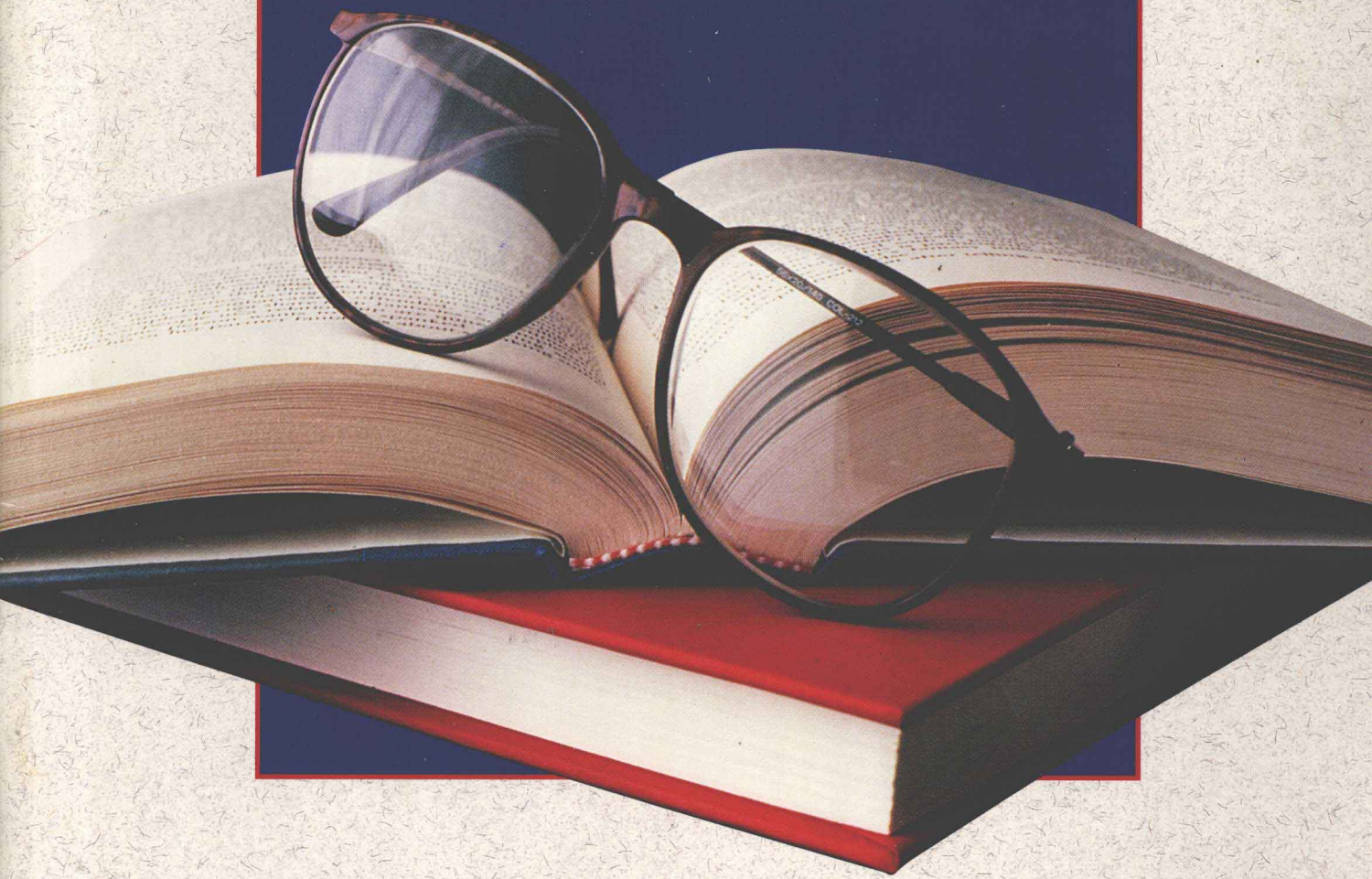
Readings

IN PSYCHOLOGY



Readings in Psychology

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Readings in Psychology

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INTRODUCING PSYCHOLOGY

Reading 1: Notes From the Overblown

Students new to psychology may be taken aback by the wide range of topics covered by the subject. This is because psychology is the study of human behavior—a subject of almost limitless scope. The following reading provides a humorous glimpse of some of the fads and fashions associated with psychology in recent years.

Chaotic is one way to describe American life during the past 20 years. Traditional values were questioned; new ways of relating to ourselves were sought. Sometimes it seemed as if we were running off in all directions at once, taking each new idea to its extreme, desperately seeking answers and relief.

At the same time, the psychological enterprise mushroomed—greater public acceptance, more literature and almost as many quacks practicing therapy as there were qualified experts. There were good ideas, good research and the first glimmer of a science of behavior change. But the penchant for taking things to excess was also present. And therein lies a tale.

Two decades ago, *I'm OK-You're OK* had just been published. The "touchy-feely" movement was gaining momentum, giving us a wealth of jargon so we could communicate more clearly. We were urged to "be here now," to "get out of our heads and into our bodies," to "drop our facades and express our feelings," but only our real feelings (in contrast, I suppose, to our unreal feelings).

