The greatest thing in all education is to make the nervous system our ally instead of our enemy.

-WILLIAM JAMES

Arnold Cohen, a physician, elected to have hospital surgery on his elbow without the use of painkilling drugs or chemical anesthesia. Instead, the operation was performed while he was under hypnosis. He experienced no pain during the surgery or in the recovery period that followed.

Susy Smith, an 8-year-old spina bifida patient, has spent most of her young life in the hospital fighting one life-threatening crisis after another. Her pediatrician has taught her a simple form of relaxation and self-induced imagery, which allows her to anesthetize different parts of her body at will in preparation for shots or to remain comfortable during complex invasive diagnostic procedures.

Ann Washburn, a secretary in her mid-thirties, was diagnosed as having severe hypertension. She was put on standard medication, and her condition stabilized. She was then taught a simple technique for inducing systematic relaxation, which she practices for 20 minutes a day. Within a short time, her physician was able to reduce the necessary medication by more than 50 Percent.

The idea that consciousness plays a part in the healing process is not a new one. Galen, around 200 A.D., advocated the analysis of dreams as a way to determine the nature and severity of humoral imbalances. Agrippa in 1510 pointed out that the patient's hope for cure and love for the physician sometimes conduced more to health than did the medicine itself. George Miller Beard, pioneer American neurologist in the 1870s, noting that physicians use psychology daily in their practice, advocated that science study the potency of definite expectation in the cause and cure of disease. In the modern period, a variety of medical disorders have been identified as having a strong psychological component, and therefore have been found responsive to treatment by dynamic psychotherapy. Numerous psychosocial factors are now routinely identified as contributing to many illnesses.
But the possibility that consciousness could be trained to alter involuntary bodily processes has only recently become an area of systematic investigation, alternately referred to as behavioral medicine or as the voluntary control of internal states. Earl Bakken, bioengineer and founder of Medtronic, Inc., in Minneapolis, has proposed the new terms cyberbiology and cyberphysiology, which serve to bring a growing number of research efforts under a single rubric that denotes the reciprocal effects of consciousness and physiology.

Cyberphysiology is the study of how neurally mediated autonomic responses, usually viewed as reactive reflexes, can be modified by a learning process that appears to be significantly dependent on image design or figures of thought. That is, simple instruction in physical relaxation techniques, coupled with awareness of breathing patterns, and the use of a person's capacity for inner visualization, appear to be the prerequisite ingredients for the motivated subject to induce a state of heightened, inwardly directed awareness that can lead to either direct or indirect control of physiological processes.

THE PROBABLE PATHWAY OF ACTION

The way in which human beings form images in the brain is not well understood, partly because imagery is not localized in only one site, and imagining also involves numerous associative processes. Studies in hemispheric lateralization, for instance, show that the left hemisphere is dominant for calculation and language, while the right hemisphere is dominant for spatial construction, simple language comprehension, and nonverbal ideation. Numerous authors have suggested that imagery may be mediated by the right hemisphere, but the left must play some role in the process. Experimental evidence shows, for instance, that it mediates such functions as size discrimination, when such differences in images must be stored and called forth for use at a later time.

On the other hand, brain lesion studies support the contention that not only nonverbal images but also body image may be right hemisphere dominant. For instance, lesions in the right parietal lobe result in a syndrome in which the patient may fail to recognize part of the body, denying it to the extent that it may not be washed, covered, or otherwise cared for. Also, lobectomies, performed on patients in past decades for severe psychiatric...
disorders, implicated the right frontal cortex as one probable area where mental images might be dominant. Patients who underwent this procedure not only lacked emotional reactivity and motivation, but also showed disruption of the temporal ordering of events and seemed unable to fantasize or imagine a future. In particular, they showed complete loss of ability for delayed action, in which an interim picture must be held in the mind.

In addition to mental imagery, motivation and emotion have been related to neurochemical processing in the frontal lobes. Through many known fibers, the frontal lobes have projections into the limbic system, which is considered the subcortical area for emotional integration. Indeed, some researchers refer to the frontolimbic system as the principal neurochemical mediating center of emotions.

