering about their future want a challenge that, with effort, they can meet. Humans enjoy the unique feeling that accompanies the successful exploitation of an uncommon competence. A successful neurosurgeon once told me that he chose this specialty because he felt he had “talented hands.” I still feel a twinge of guilt over a comment I made more than twenty years ago: I told a dozen students training for a career in clinical psychology that although they believed their primary motive was to help those with mental problems, they would become bored in less than a year if they had a magic wand that cured every patient they touched. What they really wanted was to use their talents to alleviate distress. I interpreted their long silence as a sign that they were brooding about the reasons for their choice. John Stuart Mill had a similar epiphany in 1826 when he realized, with sadness, that he not would experience great joy if all of his wishes were suddenly granted.

Psychology was not especially attractive to many of my peers because its activities did not seem to require any special abilities that were not already in the repertoire of most college seniors. Recording the behavior of rats traversing a maze or of college students memorizing words did not tax one’s intelligence excessively. The attractiveness of psychology lay in the hope that its discoveries would illuminate the human mind and, as a dividend, suggest ways to alleviate suffering. The first task used to belong to philosophers and novelists. Plato, Michel de Montaigne, and Immanuel Kant, as well as Fyodor Dostoyevsky, Eugene O’Neill, and Jean-Paul Sartre, believed that their sentences contained answers to perennial queries about the essence of human nature. I recall an afternoon when, as a thirteen-year-old, I had borrowed Dostoyevsky’s *The Brothers Karamazov* from the town library and could not wait to get home to discover its insights. Far fewer of today’s thirteen-year-olds believe that reading novels will reveal universal truths. The television programs *Nova* and *Nature* now serve that function because people have become persuaded that philosophers and writers brooding about life, self, and

society in a quiet room are less likely than scientists to arrive at the correct answers. Young people who would have chosen philosophy had they been born in the seventeenth century were drawn to psychology in the twentieth.

If psychological research helped us understand why some children cannot learn to read and some become criminals, we might eventually prevent or cure these afflictions. Psychology was a moral enterprise, and many in my age group who selected this discipline did so because of this altruistic concern. I chose psychology, instead of biochemistry or the law, not only because I wanted to understand why I was easily intimidated and a target of prejudice but also to improve social conditions so that fewer people might experience the shame of school failure, the indignity of imprisonment, and the psychic pain of depression.

It may thus have been inevitable that, when forced to decide between graduate training in biochemistry at the University of Texas (I had learned of my acceptance in early April) and studying psychology at Yale, I chose psychology. Although I would probably have accepted Yale anyway, two improbable events contributed to the resolution. The first occurred one afternoon during a chemistry laboratory exercise in which we had to estimate the amount of barium sulfate in an analysis that in 1948 took about six hours. I had just turned in my estimate when a friend who was walking to the balance to weigh his tiny pile of white powder stumbled and the barium sulfate fell on the floor in a heap. In no mood to redo the work, he asked the other students to estimate the amount of barium sulfate in the pile. He computed an average of the guesses and turned that value in as his answer. I was troubled the following week when he received an A and I was given a B. I interpreted this injustice as a warning to avoid chemistry.

The second event was even less probable. I had borrowed the recently published book *Organization of Behavior*, by the McGill University psychologist Donald Hebb, from the town library.⁵ This small public library should not have had Hebb's book on its shelves because it was highly technical and written for a professional audience. While reading Hebb, I received a letter from Frank A. Beach announcing that I had been accepted at Yale and that, if I came, I would be his research assistant. I turned to the bibliography of Hebb's book and saw with delight that the first page was full of references to Beach. The reasoning that followed was rapid and persuasive. Hebb appeared to be

a brilliant scientist; he thought that Beach was equally brilliant, and Beach wanted me to study with him. I suspect that my future was sealed in that moment. One afternoon in the summer of 2004, when my wife and I were visiting Lewis Lipsitt and his wife in Marion, Massachusetts, I learned that Lew—a distinguished psychologist at Brown University—had chosen psychology after hearing Hebb lecture at the University of Chicago the same month I was reading the *Organization of Behavior*. Psychology in New Haven, not biochemistry in Texas, was the direction that some invisible power had chosen as best suited to my uneven profile of qualities.

Yale Psychology

Psychology is the child of two quarreling parents, a fact that may account for its unsureness. The philosophical side of the family seeks to understand the qualities that are unique to humans, especially conscience, language, logic, inference, consciousness, and the symbolic categories that transform the products of perception into a version of reality no other animal could understand. This distinguished pedigree includes Plato, Montaigne, David Hume, Kant, John Locke, Charles Sanders Peirce, William James, and, more recently, Willard Van Orman Quine, Hilary Putnam, Stuart Hampshire, Richard Rorty, John Searle, and Daniel Dennett. The biological side of the family, with Charles Darwin as its eminent grandparent, searches for universal principles rooted in biology that might explain the psychological features unique to humans as well as those shared with animals.

The origins of American psychology are found in the historical resolution of two conflicting nineteenth-century interests: a concern with character and morality, on one hand, and an equally strong belief in pragmatism, technology, and a materialist explanation of behavior implied by the Darwinian thesis, on the other. These two ideas were incompatible at the end of the nineteenth century. How could anyone defend an idealistic description of humans as loyal, altruistic, cooperative, and spiritual and simultaneously accept the extreme individualism and pursuit of self-interest society demanded and biology rationalized? It took a little over a century for E. O. Wilson to try to resolve the dissonance by arguing, in *Sociobiology*, that human morality grew out of biology.⁶ Humans were nurturant to kin because they shared

some of the same genes, and they strove to perfect and to satisfy the self in order to attract the healthiest mates in the service of producing the most children. Although it is impossible to understand the premises and practices of the first psychologists without acknowledging the profound influence of evolutionary theory, it is also necessary to appreciate that, without industrialization, mass migration from small towns to urban centers made easier by rail travel, and an increasingly confident middle class wanting to be free of the restrictions of Christian ethics, Darwin's ideas would not have been adopted so quickly or eagerly.

The first academic psychologists, many working in German universities during the late nineteenth century, identified with the philosophical side of the family in their studies of human consciousness, perception, and memory. Then Ivan Pavlov, a physiologist working in Saint Petersburg at the turn of the twentieth century, expanded the vision by conditioning dogs to salivate to the sound of a metronome.⁷ The conditioned reflex, Pavlov suggested, was the fundamental psychological unit in animals as well as humans—he even posited a freedom reflex. Conditioned reflexes were psychology's atoms. It usually takes about fifty years for a fruitful idea to penetrate a scientific discipline. The magnetic moment of hydrogen was discovered in 1941; half a century later hundreds of scientists were using fMRI scanners, which rely on this fact, to measure the brain. Conditioning became the central focus of psychological research about fifty years after Pavlov's discovery, and it was the central idea in Yale's department.