We were told to "go with the flow" and "let it all hang out." This led to nude groups and nude beaches, where we shed our defenses as we shed our clothes and let it all hang out in the fresh air. Those who had long-standing problems need worry no more. They were just suffering from the effects of traumatic birth experiences and could now treat themselves to a "rebirthing" or a massage.

Although intimacy and love were both considered important, est and other therapies told us that we each needed "space" to "do our own thing." But no one quite figured out how two people each doing their own thing could do anything together. Divorce became the national pastime.

Thinking was denigrated for several years because it inhibited "spontaneity" and generated "phony intellectualizing." Far more preferred were gut reactions such as "I hate you" and any combination of four-letter words. Being "in touch with your feelings" indicated that you were in touch with yourself, a very high achievement. One wonders who you were in touch with before.

When the highest good was to "be yourself," no one discussed the crucial question of how it was possible to be anything else. As people spent more time getting in touch with, overhauling and "actualizing" themselves, they got more confused. The situation became so overwhelming by the end of the '70s that many people simply gave up and put their energies into the far simpler business of making money. This, of course, generated courses on the psychology of making and investing profits.

Meditation bloomed for a while. "TM," "mantra," "lotus position" and "köan" entered the language. The purpose of meditation was to reduce tension and/or achieve "enlightenment." The enlightenment business was brisk, and as one writer noted, the problem was not that so many people were seeking it but rather that so many people were finding it. Interest in the subject waned when some gurus claimed

that meditators could fly. The nation already had enough problems with air-traffic control.

Despite the real benefits of meditation and other methods of self-help, few people continued with them for long. At least not with the same one. There soon appeared a class of therapy junkies who had, in addition to all the traditional therapies, meditated, been to est, Arica and forty kinds of groups. And they were still looking for the magic that would change their lives.

It turned out that we were not as OK as had been imagined. The number of officially recognized mental disorders jumped from 110 to 210. Not surprisingly, the number of therapies also grew until we had more than 250 of them. "Wholistic health" and holistic medicine made their appearances, although no one knew what the terms meant. Similarly, no one was quite sure what "psychic healing" and "psychic surgery" were. They, too, were popular, but only for a short time because their devotees quickly died out. Jogging was for a time thought to be a cure for depression and other ailments, and to produce highs comparable to those achieved with drugs and meditation. Research indicated that jogging did indeed cure depression—the economic depression of those who sold running shoes and treated sprained ankles and sore backs.

The small number of individuals who had no officially recognized problems were urged to get help so they could realize their "potential," a mysterious essence first discussed by Pliny the Elder. One of the best ways to do this was to get together in "consciousness-raising" groups. When women did this, they usually talked about how terrible men were. When men did it, which was rare, they didn't know what to talk about. Often, they resorted to discussing "transitions" and "crises," vaguely defined terms that had something to do with the passage from football season to basketball, getting older, changing careers, and going from bachelorhood to marriage to "divorcedhood" to marriage, and so on.

Some people tried to realize their potential in other ways. When rolfing and "primal scream" came along, pain was thought to be therapeutic. "No pain, no gain," as the body builders say.

Tenderness was also in. Leo Buscaglia inflamed the imaginations of millions with his stories of hugging—friends, enemies, even college deans—and implied it was the greatest cure since chicken soup. "Hug therapy" quickly followed.

Reticence and tact were out. As journalist Tom Wolfe noted, this was the time of talking, especially about Me. The lack of "total and honest communication" became the explanation for the usual list of miseries: parent-child problems, marital distress, racial discord, war and athlete's foot. Wolfe pointed out that too much honest communication also led to problems such as divorce, but in those halcyon days no one wanted to hear that.

Hypnosis enjoyed a renaissance. Much to the embarrassment of most practitioners, a small group of therapists claimed hypnosis allowed you to regress to "past lives" to work through sources of current distress. Interest in this phenomenon was high until it was learned that scores of clients who were regressed to the time of the Stone Age failed to return.

Imagery was in. Merely imagining a goal—say, wealth or a better backhand—would lead to its achievement. More modestly, est promised that visualizing a parking space would make one appear. The promise was fulfilled, but only in Montana. Research has yet to determine what variables in urban centers prevent visualization from creating parking places there.

Sex was big news. We had a sexual revolution and open marriage entered our lives, as did sexually transmitted diseases. For a time, it seemed that everyone was "into" *The Joy of Sex*. Well, not everyone. The advent of the new sex therapy reminded us that many people had "dysfunctions," mainly because what they saw in movies and on television created "performance anxiety." The new army of sex therapists prescribed masturbation for their clients and, thus, what had been thought of as a disease ("self-abuse") became a cure ("self-pleasure"). Those without problems were urged to expand their horizons by trying different acts and positions, finding their "G spots" and attempting multiple and extended orgasms. After a decade of this kind of advice, it was

discovered that 85.7 percent of adults had lost all interest in the subject.