While there is some debate as to the precise structures that should be included in the limbic system, the amygdala, hippocampus, septal area, and cingulate cortex are usually included. The limbic system has been associated experimentally with the sense of smell, the experience of pleasure and pain (and hence with reward and punishment), social interaction, and even violent behavior.

Typically, the hypothalamus is singled out as a separate system of sorts that is only partly involved in limbic activation, but functionally, many, if not all, of the effects produced by stimulation or lesions in the other limbic structures can be attained by similar operations on the hypothalamus itself. The hypothalamus is implicated in the physiology of
homeostasis and the neurochemical regulation of such diverse behaviors as eating, drinking, sleeping, sexual function, physical activity, and generally in establishing the body's circadian rhythms. Its functioning also affects heart-rate, respiration, blood chemistry and glandular activity. Most recently, it has been demonstrated that the hypothalamus is involved in the immunological response to disease. Stimulation of certain areas can produce decreases in the activity of macrophages, while adjacent areas of the hypothalamus are also involved in enhancement of the immune response.

Although the precise mechanism is not clear, guided mental imagery and deep breathing appear to induce a quieting effect on nervous system activity, chiefly by acting on hypothalamic and limbic structures, which have direct neurological connections into the autonomic nervous system. This system innervates glandular tissue, the heart, lungs, stomach, liver, pancreas, intestine, bladder, and sexual organs. Controlled breathing and guided visualization also appear to act on the reticular activating system, a diffuse network of nerves responsible for widespread nonspecific arousal, which can be either heightened or quieted throughout the entire body by a correspondingly exciting or quieting mental image. Thus, relaxation and mental imagery techniques appear to be related to the hypothalamic-limbic-reticular axis.

Opposed to this avenue of activation are the effects of stress, which, especially from prolonged heightened arousal, appear to be linked to a competing configuration, the adreno-medullary-pituitary axis.

**STRESS**

Heightened arousal was first identified by Walter Cannon as being associated with the "fight-flight" response. In threatening situations, the body mobilizes its forces to cope with an incoming emergency by activating the adrenal medulla, which leads to activation of the pituitary gland. Adrenalin is released into the blood, which stimulates receptors to shunt blood away from the digestive organs and toward skeletal muscles in preparation for action. Adrenalin also increases the tendency of blood to coagulate, which is useful in preventing blood loss from wounds. Peptides are released in the brain that cause the adrenal glands to produce corticosteroids, which release fatty acids to supply energy to the muscles. Insulin is also increased for an added source of immediate energy.
All of these reactions have been biologically useful for survival, but modern research has found that prolonged activation of the stress response, especially in the absence of physical outlets, such as vigorous physical exercise or the actual conditions of battle, may lead to a variety of ailments, from chronic indigestion, ulcers, and high blood pressure, to a buildup of cholesterol, aggravation of diabetes, and lowered immune functioning. Hans Selye identified an adaptation syndrome of ever-increasing compensation for prolonged stress that culminates in the death of the organism. It is also known that extreme and violent shock from fright can, through this axis, lead to such phenomena as sudden cardiac arrest, which Cannon and Alvarez described as the likely cause of voodoo death.

THE RELAXATION RESPONSE

By the employment of readily available cyberphysiologic techniques, a trained lowering of arousal, on the other hand, has been experimentally associated with restoration of homeostatic balance and renewed health and vigor. Herbert Benson, a cardiologist who is head of the Behavioral Medicine Section at Harvard Medical School and the Deaconess Hospital in Boston, has identified what he believes is a physiological template common to almost all such techniques that he calls the relaxation response, an integrated hypothalamic activity resulting in generalized decreased sympathetic nervous system firing, with possible parasympathetic activation.

He has defined four elements needed to elicit this response: (1) a sound, word, or phrase that can be constantly repeated in the mind; (2) a passive attitude; (3) decreased muscle tonus; and (4) a quiet environment. Practice of the relaxation response for only 20 minutes a day decreases oxygen consumption and carbon dioxide elimination, without changing respiratory quotient; it decreases blood pressure; it also decreases blood lactate (a change associated with lowered stress); and increases the intensity of slow alpha waves, which are associated with restful alertness.