The history of the natural sciences reveals that dramatic progress often follows attempts to explain a highly reliable fact. Physics supplies a classic example. Early-twentieth-century scientists had discovered that each chemical element, when heated, released a distinct spectrum of light frequencies that was its unique signature. The attempts to explain this robust fact in the 1920s led to the first formulations of quantum mechanics. Classical and instrumental conditioning were equally firm observations, and attempts to explain them led, in time, to an appreciation of the importance of unexpected events, the receptivity of a species to a specific conditioned stimulus, and the brain circuits that were responsible for a select set of conditioned reactions.

Most, but not all, American faculty in psychology in 1950 were loyal to one of two traditions. Although both groups asked different questions, they held

the same fundamental premise, not unlike the members of the fragmented Puritan sects in colonial New England. The politically dominant group, seeking universal truths, wanted to understand how animals and humans learned new habits. Rats, for example, were required to learn a new, usually simple, motor habit (for example, pressing a lever or making the correct turn at the intersection of a T-maze) to obtain food, get water, escape from electric shock, or have an opportunity for sex. College students had to memorize lists of words, often meaningless nonsense syllables, or improve their skill on a simple motor response. Hidden within the daily round of experiments was the hope that conditioned habits, like a mirror directed at mind, provided a faithful reflection of a person's history.

The second group wanted to understand why adults differed in intellectual abilities, capacity for anxiety and guilt, and vulnerability to schizophrenia, depression, and psychopathy; at Yale, this group consisted of faculty loyal to Freudian ideas. The two communities gathered different evidence and described their findings with distinctive vocabularies, but both chanted the catechism that change and variation in thought and behavior were due primarily to experience and they would remain unchanged until events altered them. Although there was tacit acceptance of the assumption that the products of experience were instantiated somewhere in the nervous system, the impossibility of measuring the brain made it easy to ignore its contribution. This perspective married Locke's insistence on the power of sensory events to Darwin's emphasis on adaptations but for the moment was indifferent to biology because European immigration to the United States had made arguments for a biological contribution to human variation politically incorrect. Essentially, these scientists, like diners at a smorgasbord, carefully selected from existing ideologies those beliefs that suited their intellectual and ethical appetites.

Frank Beach was the distinctive outsider in the Yale department, for he was skeptical of both the behaviorists and the Freudians. Beach was one of five psychologists (Norman Maier, T. C. Schneirla, David Krech, and Donald Hebb were the other four) mentored by Karl Lashley at the University of Chicago during the early 1930s who believed that mind/brain was a book and not a dictionary and should be described as sets of organized patterns rather than collections of associations.⁸ This view is now a central tenet, but

in 1950 Beach stood at the periphery watching the behaviorists trying to infer big principles from tiny facts.

The status hierarchy among the natural sciences resembles the relations among siblings, with later-borns envying the power and privileges of their older brothers and sisters. Physics is the beloved firstborn in the scientific academy; psychology is the envious toddler aping the eldest. Many psychologists would love to write equations with the power of Isaac Newton's terse statement that force is the product of mass and acceleration. Here was an equation with only three terms that applied to an asteroid striking the Earth, a boulder rolling down a mountain, and a tree falling on a house. Psychologists lusted for equally simple, rigorous, profound laws that explained the behavior of living things. Clark Hull, one of Yale's eminent psychologists, aspired to be the discipline's Newton and wrote the influential *Principles of Behavior* (1943), which posited laws with abstract terms like "habit strength" and "drive."⁹ Unfortunately, Hull's laws did not distinguish among a rat running down an alley to turn right at an intersection, an adolescent learning to play soccer, and a music student trying to master the cello.

The anthropologist Geoffrey Gorer unabashedly wrote in 1955 that a unified theory of the social sciences could be summarized in twelve postulates. The second was: "Human behavior is predominately learned. Although the human infant may be born with some instincts and is born with some basic drives whose satisfaction is necessary to its survival, it is the treatment which the infant undergoes from the other members of the society into which it is born, and its experiences in its environment, which are of importance in molding adult behavior." The fifth and sixth postulates were consistent with this statement: "Habits are established by differential reward and punishment, chiefly meted out by other members of the society. . . . [T]he habits established early in the life of the individual influence all subsequent learning and, therefore, the experiences of early childhood are of predominant importance."¹⁰

This high-flying mood wafted through the halls of Yale's psychology department. At the same time, about 120 miles to the north, social scientists in Harvard's Department of Social Relations, especially Clyde Kluckhohn and Talcott Parsons, were equally optimistic, but their answers required broad concepts that promised to explain society and culture.¹¹ Kluckhohn's book

Mirror for Man (1949) was as ambitious as Hull's *Principles of Behavior*, but *Mirror for Man* gazed up at abstract symbolic meanings shared by thousands, whereas the *Principles of Behavior* stared down at the concreteness of a rat's paw striking a lever to obtain a pellet of food.

Most psychologists wanted their concepts to be imaginable because it is easier to persuade an audience of the validity of an interpretation if the audience can imagine the elements and the causal processes in which they participated. Associations between stimuli and responses resembled a network of connected roads or wires in a telephone exchange. On reflection, it seems bizarre that so many of us believed that all the complexities of human thought, feeling, and behavior could be explained with only one hypothetical entity—an acquired association between an event and a reaction. A dog could be taught to salivate to a tone; a child could learn to cry to a spider; a student could learn to divide fractions. Although salivation, crying, and dividing fractions were different responses, this variety was chaff. All one needed to know was that new links could be established if one arranged the right conditions. The construction of a mind was compared to a child with an Erector set assembling an infinitely large number of structures.

Psychologists begin their work with two incontrovertible facts: behaviors change with time, and at every age, there is psychological variation. American psychologists trying to explain these facts swore allegiance to two forms of continuity—a biological continuity between animals and humans and a psychological continuity between the infant and the adult. The biological view maintained that all animals relied on very similar processes when they learned new habits and exploited them in behavior. The hope that study of the white rat could reveal basic psychological processes that applied to all animals first surfaced in the 1890s and became dogma by 1950. Loyalty to this idea required a denial of the many examples of biological discontinuity in evolution. Respiration, for example, is accomplished with gills in fish but with lungs in mammals. More relevant is that, compared with apes and humans, laboratory rats and mice have no convolutions in their cortex, possess poor vision, and do not form social groups with a dominance hierarchy. These and many other dramatic differences imply that rats and humans might learn new habits in different ways.