Analytic therapies grew so long that outsiders assumed some patients were married to their therapists. At the same time, there was a trend in the other direction, encouraged by HMO's, insurance companies and others who paid the bills. Neuro-Linguistic Programming claimed to cure phobias in a few minutes, but the move toward brevity reached its apex with the one-minute interventions (the best-selling *One Minute Manager* was soon followed by books on one-minute mothering and fathering). I was hoping for something like *Thirty Seconds to Nirvana* but it never came.

Stress was very hot. The Type A personality was bad and Type B was good. Change of brain wave, change of diet, change of career and change of spouse were each championed as having value in reducing unwanted stress. Stress "management" became an obsession for many and contributed significantly to the amount of stress they needed to reduce.

Computer jargon infiltrated psychology and there was much concern about what people were "inputting" and "outputting." Anorexics refused any input, while bulimics were heavy on both input and output. Other people were heavily inputting, indeed abusing, things called "substances."

Psychology went public in a big way in the past 20 years, as this magazine's appearance and presence attest. In addition, many therapists became regular fixtures on others' radio and television talk shows, and some even got shows of their own. Unfortunately, all sorts of self-styled experts also got their own media forums, from which they bombarded the populace with advice on every psychological matter under the sun. I'd be happy to tell you what all that advice included, but I'm already late for my course on "Peak Performance in the Later Years," which I got into after reading a brochure entitled "Beyond Perfect Health."

Note. From B. Zilbergeld, "Notes from the Overblown," *Psychology Today* 21 (May 1987): 10–12. Copyright © 1987 (Sussex Publishers, Inc.). Reprinted with permission from *Psychology Today* magazine.

QUESTIONS

1. Do you agree that the last twenty years of American life can accurately be described as chaotic? Why or why not?
2. While the writer pokes fun at many recent psychological trends, the impact of these trends on American culture is immense. Choose one of the trends discussed and briefly describe its impact on your life or the life of someone you know.

Reading 2: Ethical Dilemmas

Research is a crucial component of psychology and other sciences. Psychological research can be delicate, however, because it may subject human participants to painful, frustrating, or intensely emotional experiences.

The scientific enterprise creates ethical dilemmas. Scientific knowledge and techniques that can be used for human betterment can be turned to manipulative and exploitative purposes as well. Just as the results of research in atomic physics can be used for the treatment of cancer as well as for destructive weapons, so methods discovered to reduce prejudice toward minority groups, to eliminate troublesome behavior problems, or to facilitate learning in school may also be used to manipulate political allegiance, to create artificial wants, or to reconcile the victims of social injustice to their fate. The double-edged potentiality of scientific knowledge poses ethical problems for all scientists. To the extent that psychological research deals with important problems and potent methods, psychologists recognize and alert others to the fact that the potential for misuse of research increases its potential for constructive application.

The psychologist whose research involves human participants faces a special set of dilemmas. The obligation to advance the understanding of relevant aspects of human

experience and behavior will, at times, impinge upon well-recognized human rights. Significant research is likely to deal with variables and methods that touch upon humanly important concerns. Psychological research often necessitates the manipulation of powerful and significant independent variables that make a difference in the world outside the laboratory. Answers to research questions may involve subjecting people to pain, to failure, or to stressful manipulations that could violate autonomy in the short run or could result in enduring change.

On the dependent variable side, research often involves the study of profound behavioral effects because the humanly important independent variables are the ones that produce humanly important effects. Fear, embarrassment, aggression, blind conformity, cheating, and boredom, as well as the positive aspects of human experience and performance, become topics of study. The same considerations require the study of vulnerable groups—children and mentally disabled, poor, old, and handicapped persons. Some of the most serious ethical questions arise from the study of important problems in human contexts such as these.

Not only do ethical questions follow from the psychologist's pursuit of important independent and dependent variables, but the methods that are needed to make inferences as unambiguous as possible are often the ones that raise ethical difficulties. Many psychologists believe (although some question this belief) that to obtain valid and generalizable data, it is often essential that the research participants be less than fully informed about the study or parts of it. For example, the requirements of research may demand that the participants be unaware of the fact that they are being studied, of the quality of behavior being studied, or of the hypotheses under investigation. Even deception may appear to be necessary if a psychological reality is to be created under experimental conditions that permit valid inference.

Other ethical problems arise in connection with research methods: Experimental tasks or environments may sometimes be meaningless, boring, or otherwise unattractive to the research participant; some data that must be recorded and preserved for scientific purposes may later be used to the participants' disadvantage or for purposes to which the participants might object; the need to obtain observations on a random sample for the sake of statistical generalization may be in conflict with the ideal of voluntary and informed participation in the research; controlled comparisons may require withholding potentially beneficial treatment from some participants. . . .

Practices such as those just mentioned (failure to obtain informed consent, concealment and deception, exposure to stressful procedures and possible harm, invasion of privacy, withholding of potentially beneficial experiences from members of a control group) raise important ethical issues. Responsible psychologists will obviously invest their ingenuity in discovering ways of conducting research that avoid or minimize these problems. The ethical dilemma with which the research psychologist is confronted, however, includes not only the negative side—ways in which the dictates of good research come in conflict with particular ethical ideals—but also the positive obligation to advance knowledge of human behavior.