Ischemic heart patients taught this technique show a decrease in premature ventricular contractions. Patients suffering from hypertension who learn the relaxation response require much less medication than usual. In normal subjects, it may actually be a prophylactic measure against hypertension. Perhaps most significant, patients in a health maintenance organization who were taught the relaxation response had faster recovery from illnesses and incurred lower costs than a comparable control group simply given regular medical treatment.

Benson maintains that the physiological effects of the relaxation response are generic to a wide range of techniques taught by the world's contemplative religious traditions, which elicit the same underlying physiological responses as a first step in systematic spiritual practice. He accounts for the dramatic differences that the various techniques produce by the differences in cognitive context, which determine the direction physiological reactions will take by the particular cognitive goal described in the different philosophies. Hence, he concludes, the individual's consensually shared world of meanings, beliefs, and values, play a major role in the long-term outcome of such practice.
He believes that the relaxation response is also the basic template for a wide range of cyberphysiologic techniques currently of interest to behavioral medicine, including hypnosis, biofeedback, yoga, and meditation. The relaxation response may also be the generic first step toward the eventual experimental regulation of the immune system.

These are, however, only a few of many techniques that may have cyberphysiologic consequences, for therapeutic intervention in the treatment of illness, and for education as a form of self-development.

**HYPNOSIS**

Once thought of as magical or mysterious, hypnosis is rapidly becoming accepted as an appropriate form of treatment for numerous disorders. Some primary care physicians are beginning to discover the value of hypnotherapy in controlling chronic disease and pain, in changing negative behavior, and in facilitating self-regulation of autonomic responses.

A useful definition put forward by Karen N. Olness, Professor of Pediatrics at Case Western Reserve University, is that hypnosis is an alternative state of awareness—often but not always involving relaxation—in which an individual develops heightened concentration, which allows him to accept suggestions to use mental or physical faculties in an optimal fashion to solve a problem, improve a skill, or maximize some potential.

The hypnotic state may best be described, she says, as effectively analogous to pretending, daydreaming, imagining, or to being fully absorbed in some activity, such as reading a good book, watching a TV program, or attending a concert. Fixed attention, imagery, and concentration on an image with its associated feelings are factors in formal hypnotic induction. Parents unwittingly learn this in getting a tired child to fall asleep. Some of the more successful teachers, coaches, and salespersons may stumble on this phenomenon by fine-tuning their respective approaches to dealing successfully with people. It is also common for people to drop into this state automatically at peak moments, such as a birth or wedding, or in states of high anxiety.

The hypnotherapist, Olness points out, possesses no special powers. Instead, the patient is actually the self-hypnotizer, while the role of the one inducing the trance is that of coach or guide.

Olness has had extensive experience in conducting experiments with children, whom she has found learn cyberphysiologic techniques of self-hypnosis faster than adolescents and adults, chiefly because young children are more in touch with their inner lives and have more active imaginations. Controlled studies by her and her colleagues have demonstrated that children are able to regulate peripheral temperature, auditory evoked potentials, bronchial dilatation, transcutaneous oxygen flow, cardiac rate, and anorectal sphincter responses. In clinical practice, she has found self-hypnosis useful as a therapeutic modality in a variety of problems, including enuresis, acute pain, chronic pain, asthma, habit disorders, and anxiety.
Other researchers have had similar results. In one of the more interesting studies reported in the literature, Surman, Gottlieb, Hackett, and Silverberg, at the Massachusetts General Hospital, showed that warts, although thought to be viral in origin, could be suggested away under hypnosis. Surman and other colleagues have also been experimenting with hypnosis, in conjunction with supportive psychotherapy, in an attempt to control the clinical course of herpes simplex virus in severely affected individuals, since herpes has been shown previously to recur under stress. Thus, experimental and clinical evidence for the efficacy of hypnosis suggests that it has many potential uses in a medical setting.