The behaviorists also argued that behaviors that appeared to be instincts

in mice, rats, and birds might be early origins of voluntary actions in primates and humans. Konrad Lorenz, who challenged the smoothness of the transition between species, insisted that the chirping of birds bore no relation to a child's speech and that nest building by a pregnant rat was not an early form of a human mother's nurture of her infant.¹² Lorenz's claim that responses that appeared to be "instinctive" were, in fact, reactions restricted to a species and released by very particular incentives threatened the Pavlovian model. Daniel Lehrman rescued the behaviorists from the German's skepticism in 1953 by demonstrating that experience was necessary for Lorenz's automatic instincts. Continuity across species had been saved, and the behaviorists could return to their laboratories assured that the mechanisms of learning were essentially similar in all species. This victory had political overtones, for Lorenz was regarded as sympathetic toward Nazi ideology. A challenge to his views was thus also a way to discredit Hitler and his storm troops.¹³

The commitment to a biological continuity across species, which is alive and well today, is revealed in an experiment in which human speech varying in rhythm and timbre—called prosody—was presented to rats. The rats, like children, could discriminate speech segments with different prosodic features. But surprisingly, the authors implied that the process involved was the same in both species.¹⁴ The truth of this claim is not obvious. Children can tell the difference between the songs of a finch and a meadowlark, but it is not obvious that they use the same mechanisms as birds do to make this discrimination. Children who walked various distances between their homes and candy stores in their neighborhood could discriminate between distances of one hundred and three hundred yards. But honeybees, which can make the same discrimination, use a very different mechanism when they visit flowers at varying distances from the hive.

The problem is that similarity between two outcomes does not guarantee that the processes that mediate the behaviors are identical. Alan Turing argued that if an expert cannot tell the difference between the output of a computer and a person playing chess, it is reasonable to conclude that the "processes" are similar in machine and person.¹⁵ Physicists are one source of this bold statement, for they argue that if two outcomes can be described with the same mathematics, they can be regarded as equivalent. The mathematics that describes the motion of water in a bowl is the same whether the

bowl is rotated or the Earth rotates. But this rationale for equivalence is dangerous in the life sciences. The equivalence argument makes no sense in a moral context. If a child struggling in a lake dies, either because a bystander does nothing or because he tries to save the child and, in so doing, both he and the child drown, few would say that the two outcomes were equivalent in psychological terms. The deaths of a hundred thousand people following an earthquake, a flood, a flu epidemic, or war are not equivalent, either in the conditions that produced the deaths or in the psychological consequences for those in the community who survived.

The premise of psychological continuity asserts that every experience is stored somewhere in brain/mind and that every response or thought has its origin somewhere in the past. There are no breaks in the chain and no sudden discontinuities. Freud assumed that the delusions of a paranoid who thought he was Napoleon could be traced to his nursing experiences. Jean Piaget claimed that the knowledge that a ball cannot be in two places at the same time was a derivative of experiences twenty years earlier when an infant reached for a rattle. Perfectly respectable nineteenth-century psychologists wrote that adult greed could be seen in the infant's automatic grasping of a pencil placed on the palm. Only a hundred years ago, psychologists warned American parents to keep their infants away from the new art form of the movie because emotional reactions to the aggressive or romantic scenes portrayed on film could have a malevolent outcome decades later.

Psychological continuity is a pretty idea because it renders early forms useful. If the origins of adult enthusiasm or despair were in late childhood, the first years of life would appear to have no important purpose. The possibility that the products of early development could be temporary bothered those who believed that mothers must remain close to and vigilant with their infants. A faith in continuity has the added advantage of seeming mechanistic. It is easier to invent cause-and-effect sequences when a new phenomenon is preceded by one that makes a contribution to it than if a property emerges suddenly.

There is a third basis for the attractiveness of continuity from the first days of life to old age. A historical era is often marked by a dominating philosophical position that scholars are reluctant to confront—an intellectual electric fence. European philosophers, from the Renaissance to the nineteenth cen-

tury, resisted inferences or deductions that contradicted the Bible. Although few social scientists today worry about the implications of their work for religious tenets, they are concerned with the implications of their ideas for the ethic of egalitarianism. Continuity in the growth of human properties is in closer accord with egalitarian principles because discontinuities imply maturational changes in the brain and, therefore, the need to award power to biology. A faith in continuous development both orients the investigator to the experiences that gradually establish new properties and suggests, but of course does not prove, that one could arrange similar growth-enhancing experiences for all children and as a result approach similar levels of dignity for all adults. The appeal of Jared Diamond's admirable book *Guns, Germs, and Steel* (1997) profits from this premise.¹⁶ Diamond suggests that the primary reason that cultures in the Middle East developed tools, writing, and social institutions before societies in other regions rests with the ecology of the Fertile Crescent about ten thousand years ago, which made it easy to domesticate plants and animals—a stroke of good luck. The possibility that thousands of years of migration from Africa to the Fertile Crescent might have created a population with distinct values and perhaps a special biology that contributed to their early domestication of plants and animals is simply ignored. Diamond, like the behaviorists, gave the environment all the power.

My generation had also decided, with embarrassingly meager evidence, that social experiences were the primary causes of, and potential cures for, the habits, attitudes, and feelings that produced psychic distress. The origins of depression, academic failure, and criminality were stimulus-response units established over the years through encounters with family members, peers, and teachers.

The need for tidiness—scientists use the word “parsimony”—allowed the behaviorists to ignore other conditions that induced psychological change. They blithely denied that animals and humans acquire new actions simply by watching others. The plethora of television shows devoted to cooking and home improvement is sufficient proof of this claim. The behaviorists were also indifferent to the changes demanded by environmental disasters, such as earthquakes and floods. And they dogmatically refused to acknowledge the power of thought. An adolescent boy's happy mood is altered when he learns that his father was imprisoned years earlier for armed robbery. Arthur

Miller exploited this phenomenon when he had Biff discover his father with a prostitute in *Death of a Salesman*. But perhaps the most egregious error was a reluctance to award the brain any place in the explanations of human differences in talents or adaptation. To do so required acknowledging that some variation might not be repairable with experience. Recognition of that possibility diminished the autonomy of the young discipline we had chosen to nurture and prevented us from appreciating that most behaviors can be likened to a piece of homogeneously gray cloth woven from the thin black threads of biology and the equally thin white threads of experience.

The exclusion of biology can be traced to John Locke's declaration that all minds are essentially alike at birth and that later variation is due to what children heard and saw and which habits were praised and punished. Locke's position was attractive because a growing proportion of eighteenth-century Britons desired a more egalitarian society in which neither religion nor family pedigree was a basis for legitimacy. The newly ascendant middle class wished to challenge the notion that princes and priests were inherently more virtuous than paupers. Legitimate power should belong to those who exploited their experiences intelligently.