Note. From "Ethical Dilemmas in Research with Human Participants," in *Ethical Principles in the Conduct of Research with Human Participants* (Washington, D.C.: American Psychological Association, 1982), 16–17.

QUESTIONS

1. List three or four ethical problems that may arise in connection with research methods.
2. Describe some of the "humanly important independent variables" and some dependent variables that produce "humanly important effects."
3. Do you think research participants should be fully informed about a study in which they participate? Explain.

SECTION I

LEARNING AND COGNITIVE PROCESSES

Reading 1: Molecules of Memory

In this account, researchers demonstrate that learning actually brings about physiological changes in the learner's nervous system.

In her mind, the teenage girl lying on the neurosurgeon's operating table was seven years old again, walking through a field with her brothers. The sun was shining, and she could see her brothers tramping ahead through the high grass. Then suddenly, from behind her, a man with a sack appeared and said, "How would you like to get into this bag with the snakes?" The teenager on the table screamed out in terror.

Clearly, our past lies embodied within us. The 14-year-old girl was undergoing an operation for epilepsy when an electrode probing her brain suddenly brought the terrifying childhood memory flooding back. (Although the incident sounds like some Freudian fantasy, complete with a sack full of phallic symbols, the girl's brothers attested that it really did happen; they too had witnessed it.) The event she relived with such hallucinatory vividness was evoked by electric pulses shooting through nerve cells in her cerebral cortex.

This now-famous case and others like it were first reported by American neurosurgeon Wilder Penfield in the 1930s. While they demonstrated that memories could be called up by electric stimulation of the brain, they raised far more questions than they answered: How, for example, do our experiences of the outside world—of an unmowed field in the summer sun, of a strange man with a bag of snakes—leave their traces within the cells of our brain? What miraculous substances create these cellular pieces of the past? How do we learn and remember what we learn? How, in short, do we become who we are?

In truth, the answers to these questions are still mysteries—indeed they may safely be counted among the great challenges of neuroscience. What we know is that somehow memories are kept secure within the 100 billion neurons of our brain. And we assume that the brain cells that store our memories undergo some chemical change that allows them to do so. According to today's prevailing theory, a single memory is held not within a single neuron but spread out over a vast neuronal net. Like a tile in a mosaic, each of these nerve cells represents a tiny piece of a much larger picture. But the image—the past experience—is readable only if each neuron is linked with the other relevant neurons that make up the mosaic. Destroy the connections and the memory fades into nothingness. Strengthen the connections and the memory becomes more powerful, more easily recalled.

The brain's neurons communicate with one another by pulses of electricity conducted along the fibers that stretch away from each cell. These signals in turn are passed from one nerve fiber to the next by neurotransmitters, chemical message-bearers that travel across the sliver-size gaps separating the fibers. It is at these gaps, or synapses, that the critical linkage of one nerve fiber to the next is made. And so, in some sense, it is within the pattern of signals sent across a multitude of synapses that a memory resides.

Consider the teenage girl operated on by Penfield. One summer day when she was seven, she was surprised in a field by a strange man with a bag. What happened? Light reflecting

from the man's face entered her eyes and was transformed into electric impulses that ran through a particular series of neural pathways—raced through a specific series of synapses—in her brain's visual area. Then air vibrations carrying the man's voice—"How would you like to get into this bag with the snakes?"—entered her ears, and they also were translated into a pattern of synaptic connections. The girl screamed in terror and ran home, where she recounted the traumatic event to her mother. Each time she recalled the incident, electric signals flowed through the same, newly established network of synapses, and the scene in the field played back like a movie through her mind.

Of course, this is explanation by analogy. True explanation will come only with a detailed understanding of the molecular processes that enable our nerve cells to store information. To this end, neurobiologist Eric Kandel of the Howard Hughes Medical Institute at Columbia University has dedicated a lifetime of research. Yet, after 30 years' effort, he feels our knowledge is at best rudimentary. "In moments of delusion," he says, "we think we've gained a pretty sophisticated understanding of learning and memory processes. But, really, we still have a long way to go."

Nonetheless, Kandel and his colleagues at Columbia are providing some stunning insights into how the lessons of the past are written into the language of the nervous system. Because of their work we are beginning to see that the act of remembering—of learning—is a dynamic process. A model for memory must now include the probability that as we learn, stores of neurotransmitters are built up, nerve fibers grow and branch out, and a dominolike series of chemical events takes place that allows one neuron to forge a lasting connection with another. Once, memory could be described as a mysterious working of the mind. Now, says Kandel, "we think that we can trap aspects of learning and memory processes within a single cell."

The animal that is letting him in on the arcane secrets of memory is a California marine snail whose remembrances of things past would normally consist of little more than mating and munching seaweed. Kandel has made the large, shell-less sea slug *Aplysia californica* a superstar within the neuroscientific community.

His choice of a mere mollusk stems in part from his belief that the ability to store information is an evolutionary legacy, a universal feature of the nervous system: many invertebrate animals and all vertebrates are capable of primitive forms of learning and remembering. Because of this common evolutionary heritage, the reasoning goes, memory and learning in slugs and people are likely to have common cellular features. *Aplysia*, of course, possesses far fewer nerve cells than we do—a mere 20,000 or so. And *Aplysia*'s neurons are larger. Otherwise, however, its neurons are hardly distinguishable from our own; their structure and signaling mechanisms are the same.