BIOFEEDBACK

Biofeedback involves the mechanical or electrical recording of physiological processes, usually heart rate, internal body temperature, brain wave activity, respiration, blood pressure, or muscle tension, and the feeding back of this information to the subject, who is then able, with appropriate instruction and motivation, to self-regulate these activities.

One of the most extensive programs of biofeedback research has been conducted at the Menninger Foundation in Topeka, Kansas, by Elmer and Alyce Green. Subjects have been successfully trained to reduce striate muscle tension, to show control over the firing of single muscle units, and to raise the temperature in the hands through vasodilation of the smooth muscle tissue surrounding the capillaries.

In clinical applications, biofeedback has proved helpful as an adjunct in the treatment of Reynaud's disease, in the control of cardiac arrhythmias, high blood pressure, gastrointestinal disorders, tension headaches, epilepsy, and cerebral palsy.

One of the most interesting innovations in modern biofeedback technology that may significantly influence our standard of normal health is voluntary cardiorespiratory synchronization (VCRS), first developed by John Almasi, along with Otto Schmitt of the University of Minnesota. Subjects are taught to synchronize their breathing and heart rate to a predetermined ratio by a system of lights linked to the subject's body signals and sent through a computer. Virtually all variability in the continuously produced electrocardiogram signal is eliminated, whereas in normal ECG recordings the exact shape and amplitude of the electrocardiographic signatures will change significantly from beat to beat.

Initial tests in over 200 individuals, including university staff, students, and hospital patients, have established that VCRS can be quickly and easily achieved by almost any cooperative individual. After as little as 30 seconds of practice, the subject breathes comfortably and accurately at a pace regulated by his electronic Inhale/Exhale instruction lights.
This advance suggests the possibility of more accurate standards of heart rate functions for different age populations; it would give a highly accurate and personalized record of normal individual functioning; and it would allow the detection of minute changes in normal cardiac activity, so that pathology could be more quickly identified.

Biofeedback has become an accepted tool in clinical practice. At the same time, a little-understood aspect of its application is the attendant changes in consciousness associated with health and the feeling of wellbeing. In the opinion of the Greens at the Menninger Foundation, changes in consciousness may well prove important in future medical applications of biofeedback technology.

YOGA

Yoga, as it has been traditionally practiced in India, is a 2,000-year-old psychophysical regime consisting in cleansing of the body and purification of the mind in preparation for the mastery of "perfect one-pointed concentration," which the practitioner then turns within and focuses on inner events.

Scientific studies of yoga practitioners conducted under strict laboratory conditions show progressively finer control of skeletal muscle groups as well as respiratory control of the vascular system. Sweat glands can be made to open on command, heart rate can be reduced to half the normal rate by blocking the action of the sinoatrial node, and basal metabolic rate can be reduced by 50 percent, allowing the subject to go into a quiescent state of semihibernation without losing consciousness.

A striking series of measurements was taken at the Menninger Foundation, when the Greens investigated the abilities of Swami Kama of Rishikesh. (See the diagrams of simultaneous warming and cooling of the hand and voluntary heart control on the previous page.) The swami was able to raise the skin temperature on one side of his hand and he was able to lower it on the other side. The difference was more than 11 degrees.

Recently, yoga has increasingly become a more active area of medical and scientific investigation. Studies have shown that a group of healthy volunteers given 90 days of yoga training show significant increase in their exercise tolerance. Hypertensive patients
given 6 months' yoga training showed a statistically significant drop in both systolic and diastolic pressure, while those on antihypertensive medication showed a significant reduction in daily drug dosage. A group of untrained males taught yoga exercises for a 4-month period showed enhanced coagulation of blood as per specific variables, such as fibrinolytic activity, blood and plasma level, and platelet aggregation time. After yoga training, patients with pleural effusion were able to expand their lungs more quickly than a comparable control group. Yoga, in general, is being more widely practiced in the United States, not simply as a form of therapeutic intervention, but also as a daily regime for the maintenance of good health.