This meritocratic ideal became the foundation of American behaviorism two centuries later. John Watson, a psychologist at the Johns Hopkins University in the 1920s, effectively disseminated Pavlov's discovery because many Americans with liberal views looked to science to quiet a strident eugenics movement that was pressing for the sterilization of the retarded and laws restricting foreign immigration and the further "tainting" of the pure Mayflower pedigree.¹⁷ A resolution of this political crisis required an unquestioned faith that human talents and character were learned and were independent of the biology children inherited. The chant among most social scientists in the 1920s was that humans, unlike animals, had no instincts. One dogmatic behaviorist even denied that sexuality had a foundation in biology. The postures of lovemaking were learned, and an infatuation was no different in fundamental mechanism from the excitement experienced during a baseball game. The behaviorists were loyal to the credo of the biologists in their search for universals, but they had thrown out the biology.

With vaulting ambitions the behaviorists felt justified in applying their

ideas to classrooms, families, autistic children, and adults fearful of flying because they were certain that they possessed a principle that could explain almost every psychological phenomenon. This confidence created an evangelical mood among the graduate students. The faculty created the illusion that our small band of talented students who had the good fortune of studying in the most enlightened department had an obligation to move psychology forward. Beach gave a final examination during my first year that consisted of reading several current issues of the *Journal of Comparative and Physiological Psychology* and criticizing some of the papers. My initial feeling was despair. How could a first-year graduate student find serious defects in papers that had passed professional judgment? But when I quieted my fear and began the assignment, I was alternately delighted and appalled by how easy the assignment was to complete. The message Beach intended had been assimilated.

The behaviorists never assumed that the infant mind was a “blank slate.”¹⁸ They acknowledged that every child was born with a set of reflexes and sensory capacities. All infants had the ability to sneeze, suck, babble, smile, reach, feel pain, taste food, see objects, and hear sound. But experiences could manipulate those inherited elements to create almost any skill, attitude, or emotion desired. The clever manipulation of events could shape the instructions genes had written and, like ancient alchemists, turn lead into gold.

The ambience of confidence intimidated some of the students training to be clinical psychologists who had little interest in animals and conditioning. Many, however, felt that they had to prove to the faculty, and to themselves, that they were authentic scientists by conducting an experiment with rats that demonstrated a form of learning. This work was an initiation rite allowing entrance into a sacred club. The relation of brain function to behavior holds a similar position of centrality in contemporary psychology, and some students feel obligated to conduct a study that requires the use of a brain-scanning machine. One graduate student whose parents had not attended college announced that his thesis would involve the measurement of brain activity. I told him this was not a good idea because he knew little about the brain and even less about the electronics of the apparatus he would have to use. After acknowledging both weaknesses, he confessed that he had to work on a prob-

lem that would “transcend his childhood background.” Neuroscience was High Church, and studying the brain was a required ritual for anyone who wished to be ordained into a holy order.

Some of the Impressionists assumed an attitude of superiority toward their peers by linking their new painting technique with science. Discoveries in the physiology of vision had suggested rational rules that, if followed, would produce canvases that had unique perceptual effects on viewers. Georges Seurat and Vincent Van Gogh felt “intellectually ahead” of the unsophisticated Parisian artists who were unaware of these scientific advances. One reason why the composer Arnold Schoenberg, who had read about biological evolution, invented the twelve-tone scale was his desire to enhance the public’s aesthetic sense by exposing them to a new form of music. Some philosophers legitimate their claims about mind by citing the evidence of cognitive psychologists; some cognitive psychologists seek legitimacy in the discoveries of the neuroscientists; some neuroscientists look for support in the research of molecular biologists; some molecular biologists explain the electrical activity of neurons with the concepts of the physicists; and all stand gazing in awe at the mathematicians, who, staring straight ahead, worry occasionally about the shaky foundations of their elegant equations. The members of each scientific discipline, like children trying to join a more powerful group, seek to persuade others by announcing who their friends are.

A Pair of Premises

Two related assumptions penetrated the research on learning. First, any result found with any group of animals probably had a generality that went beyond the species observed, actions taught, and rewarding events administered. Inferences based on rats learning a maze to obtain food had implications for children learning to read. With few exceptions, the biology of the learner was irrelevant because of the presumed biological continuity between animals and humans. This assumption remains vital today, although there is a keener appreciation that species inherit different sets of biologically prepared properties. A few lone voices insisted that studies of humans required some knowledge of their prior history to predict whether, and what, each would learn. But most psychologists did not want to hear this skeptical

restriction on their ambitions. I assure readers who find this description exaggerated that my friends and I were certain of the power of conditioning to create almost any desired outcome. We even believed that a mother who was cold and aloof could create the symptoms of autism in her child. If one wishes to believe, it takes precious little to produce a commitment.

A second, more important issue centered on the meaning of the term “reward,” or reinforcement, and why rewarding events (food, praise, sex, or escape from punishment) had the mysterious power to establish new associations and sustain an action that delivered the event, if even for a limited time. A resolution of this question was important because explanation is the goal of inquiry. Darwin, not Robert Chambers, is praised because he supplied the mechanism of natural selection to explain evolution. The idea that no one would do anything unless they were rewarded went unchallenged, even though it did not match daily experience. Anyone can learn the name of a new neighbor simply by being told this information. Nothing else happens! No reward is administered, yet the listener might remember the name for years. The assumption that an animal will not establish a new association unless it receives something material for behaving (notice the hidden value judgment) shares a feature with Isaac Newton’s principle that all objects remain at rest until a force is imposed. Why would an animal or child do anything unless it received something for the effort? I recall an afternoon when Neal Miller, one of America’s most respected psychologists, began his graduate seminar by confessing that he did not understand why his three-year-old son had turned on the garden hose the previous day. Miller seemed genuinely puzzled by his inability to imagine what the reward for that action might have been because he was not ready to acknowledge that at least three very different types of events can function as rewards. The most obvious class refers to events that satisfy biological needs or are universally pleasant because of their sensory foundation, like food when hungry, water when thirsty, and sweet tastes and sexual release. This class also includes the termination of an aversive state. Although these events have a biological foundation, they do not rest on the same brain state.

The second class is defined functionally as any event that can establish an association and sustain behaviors aimed at obtaining the event. Stated simply, a reward is anything an animal is willing to work to attain. Unexpected events

that are not aversive are one member of this class. The consequences of turning on a hose belong to this category. That is why monkeys in a boring cage will work to see some interesting things in the world outside the cage.