Because *Aplysia*'s brain is simple and contains some of the largest, most accessible neurons in nature, Kandel and his colleagues have been able to eavesdrop on their synaptic conversation in ways that would be impossible in humans. Like Penfield, they can use an electrode to stimulate a neuron and make it fire. But they can also insert electrodes into the neighboring nerve cells this neuron communicates with and record what those cells are saying as well. Through such recordings the researchers have managed to pinpoint how specific neurons control aspects of *Aplysia*'s behavior. And by meticulously examining how these nerve cells change as the animal learns to alter its behavior, Kandel and his fellow investigators have begun to peel back the cellular layers of memory.

Aplysia is not without its smarts. In many ways it is as capable of learning as Pavlov's famous dogs. The slug may not salivate at the sound of a dinner bell, but it can learn to associate two signals and modify its behavior accordingly. Kandel and his colleagues use simple Pavlovian conditioning, of course, because one can't ask a snail—or for that matter, a dog or a monkey—to describe what new memories have entered its mind. That a slug has learned a lesson from its experience, that it has "remembered" that two stimuli are connected, must be inferred from its behavior.

As in our own brain, sensory signals in response to the world outside flow in electric pulses down different neural pathways in a slug's nervous system. If two different stimuli are to be connected, then bridges of some sort must form between neural paths. Through Kandel's analysis of *Aplysia*, it becomes clear that those bridges are the synapses, and we begin to understand how they may join neural paths together into complex networks in which all our experiences are stored.

Aplysia, for example, normally responds to a gentle touch to its siphon—a breathing organ lying atop its gill—by slowly retracting its gill halfway in an act of wary self-defense. But if its experience of the outside world becomes more threatening, it modifies its behavior. As Kandel has shown, if you shock a slug's tail, not once but repeatedly, it begins to reason that if the future resembles the recent past, it's in big trouble. This knowledge—something's out to get me from behind—becomes embodied in its brain. So after repeated tail shocks, a touch to its siphon takes on a new meaning. Give the siphon a little squirt from a WaterPik and the tail-shocked slug reacts as if its life was on the line. It quickly covers its siphon and gill with a protective flap of skin, behaving for all the world like a shell-shocked soldier leaping into the nearest foxhole at the sound of a snapping twig.

A soldier's memory of war, however, must be the result of millions of synaptic alterations that could not conceivably be mapped. *Aplysia*, on the other hand, is simple enough that Kandel's group has been able to trace most of the circuitry that links sensory pathways coming from its siphon to those coming from its tail. Critically, they have found that the tail pathway, once stimulated by electric shock, amplifies the siphon neuron's ability to tell the gill to retract.

After repeated tail-shock training, the synaptic terminal at the end of a memory-laden siphon neuron begins to bulge with bags of neurotransmitter. What this does, in effect, is give the siphon neuron a kind of megaphone to boom commands that once it could only whisper. In this case the recipient of the command is the motor neuron that yanks the slug's gill under its protective flap.

Admittedly, the application of findings about a slug to the workings of human memory is a great leap of extrapolation. "But I think it's a very reasonable one," says Kandel. "I'm very excited about the bridges that can be made in the future between memory and learning in *Aplysia* and higher vertebrates." For in very similar ways, repeated stimuli evidently reinforce specific synaptic patterns, whether in a slug brain or a human one.

Consider again Penfield's teenage patient. Four years after the traumatic events in the field, the girl developed epilepsy. And apparently the electric discharge of those initial seizures, wrote Penfield, "followed the well-worn synaptic pattern that was capable of waking the childhood memory." Indeed, he speculated, by repeatedly firing neurons along this pathway, the seizures may have "burned" this synaptic pattern into the girl's brain. When, during the operation, Penfield applied a small current to her cortex, the burst of electricity once again flowed down this well-traveled path, and she relived the scene in the field, saw again the approach of the man with the snakes. "Oh, I can see something come at me!" She screamed after Penfield applied the electrode to her brain. "Don't let them come at me!"

Kandel believes we are now on the verge of a molecular vision of complex mental processes like memory. "It will be a beautiful complement to psychological insights into the mind," he says. "Neurobiology is going to have the influence on people's thinking about how their minds work that psychoanalysis once had."

It was through Sigmund Freud that Kandel first became immersed in the workings of the human mind, and his career is in some sense a mirror image of Freud's. In 1939 Kandel's Jewish family was forced to flee Vienna for New York. While Kandel began his professional life training to become a psychoanalyst, Freud spent the first 20 years of his career as a neurobiologist, making his mark with a series of original studies of both fish and human brain anatomy. Indeed, in an

1897 paper published only posthumously, Freud anticipated the modern view of brain function, even suggesting that memory and learning occurred through the modification of nerve synapses. . . .