The third class, which applies only to humans, refers to experiences that are desired because they are symbolic of an enhanced conception of self. Some energetic souls fly a thousand miles to climb a snow-covered mountain in subfreezing temperatures; others travel as far to watch a blood-red sunset over a tropical beach. Notice that an event belonging to one of these categories need not belong to the other two. The taste of chocolate cake is inherently pleasant, but dieters avoid this delightful experience. Unexpected events are sought if they can be understood but avoided if they generate a level of uncertainty that can not be coped with effectively. Working eighteen hours a day, seven days a week, to accumulate money or power fits neither of the first two definitions of reward. The pleasures derived from these rewards have a unique feature, for they require a comparison with an alternative, prior, or ideal state of affairs. I recall a walk along a beach on Vineyard Sound with a chilly breeze on my left and a hot sun on my right. My judgment that this stroll was pleasant required knowing that the temperature in Boston that afternoon was 95 degrees and the humidity 75 percent. If the sensations from the breeze, sun, rotting seaweed, and old bottles on the beach were the only information available, I would have no way of knowing if the walk had been pleasant. Pleasure, as every ancient philosopher understood, is not a unitary phenomenon psychologically or biologically.

Mitchell Berkun, a fellow graduate student, and I, who assumed the second definition of reward, felt much too smug after we taught rats to strike a lever so that they could enter a steel wheel where they could run until fatigued. We concluded that running must be a reward and failed to consider the possibility that our rats were no different from dogs running through meadows, hawks soaring through the sky, and fish swimming in lakes. The biology of these animals permitted them to engage in these behaviors. Birds fly because they can fly. Nonetheless, the puritanically pragmatic conviction that all effort must be rewarded if it is to produce new knowledge and that no one in their right mind would do anything unless he or she got something for it—a version of the contemporary view that all animals are self-interested because of a biological urge for inclusive fitness—seemed to us irrefutable.

Although scientists still rely on the concept of reward, the belief that a change in stimulation—external or internal—can function as a reward has become accepted. A fundamental principle governing the brain is that neurons respond to change. Changes in illumination or motion automatically activate circuits and provoke attention to the site of change, for that is where information is likely to reside. A reward, therefore, does not have to be something the animal needs, such as food, water, a mate, or relief from pain. Essentially, many events called “rewards” are punctuation marks that, like a white streak in a blue sky, interrupt the stream of experience and, through activation of many brain structures, facilitate the establishment of associations. This is why we remember rare events and movies with unusual photographic effects for the longest time.

It will come as no surprise that a few psychologists, bothered by the functional definition of reward, argued that the definition was circular. Investigators insisted that a reward had to be present if an animal learned a new response, even if they could not specify what it was. If a two-year-old girl alone in her crib talked to herself each night, there had to be reward for her private chatter. Neal Miller recognized this problem and appreciated the utility of Karl Popper’s declaration in *Conjectures and Refutations* that the elimination of a bad idea is one route to scientific progress.¹⁹ In an attempt to specify the features of a reward in absolute terms, he borrowed a Freudian notion and declared that all “rewards” had the essential property of reducing the total amount of stimulation an animal experienced. When a visiting student from England asked Miller why he stubbornly defended this single-minded and counterintuitive definition, his reply, spoken in a classic Washington twang, was, “There is only one thing you find in the middle of the road.” He did not add, but the students understood, that he meant horse manure. Although no one was sure how to measure “the total amount of stimulation” in most circumstances, this idea could be tested under special conditions.

Fred Sheffield, who had trained with Edwin Guthrie at the University of Washington in Seattle, was the rebel in the department. Guthrie, who did accommodate to human experience, asserted that two events could become associated if they simply occurred close in time. No reward or reduced stimulation was necessary. Guthrie used the phrase “contiguity theory” for this rule. Sheffield’s views created a theoretical tension, and any experiment that

could evaluate the differential validity of the two positions would be celebrated.

I chose this controversy for my dissertation in the fall of 1953. I had learned about rat sexual behavior from my apprenticeship with Beach and knew that when male rats copulate their penis does not remain in the vaginal canal until an ejaculation occurs. Rather, the male penetrates the female, is reflexively thrown off, waits ten or fifteen seconds, mounts the female again, and, after six or seven repetitions of this sequence, finally ejaculates—an uncommon practice in most mammals. This fact of nature provided a perfect opportunity to test the opposing views of Sheffield and Miller.

It was obvious that a male rat was at a higher, rather than a lower, level of stimulation after his first few penetrations of the female. If Miller was right, no rat should learn to make the correct turn in a maze in order to contact a female receptive for sexual activity if the reward for this effortful response was increased stimulation. My private expectation was that the rat would learn to make the correct turn. Every adolescent girl knows that the longer she puts off her hyper-aroused boyfriend, the more insistent will be his pursuit. And that is what happened. The male rats that were permitted only one or two penetrations and were then separated from the female, or animals that could only mount the female and were denied a penetration, quickly learned where the female was resting. Sheffield had been validated. Nature does not like playing favorites, however, and there was a thread of support for Miller. Across the successive days of testing, the frustrated males waited longer before they made their first approach to the female. Thus, the arousal created by the penetration or the mounting had aversive properties, as Miller would have predicted. Although learning the correct turn in the maze required contiguity between the stimulus features at the choice point in the maze and the salient experience of the brief penetration, the response of approaching the receptive female, which was biologically prepared, could be inhibited to some degree. Boys eventually do stop pursuing girls who never say yes.

The apprenticeship with Frank Beach had its humorous moments. One event remains a flashbulb memory. My first assignment as his research assistant was to find out whether male dogs that had no internal source of male hormone—their testes and adrenal glands had been removed—were capable of an erection. The consensual assumption in 1950 was that an erec-

tion was impossible without the presence of male sex hormone. My task, which seemed to be an example of elegant science then, but strikes me as a bit odd today, was to descend to the basement, where the dogs were housed, at the end of the work day, usually after dinner, masturbate the group of male dogs, and measure the diameter of their penile bulb—a structure at the base of the penis that expands with arousal to keep the male locked to the female. I accepted this task, performed the proper fingering of the dogs, and made the measurements with a caliper. To Beach's surprise, all the dogs had erections. I found it disconcerting that after several days of servicing these animals they would bark when they heard my footsteps on the stairs. They were excited by the imminent arrival of their generous friend.

I gave Beach the measurements and forgot about this experience. Twenty years later (I was now at Harvard), Beach telephoned. I remarked that it was good to talk with him, for we had not been in contact for many years. And then, out of the clear blue sky, he asked, "How is your publication list?" I knew at once that he was referring to the dogs, and I replied, with some force, "I do not want to be associated with that work." He told me that he had finally looked at the data, was preparing a paper for a journal, and wanted to know whether I could remember the degree of tumescence the dogs displayed. I replied that I had absolutely no memory and could not help. He pursued the issue by suggesting that he send me photographs of dog penises in different degrees of tumescence to help me answer his question. I insisted that my memory of those evenings had faded and added that if he did submit the paper for publication, I did not want my name listed as an author. He agreed but added, with a laugh, that he might include a footnote that read, "The author thanks Jerome Kagan for his handi-work."