"For me," says Kandel, "memory was one of the core problems of psychiatry. Moreover, Pavlov had made it clear that learning and memory—unlike the unconscious—could be studied in a rigorous fashion." As a medical student in the early fifties, Kandel recalls, he became increasingly entranced by the magic of neurobiology. "Putting an electrode into a nerve cell and hearing the sound"—the *pop-pop-pop* of a neuron firing over the audio amplifier—"was really quite exhilarating." In 1957, after graduating from medical school, he went to the National Institute of Mental Health; there, together with neurobiologist Alden Spencer, Kandel attempted to use new electrophysiological techniques to stick microelectrodes into the individual cells of the mammalian hippocampus.

The hippocampus is a sea-horse-shaped structure underlying the area of cortex that Penfield stimulated in his 14-year-old patient, and it's a part of the brain that's known to be crucial to memory formation. People whose hippocampus has been destroyed by injury or disease live in an eternal present, unable to form any lasting memories. Prisoners of the moment, they wake up each day unable to remember where they are, and ten minutes after they are told they have forgotten once again. No one had succeeded in recording from hippocampal cells before Spencer and Kandel. "I will never forget the sound of those first impalements," says Kandel. "This blast came over the loudspeakers that was so large the amplifier was overloaded—it was absolutely fantastic!" The two young explorers had planted their electrode like a flag within one of the great uncharted continents of the brain.

To make real inroads into memory, however, Kandel knew he would need a far simpler system than the mammalian hippocampus. So when he heard about a slug species whose nerve cells were being studied in France, he was intrigued. Indeed, he learned, the slug's large, flamboyant yellow-orange nerve cells were ideal targets for electrode impalement. In 1962 Kandel went to Paris to perform his first electrophysiological experiments on memory on the slug. . . .

During the formation of long-term memory, says Kandel, the neurotransmitter that a sensory cell receives can apparently "act as a growth factor, initiating a cascade of gene expression that is highly reminiscent of the genetic process that controls development in an embryo." A neuron begins its life by sending out an embryonic growth cone, which creeps along fibers in the developing nervous system until it branches out like a tree to form a synapse with a neighboring neuron. In fact, Kandel suggests that learning and memory may be considered as an extension of this developmental process.

For Kandel, this convergence between memory and development is part of a synthesis that is spreading through the life sciences. "The most wonderful thing to come out of the past ten years," he says, "is that we are beginning to see a unity underlying biology that is a marvelous edifice for understanding life functions. Physicists and chemists have always felt that biology was a descriptive science that had an overlying concept of evolution but other than that didn't have any powerful underlying principles."

That's no longer true, Kandel thinks. By digging down to the molecular innards of cells in many species, including ourselves, biologists are seeing how all life has evolved through variations on universal themes. Genes, proteins, and the mechanisms by which their function in cells are regulated, are increasingly being organized into families with deep characteristics in common. "When intellectual historians look back at this period," says Kandel, "I think that they're going to see something very special in the nature of biology."

Sitting in his Columbia office, Kandel muses over the shifting directions his career has taken. After an absence of 30 years he is now returning to the place where he first began, the mammalian hippocampus, the brain area that is crucial for forming long-term memories in higher animals, including humans. Recently researchers have been excited by the

finding that a molecule within the hippocampal cells can associate signals from two different neurons. Kandel, who sees key similarities between this molecule and the one underlying associative learning in *Aplysia*, now hopes that the insights gained from his slug will apply to quicker-thinking creatures.

"Association," says Kandel, "has always been thought to be central to learning—and here are these molecules, this built-in logic, that allows an individual neuron to associate one stimulus with another." Two hundred years ago Immanuel Kant revolutionized philosophy by proposing that the potential to perceive causal relationships was not learned but inherent in the structure of the human mind. The finding of stimuli-knitting molecules in both *Aplysia* and the mammalian brain opens up the possibility that Kantian causality is indeed built into the biology of nerve cells.

"Until quite recently, the major insights into the human mind came from philosophers like Kant and from psychologists like Freud," notes Kandel. But now biology is entering this once ethereal territory through the work of researchers bent over electrodes and gels, slug neurons and slices of hippocampal tissue. "What is so exhilarating for many of us in this field," says Kandel, "is the feeling that neurobiology can now be the driving force behind what has to be the greatest and most precious quest of all—the quest to understand ourselves."

Note. Excerpted from G. Montgomery, "Molecules of Memory," *Discover*, Special Issue: Exploring the Mind, 1990, 38–47. Geoffrey Montgomery/Copyright © 1990 Discover Publications.

QUESTIONS

1. How is a single memory similar to a tile in a mosaic?
2. What evolutionary legacy does Kandel believe can be found in many invertebrates and all vertebrates?
3. Summarize Kandel's theory about what happens during the formation of long-term memory.

Reading 2: Eyewitnesses

Most of us would probably acknowledge that our memory is not perfect. In the reading that follows, Elizabeth Loftus discusses the kinds of mistakes that memory can cause in eyewitness accounts.

The ladies and gentlemen of William Bernard Jackson's jury decided that he was guilty of rape. They made a serious mistake, and before it was discovered, Jackson had spent five years in prison. There he suffered numerous indignities and occasional attacks, until the police discovered that another man, who looked very much like Jackson, had committed the rapes.

If you had been on the jury, you would probably have voted for conviction too. Two women had positively identified Jackson as the man who had raped them in September and October of 1977. . . .

This is just one of the many documented cases of mistaken eyewitness testimony that have had tragic consequences. . . .

One reason most of us, as jurors, place so much faith in eyewitness testimony is that we are unaware of how many factors influence its accuracy. To name just a few: what questions witnesses are asked by police and how the questions are phrased; the difficulty people have in distinguishing among people of other races; whether witnesses have seen photos of suspects before viewing the lineup from which they pick out the person they say committed the crime; the size, composition and type (live or photo) of the lineup itself. . . .

Studies by others and myself have uncovered other common misconceptions about eyewitness testimony.

They include:

• *Witnesses remember the details of a violent crime better than those of a nonviolent one.* Research shows just the opposite: The added stress that violence creates clouds our perceptions.

• *Witnesses are as likely to underestimate the duration of a crime as to overestimate it.* In fact, witnesses almost invariably think a crime

took longer than it did. The more violent and stressful the crime, the more witnesses overestimate its duration.

• *The more confident a witness seems, the more accurate the testimony is likely to be.* Research suggests that there may be little or no relationship between confidence and accuracy, especially when viewing conditions are poor.

The unreliability of confidence as a guide to accuracy has been demonstrated outside of the courtroom, too; one example is provided by accounts of an aircraft accident that killed nine people several years ago. According to *Flying* magazine, several people had seen the airplane just before impact, and one of them was certain that "it was heading right toward the ground, straight down." This witness was profoundly wrong, as shown by several photographs taken of the crash site that made it clear that the airplane hit flat and at a low enough angle to skid for almost 1,000 feet.

Despite the inaccuracies of eyewitness testimony, we can't afford to exclude it legally or ignore it as jurors. Sometimes, as in cases of rape, it is the only evidence available, and it is often correct. The question remains, what can we do to give jurors a better understanding of the uses and pitfalls of such testimony? Judges sometimes give the jury a list of instructions on the pitfalls of eyewitness testimony. But this method has not proved satisfactory, probably because, as studies show, jurors either do not listen or do not understand the instructions.

Another solution, when judges permit, is to call a psychologist as an expert witness to explain how the human memory works and describe the experimental findings that apply to the case at hand. . . .

Expert testimony on eyewitness reliability is controversial. It has its advocates and enemies in both the legal and psychological professions. For example, several judicial arguments are used routinely to exclude the testimony. One is that it "invades the province of the jury," meaning that it is the jury's job, not an expert's, to decide whether a particular witness was in a position to see, hear and remember what is being claimed in court. Another reason judges sometimes exclude such testimony is that the question of eyewitness reliability is "not beyond the knowledge and experience of a juror" and thus is not a proper subject matter for expert testimony.

In virtually all the cases in which a judge has prohibited the jury from hearing expert testimony, the higher courts have upheld the decision, and in some cases have driven home the point with negative comments about the use of psychologists. In a recent case in California, *People v. Plasencia*, Nick Plasencia Jr. was found guilty of robbery and other crimes in Los Angeles County. He had tried to introduce the testimony of a psychologist on eyewitness reliability, but the judge refused to admit it, saying that "the subject matter about which (the expert) sought to testify was too conjectural and too speculative to support any opinion he would offer." The appellate court upheld Plasencia's conviction and made known its strong feelings about the psychological testimony:

"Since our society has not reached the point where all human conduct is videotaped for later replay, resolution of disputes in our court system depends almost entirely on the testimony of witnesses who recount their observations of a myriad of events.

"These events include matters in both the criminal and civil areas of the law. The accuracy of a witness's testimony of course depends on factors which are as variable and complex as human nature itself. . . . The cornerstone of our system remains our belief in the wisdom and integrity of the jury system and the ability of 12 jurors to determine the accuracy of witnesses' testimony. The system has served us well. . . .

"It takes no expert to tell us that for various reasons, people can be mistaken about identity, or even the exact details of an observed event. Yet to present these commonly accepted and known facts in the form of an expert opinion, which opinion does nothing more than generally question the validity of one form of traditionally accepted evidence, would exaggerate the significance of that testimony and give a 'scientific aura' to a very unscientific matter.

"The fact remains, in spite of the universally recognized fallibility of human beings, persons do, on many occasions, correctly identify individuals. Evidence that under contrived test conditions, or even in real-life situations, certain persons totally unconnected with this case have been mistaken in their identification of individuals is no more relevant than evidence that in other cases, witnesses totally unconnected with this event have lied.

"It seems beyond question that the identifications in this case were correct. We find no abuse of discretion in the trial court's rejecting the proffered testimony."

Quite the opposite view was expressed by the Arizona Supreme Court in *State v. Chapple*. At the original trial, defendant Dolan Chapple had been convicted of three counts of murder and two drug-trafficking charges, chiefly on the testimony of two witnesses who identified him at the trial. Earlier they had selected him from photographs shown them by the police more than a year after the crime.