The Inevitable Collapse

The walls of this beautiful palace of behaviorism began to collapse within a decade. The mind can tolerate some inconsistency between its beliefs and the facts. Humans must hold an unquestioned faith in some assumptions, for living as well as for doing science. Each person must commit to a few core premises because there are too many alternatives after morning coffee. Should I garden, go to work, return to sleep, play chess, visit a friend, or talk

of Michelangelo. The Swedish novelist Pär Lagerkvist had God reply to a spirit who asked what his purpose was in creating humans: "I only intended humans would never be satisfied with nothing."²⁰

Ethical premises serve this function in daily life; theoretical assumptions do so in science. Fortunately, evolution awarded our species a unique talent. We are troubled by semantic or logical inconsistency between what we believe and what we observe (or what others tell us they have observed). We can tolerate a little inconsistency, but an ideology can quickly turn sour when the ugly facts begin to accumulate. That is what happened to the elegant structure of behaviorism, for new evidence had made it vulnerable to attack. An advantage of defending a firm intellectual position is that it motivates a critique that results in a novel perspective. Noam Chomsky, the American linguist, and Jean Piaget, the Swiss epistemologist, with a host of other scholars, gained celebrity by announcing that the emperor had no clothes.²¹ Chomsky reminded psychologists of facts that every parent knew. All three-year-olds speak new sentences every day. This should not be possible if the sentences had never been heard and, therefore, had not been rewarded. Piaget's ideas, which had been made comprehensible to American audiences by John Flavell, also required new conceptions.²² A two-year-old picks up a doll and feeds it imaginary milk with an imaginary bottle. This action, which the child had never seen performed, had to originate in a mind that was continually, and spontaneously, rearranging and creating new mental units without any obvious reward.

One unrecognized mistake in the behaviorists' scheme was the failure to appreciate that there is not always a deterministic relation between a conditioned stimulus and a conditioned response. They thought of this relation as resembling the shattering of a glass that had fallen from a table to the floor. But life systems work differently. Every person infected with flu viruses does not develop a sore throat because the immune system can intervene to prevent the usual symptoms of the flu. A fundamental principle of brain function is that excitatory and inhibitory systems are balanced. If I secrete too much cortisol because of overwork, my brain tells my body to slow cortisol production. The popular nineteenth-century concept of will, now part of the mind's executive functions, was the controller in the tower selecting the actions appropriate for the setting. A boy who has hurt himself and suppresses

a cry illustrates the power of “will.” We shall see in chapter 6 the dissociation that can occur between bubbly social behavior and a piercing inner tension. Put plainly, living forms are not two-layered systems.

One discovery contributed in a major way to the rejection of orthodox behaviorism. Behaviorists had assumed that any event could be a conditioned stimulus for any reaction. If some events had special salience for a particular species, the animal’s biology could trump the power of environmental arrangements and master planning would be impossible. John Garcia performed the execution by showing that rats could not learn an association between a light and a subsequent feeling of illness but that they easily learned an association between a distinct taste and the subsequent, unpleasant sensations.²³ The implication was clear. One could not teach any response to any animal because each animal had biological preferences that, in some cases, could not be abrogated. It would be easy to condition sexual arousal to the perfume worn by a romantic partner, as every manufacturer knows, but probably impossible to do so to the color of the pillow on which the lovers reclined or the sound of the air conditioner in the room. One team of psychologists conditioned a pig to pick up small objects with its mouth and drop them into a bucket. After performing this conditioned response for a few weeks, however, the animal suddenly reverted to its usual practice of burying the small objects. Its biology could not be suppressed indefinitely.²⁴ Children compare their qualities with those of peers and siblings. It is probably impossible to arrange an environment that would prevent these thoughts from developing. Conditioning is powerful, but its power is limited. The crisp, beautiful assumptions of Pavlov, Miller, and the behaviorists had been wounded, though not fatally, by irrefutable facts, as Ptolemy’s argument that the Sun orbited the Earth succumbed to the observations of Galileo Galilei and Tycho Brahe and the brilliant equations of Johannes Kepler and Isaac Newton.

Freud

Psychoanalytic theory, which enjoyed a broad-based popularity in the United States from about 1910 to the late 1960s because it celebrated the power of experience, also came under attack. Sigmund Freud’s ideas seemed intuitively correct to large numbers of psychiatrists, psychologists, and citizens,

especially in the United States, during the years between the two world wars because history had tweaked the balance between the mental and the biological. Humans have always been, and will always be, vulnerable to bouts of fatigue, apathy, depression, worry, tension, insomnia, and irritability. These complaints have strikingly different causes, including illness, strenuous work, uncertainty over money, job security, health, the loss of a loved one, rejection by a friend, or anxiety, shame, or guilt over desires or acts that violated a personal ethic. The unpleasant feelings are universal because humans anticipate future calamities, wonder what others are thinking about them, and cannot avoid succumbing to some illegitimate temptations. The individual tries to understand the reason for the unpleasant feeling; the local culture supplies the favored interpretations. The most popular interpretations derive their appeal, in part, from nodes of uncertainty in the community, ideas borrowed from other disciplines, or new inventions.

The industrialization of the nineteenth century transformed rural America. Young adults were emigrating from villages to cities, where the accelerating pace of life was accompanied by crime, diminished status, and some guilt over the need to be more competitive and less honest than one wished to be. It is relevant that industrialization, which required energy derived from wood, coal, and kerosene, made everyone more conscious of the concept of energy. When one of the recently discovered laws of thermodynamics stated that all energy was conserved, it was inevitable that someone would apply this scientific principle to human behavior. A neurologist named Charles Beard suggested that each brain, like a saucepan of warm water, possessed a fixed amount of energy, and symptoms would appear if this resource were depleted.²⁵ Beard invented the word “neurasthenia” in 1869 to describe adults who experienced fatigue, tension, depression, or insomnia because their nervous systems had run out of energy. Lenin was suffering from headaches, insomnia, and fatigue in 1903 and received this diagnosis from a physician who told him he was working too hard.

Neurology was a new medical specialty whose members charged higher fees than most doctors. As a result, wealthier citizens, who more often worked with their minds rather than their muscles, were the most frequent patients in the waiting rooms of this new category of doctor. Beard’s diagnosis was flattering, for it implied that the symptoms were a sign of high intelligence

and the investment of energy in difficult mental work. A less flattering diagnosis of insanity was given to less well educated, working-class patients whose symptoms were usually criminality, delusions, alcoholism, hallucinations, and severe depression. These pathologies were believed to be the result of constitutional defects rather than excessive mental activity.