Chapple's lawyer tried to introduce expert psychological testimony on the accuracy of such identification. The judge refused to permit it on the grounds that the testimony would pertain only to matters "within the common experience" of jurors. The high court disagreed, maintaining that expert testimony would have provided scientific data on such pertinent matters as the accuracy of delayed identification, the effect of stress on perception and the relationship between witness confidence and accuracy. "We cannot assume," the court added, "that the average juror would be aware of the variables concerning identification and memory" about which the expert would have testified. Chapple's conviction was reversed, and he has been granted a new trial.

Like lawyers and judges, psychologists disagree on whether expert testimony is a good solution to the eyewitness problem. Two of the most out spoken critics are Michael McCloskey and Howard Egeth of The Johns Hopkins University. These experimental psychologists offer four reasons why they believe that expert testimony on eyewitness reliability is a poor idea. They say that there is no evidence that such testimony is needed; that there is no evidence that it does any good or that it can provide much beyond the intuitions of ordinary experience; that the data base on which the expert must rely is not sufficiently well-developed; and that conflicting public testimony between experts would tarnish the profession's image. Given this sorry state of affairs, they argue, psychologists may do more harm than good by intruding into judicial proceedings.

Obviously, many psychologists disagree with this assessment and believe that both the law and psychology gain from mutual interaction. In the area of eyewitness testimony, information supplied by psychologists to lawyers has stimulated responses that have suggested a number of important ideas for future research.

For example, psychologists need to learn more about the ideas that the rest of us have about the operation of human perception and memory. When these ideas are wrong, psychologists need to devise ways to educate us so that the judgments we make as jurors will be more fully informed and more fair. Only through this give-and-take and occasional biting controversy, will progress be made. It is too late to help William Jackson . . . but it is not yet too late for the rest of us.

Note. Excerpted from E. F. Loftus, "Eyewitnesses: Essential but Unreliable," *Psychology Today* (Feb. 1984): 22–26; as reprinted in *Psychology 88/89: Annual Editions* (Guilford, Conn.: Dushkin).

QUESTIONS

1. Name four factors that may influence the memory of an eyewitness.
2. Name three misconceptions about the reliability of eyewitnesses.
3. Explain why the judicial system continues to call upon eyewitnesses for testimony.
4. What are the pros and cons of permitting expert psychological testimony about eyewitness reliability in court?

Reading 3: Recreating Memory

Daniel Goleman explains how we fill the gaps in our memory with images that match the present.

Scientific inquiry into personal memory is revealing the forces that create, distort and sometimes erase the images that constitute each person's autobiography.

Sorting through the fiction and fact with which each of us paints the canvas of our lives, the new research is saying with new precision which aspects of a person's memory are likely to be most accurate and which aspects skewed or even erroneous. It examines the periods of life best remembered, those most often lost and the factors that shape or contaminate memory. Through such findings researchers are coming to understand more about the strands from which a personal past is woven.

"Most people would be quite surprised at how malleable their memory is—even those memories they feel most certain about," said David C. Rubin, a psychologist at Duke University.

Dr. Rubin's research has shown that people remember some parts of their lives far more easily than others. Remarkably, the pattern of past memories tends to be the same for everyone. For instance, from middle age on, most people have more reminiscences from their youth and early adult years than for the most recent years of their lives.

Evidence on how the present paints the past is emerging in other research revealing people's propensity to forget parts of their life that no longer fit with their current images of themselves. This became clear in a study of the early home life of 310 men and women who as children had been so troubled they were treated in a child guidance clinic. Researchers who tracked the children down some 30 years later discovered that those who had adjusted well in adulthood had fewer memories of the painful events of childhood than did those who were currently suffering from emotional problems.

For the well-adjusted adults, the forgotten facts of childhood included family dependence on welfare and being in the care of foster parents or in a home for delinquents.

"They have become conventional people after a troubled and disadvantaged childhood; they like to look back on life as though it were always that way," said Lee Robbins, a sociologist in the department of psychiatry at Washington University in St. Louis, who published the study in the *American Journal of Orthopsychiatry*.

The bias in memory can work both ways, Dr. Robbins pointed out. A present predicament can sensitize a person to parts of his past. For instance, one study showed that people with arthritis were more likely than their nonarthritic siblings to remember that a parent had also suffered from the disease.

Similarly, research by Gordon Bowers at Stanford University and others has shown that depressed people, for example, remember sad events from their past more easily than happy people, while happy people recall more pleasant moments.

When it comes to the emotional facts of childhood, people from the same family can remember almost opposite circumstances. In another study Dr. Robbins compared the childhood memories of patients being treated for alcoholism or depression with those of their siblings, who were no more than 4 years older or younger. At the time of the study, the subjects were 30 to 50 years old.

Dr. Robbins found that the pairs of siblings agreed 71 percent of the time on such factual matters as whether the family had moved or whether the parents yelled at each other during arguments. But when the siblings were asked to say how often these things had occurred, the level of agreement fell dramatically, to 47 percent.

And when the memories were of matters that required a value judgment or inference—such as whether a parent was hard on the children, whether a mother hid her anger, or whether the father's drinking embarrassed the family—the level of agreement plummeted to as low as 29 percent.