Freud brought three original ideas to this historical moment.²⁶ The first was that early family experiences that frustrated the biological urges for the pleasures of eating, defecation, and genital stimulation, rather than an inherited constitution or conditioned habits, created unconscious states that could influence the later development of personality and neurotic symptoms. The second idea was that too much or too little sexual pleasure was harmful. Many Americans believed that frequent masturbation could lead to insanity. The availability of inexpensive condoms, moreover, made premarital sex less risky, and as a result, women could lower their guard and consider the delights of romance with a relatively new acquaintance. However, they remained vulnerable to anxiety, shame, or guilt for a permissive eroticism.

Sexual frustration could also bring on mental disturbance because some sexual pleasure was required for good health. The ancient notion that the symptoms of female hysteria—extreme anxiety, temporary paralysis, panic attacks—could be caused by sexual frustration remained popular, and physicians were massaging the genitals of their female patients with battery-powered vibrators, or their fingers, until the hapless women had therapeutic orgasms in the doctor's office. Although Galen had used the same therapeutic intervention seventeen centuries earlier, today's doctors would lose their licenses if they chose this form of therapy. Freud's third original suggestion was to replace this and other physical practices with free-associating to a therapist because rescuing anxious ideas from their home in the unconscious and rendering them conscious released the energy that had been used to repress them.

Freud's ideas seemed reasonable to some because he changed the secondary, rather than the primary, features of existing nineteenth-century assumptions. He accepted the belief that each person inherited a fixed amount of energy, which he called libido, but attributed the depletion of energy to the repression of sexual impulses rather than to excessive thought. Freud also acknowledged his society's belief in the importance of early experience, but

he made punishment of sexual interest, rather than of lying, disobedience, or incivility, the cause of symptoms. This move shifted the blame from the patients to their parents and supplied an interpretation that was as flattering to the patients as Beard's explanation that an insomniac was thinking too much. The popular explanation of extreme anxiety in a married woman was that she was born with a constitutional flaw that prevented her from regular sexual satisfaction. Many physicians also suspected that, in some cases, the husband was insufficiently sensitive to his wife's erotic needs. These interpretations attributed flaws to the wife, the husband, or both partners. Freud removed the stigma from the couple by blaming the symptoms on the unintentional errors of child-rearing by the wife's parents.

Finally, the suggestion to replace the therapeutic interventions of cold baths, herbs, and electrical stimulation with confessions to a therapist fell on friendly ears because many physicians had become convinced that longer conversations with patients had benevolent effects. The claim that each mind has a limited amount of libidinal energy, family experiences that cause repression of sexual motives lead to symptoms, and confession of the products of introspective analysis alleviates angst were transformations of late-nineteenth-century thought. All three ideas were imaginable and just discrepant enough to be arousing.

Freud's declaration that panic attacks, hysterical paralysis of the legs, and compulsive hand washing were due to repression of sexual thoughts, however, lost some validity after World War II when sexuality became more acceptable and, for some, a domain for achievement. Although the intensity of anxiety or guilt over sexual behavior had become diluted, the frequency of neurotic symptoms had not changed. Attributing the insomnia and nightmares of a Vietnam veteran who had slept with many partners to repression of sexuality became a ludicrous idea.

No one has offered a satisfactory explanation of why so many educated Americans and Europeans during the period 1910–1960 were convinced of the essential truth of Freud's assertions. I confess to being a member of this relatively gullible group as a starry-eyed student in 1950. One part of the answer must involve the chronic uncertainty that hovered over sexuality during that half-century. Desire had been allowed freer access to imagery but not to actions; hence, it seemed reasonable to guess that feelings of ten-

sion, which in fact were generated by the many uncertainties of daily life, were due primarily to the restraints imposed on making love whenever one wished. Essentially, Freud's followers thought it reasonable to attribute all uncertainty to sexual restraint.

The dissolution of the barrier between fear and anxiety and the classification of anxiety as a state of "illness" are also relevant. Fear assumed prominence in Christian Europe during the medieval centuries because of the preoccupation with God's wrath. Augustine regarded fear of divine punishment as a blessing because it helped humans behave morally, and John Bunyan, writing almost a thousand years later, reasserted the belief that fear of God permitted one to love the Deity. The contemporary view, thanks to Freud, maintains that fear and anxiety restrict the capacity to love. By arguing that anxiety was not a necessary emotion and could be reduced by emptying one's unconscious of its repressed wishes, Freud implied that everyone could rid themselves of this enemy of happiness.

If life's assignment is to control hedonistic desires, anxiety is an ally and not an alien force. But anxiety is the enemy if one is supposed to gain friends, seduce lovers, and take risks for gains in status and money. If humans are to restrain greed, lust, competitiveness, and aggression, self-control is a prerequisite. But if these are the goals to gain the willful control of self through anticipated anxiety is an impediment. Thus history relegated "will" to the same ash heap of ideas where Newton's ether lies gathering dust. The notion that humans can and should be free of anxiety is one of the distinguishing illusions in Western thought over the past century and one reason why American psychiatrists consider intense anxiety a mental disorder but not intense competitiveness, sexual arousal, or desire for higher status.

I also suspect that the American eroticization of personal freedom awards authority to the argument that liberating the wishes imprisoned in the unconscious would bring health and vitality. A popular psychology textbook published in 1930 declared that the primary goal of development was to emancipate each child from the restrictions imposed by the family. Freudian ideas benefited from the semantic link between the motto on the New Hampshire license plate, "Live free or die," and the rescue of desire from its imprisonment in the unconscious. Freud actually wrote that psychoanalysis "sets the neurotic free from the chains of his sexuality." Freud was acutely aware of his

minority status as a Jew in Austrian society and must have hoped that he, too, could be freed from the chains of prejudice that required him to be continually vigilant. He asked Carl Jung to be the first president of the International Psychoanalytic Society, hoping this move would make analytic theory more attractive to a large number of non-Jewish professionals.

Freud's image of mind was as mechanical as that of the behaviorist. He described thoughts and feelings as if they were electrically charged particles that, if diverted from their "natural" target, would be converted into a bodily symptom. This prose made it easier to imagine how a feeling of tension could be transformed into a blinking tic. The explanation shared the concreteness of behaviorists who wrote that the tic was a conditioned response. Behaviorists friendly to Freud suggested that the conditioned stimulus for a blinking tic could have been the sight of a violent or sexual scene that evoked a reflex blink.

One reason that psychoanalytic ideas were less popular among Europeans than Americans when first introduced was that Europe placed greater value on the harmony of the community than on the primacy of the individual. Hence, Europeans were willing to accept some restrictions on personal freedom if the restraint strengthened the social matrix. London, Paris, and Florence were vibrant cities with significant institutions centuries before New York, Boston, and Chicago had paved streets. It is also relevant that European suffering during centuries of bloody wars initiated by men with an exaggerated sense of self had made citizens more skeptical of the assumption that celebration of the unfettered individual was a good idea. Psychoanalytic theory had minimal appeal to physicians or citizens in India, Japan, or China because their attitudes toward sexuality were more permissive, and they, too, believed that freeing each person from his or her obligations to others was not an ideal to pursue. Like John Locke in the eighteenth century, and Karl Marx in the nineteenth, the appeal of Freud's ideas profited from the historical context in which they were introduced. Thus, the attractiveness of the two "theories" that dominated the American conception of human behavior during the first half of the twentieth century was based, in part, on their being pinned to the coattails of deeply held political premises and superficial resemblance to simple physical models of mind mistakenly classified as truths about nature. The credibility of current sociobiological explanations

of some psychiatric disorders is helped by a political pressure to rationalize the symptoms as biologically adaptive at other times and in other places so that the poor and uneducated, who more often suffer such symptoms, will be relieved of some blame for their condition and can find relief in new pills rather than in new social arrangements.

Too Much Abstraction

A serious problem with the concepts of behaviorism and psychoanalysis was their extraordinary generality. The terms “drive,” “learning,” and “reward” (the three legs of the stool that held the structure of behaviorism steady) rarely specified whether the agent was a rat learning to turn right in a T-maze or an adult trying to master the calculus. I remember reading a long theoretical paper on learning in a premier journal in which the author never thought it necessary to mention the animal species observed. This indifference to detail remains strong today. The first sentence in the abstract of a paper published in the December 2004 issue of *Behavioral Neuroscience*—a journal that enjoys high respect—stated: “A learning event can be dissociated into three components: acquisition, storage, and recall.”²⁷ There is no specification of the class of animal, the structure being learned, stored, and recalled, or the method used to measure these events. Freud, too, did not think it worthwhile to distinguish between the libidinal arousal of a nursing infant and a college senior leafing through *Playboy* magazine. A physician writing about illness who did not specify whether the affliction was cancer, arthritis, or diabetes in a mouse, dog, or human would be a target of biting satire. It would be impossible to understand the intended meanings of individuals who spoke only verbs—“lick,” “run,” “protect,” “bite,” “taste,” “choose,” or “give”—and never named the actors or the targets of their actions. Some readers may be surprised to learn that the word “attachment,” which was invented by the English psychiatrist John Bowlby to explain why human infants cried when their mother was absent, has been used to explain why rat pups explore a space suffused with a particular odor. This practice assumes that theoretical terms intended for a restricted set of events can, like the joker in a deck of cards, be borrowed and applied to very different phenomena.

This permissive semantic stance attracts scientists who hold strong a priori

beliefs, often ethical in content, about the best society, optimal parent-child relationships, and the goals humans should pursue. The concept “positive affect,” for example, is popular among psychologists even though erotic scenes, food, and money create distinctly different brain and psychological states and a few adolescents enjoy torturing animals or setting fires. The argument that these five experiences belong to the same natural category strains the bounds of reasonableness. The developmental psychologist Lawrence Kohlberg had decided that the construction of a coherent, semantically consistent set of values that could be defended with a verbal argument represented the “highest stage of morality” and used the answers of children and adolescents to moral dilemmas to defend this position.²⁸ Because ten-year-olds are not cognitively mature enough to create logically tight arguments, the evidence supported his beliefs. Jean Piaget had decided that the ability to reason correctly about hypothetical events represented the “highest stage of intellectual development” and administered problems to children of different ages to support this bias. Freud used patients’ verbal descriptions of their life histories to defend his belief that failure to resolve the oedipal conflict was followed by the development of neurotic symptoms. All three understood that they needed evidence to persuade others of the correctness of the assumptions they had already decided were true. None attempted to refute their intuitions.

Discovery followed by proof of a possible explanation are the yin and yang of science. Ideas that originated in robust evidence usually have a longer life than those arising from thought alone. Charles Darwin had no idea what he would see on the voyage of *HMS Beagle*; Santiago Ramón y Cajal did not know what shapes would appear under the lens of his microscope; and Edwin Powell Hubble could not anticipate what images would develop on the pictures taken while peering through a telescope at the night sky. The unexpected observations of these scientists led to creative ideas that proved to have a thick thread of validity. Physicists come in two colors. One group tries to find a mathematics that will explain a set of reliable observations. The second group attempts first to imagine the physical events behind the observation. Werner Heisenberg belongs to the first group, Paul Ehrenfest to the second. Psychologists can be assigned to comparable groups. Some try to model, logically or mathematically, the mechanisms behind the learning

of associations. A larger group broods on the psychological and biological processes that occur when an association is formed.

The history of all the sciences suggests that the collection of evidence in the service of proving a conjecture is most useful when the synthetic notion originates in prior, trustworthy observations. This strategy can be dangerous in immature sciences, like psychology, that have a meager store of reliable facts. Bruce Alberts, a biologist and a past president of the National Academy of Sciences, wrote that his doctoral research on chromosomes, conceived in a priori mode, failed to find the desired result. As a result, his faculty committee did not approve his thesis. Later, following soul searching, Alberts decided that it was a better strategy to develop a reliable method first and then use it in experiments—a decision that turned out to be wise.

Michel de Montaigne did not discover that moderation was the optimal way to conduct a life; Blaise Pascal did not discover that God existed; Immanuel Kant did not discover that individuals should obey any imperative they want everyone else to follow. These philosophers first decided that these ideas were true and then constructed coherent semantic arguments to support their positions. Investigators who work in a “proving” frame, compared with those who operate in a “discovery” frame, are tempted to use abstract words that maximize the generalizability of their favored construct. The behaviorists wanted to prove that animals and humans learned new associations when a reward followed an action. The headiness of this notion would have been diluted if they had been asked to specify the species, the response, and the reward. The beauty of their theory would have been tarnished if they had been required to list all the exceptions to this principle. Kant would not be celebrated if he had written that the categorical imperative applied to murder but not to stealing. Fewer students would be assigned Montaigne’s essays if he had suggested that the doctrine of moderation applied to the drinking of alcohol but not to sexual activity.

I confess to being guilty of this error early in my career. I, too, was certain of the truth of some ideas when I left New Haven to take a faculty position at Ohio State University. I was irrationally opposed to awarding biology any significant influence on development and was convinced that the behaviors, beliefs, and emotions established early in life would persist unless there were

consistent attempts to change them. The only premise that turned out to be somewhat more fruitful was the belief that the variation in behavior, mood, and belief among children was caused primarily by the private constructions children created from parental treatments and peer experiences. These symbolic representations, rather than the events as recorded on film, were the effective monitors of development. This notion bubbled up from introspection on daily experience and reading, not laboratory evidence, and I wanted to prove its truth as soon as I unpacked my box of books in Arps Hall on the campus of Ohio State University in the fall of 1954.