MEDITATION

Meditation means sustained and effortless vigilance of one's own consciousness, with a view toward enhancing the quality of personal experience. This may involve a specific focus on cognitive processes, or a single idea, or it may involve the attempt to achieve a noncognitive but heightened awareness where the mind is deliberately taught to empty itself of all thought.

Deikman has identified meditation as deautomatization—a perceptual reorganization of the psychological structures that order, limit, select, and interpret physical stimuli. He defined it as an undoing of the ongoing process of unconscious habit formation, by reinvesting actions and percepts with attention. In his experimental subjects he noted alteration of perception, time underestimation, paradoxical thoughts, desensitization to external stimulation, and personal attachment to the object of concentration.

Kamiya, noting that alpha brain waves are associated with meditation, used the electroencephalograph to teach college students who had no experience in personal disciplines to generate alpha waves and to sustain them over long periods.

Brown and Engler used questionnaires and Rorschach responses to compare three groups of meditators, all of whom had training in Vipassana, or Buddhist "insight" meditation: a mixed group of Western meditators with different levels of experience who were attending a month long intensive training session, a selected group of advanced Western meditators, and a group of advanced teachers in Asia. Results tended to corroborate that meditation induces definable stages of change in the subjective experience of consciousness, which initially are temporary, but may lead to permanent alteration of personality. Epstein and Leiff have defined these stages: (1) Distraction of awareness by somatic, affective, and cognitive disturbances; (2) transient, undisturbed concentration on an internal object; (3) single-minded cultivation of concentration on the object; and (4) the production of insight into the object and into one's own cognitive processes.

Studies also suggest that cognitive context leads to measurable differences in the meditative state. Bal K. Anand of the All India Institute of Medical Sciences, demonstrated that advanced yogis in deep meditation showed no alpha-blocking when presented with a series of disturbing outside stimuli, whereas the startle response usually blocks alpha production in normal subjects. This effect is commensurate with the goal of
yoga as kaivalya, complete isolation of consciousness from sensory impressions. At the same time, Kasamatsu and Harai demonstrated that Zen monks in meditation showed alpha blocking only at the instantaneous presentation of the external stimulus, whereas the effect perseverates in normal subjects. This is commensurate with the Zen teaching that the satori experience is "neither here nor there." Stimuli are acknowledged, but for what they are, empty and impermanent, so there is no prolonged mental attachment to them.

Finally, Shapiro has proposed meditation as a cyberphysiologic technique for self-control in a variety of applications, including smoking cessation and obesity. He has also outlined its usefulness in conjunction with more traditional forms of therapeutic intervention in reducing alcohol consumption and in lowering methadone dosage among abusers.

**PSYCHONEUROIMMUNOLOGY**

Voluntary immunoregulation means the use of personal consciousness for purposes of regulating the body's immune system—a complex network of cells in the blood, lymph, and certain organs that help us resist infection and fight off disease.

That the immune system can be altered through training has been recently shown by Robert Ader at the University of Rochester, who succeeded in instrumentally conditioning immunosuppression in rats. It has also been fairly well established that psychosocial factors can alter susceptibility to infection, especially if they are of a stressful nature. Experimental studies have shown that depression, grief, prolonged anxiety, and even loss of sleep can cause alterations in serum immune levels, although it is presently unclear how these stressors lead directly to greater infection or mortality.

Peavy found that, in a group of 41 healthy volunteer subjects, those showing indications of high stress evinced significantly lowered immunity, as assessed by white blood cell count, white blood cell differentiation, and a test of phagocytic function. When these subjects were trained in biofeedback-assisted relaxation to lower tension in the forehead, slow the heart rate, and raise the hand temperature, they showed a dramatic and statistically significant improvement in phagocytic functioning, although white blood cell count and white blood cell differentiation did not change.

Schneider, Smith, and Whitcher studied the influence of relaxation and imagery (without hypnosis) on immune functioning in healthy medical students who were optimistic about influencing their immune systems. Subjects were asked to relax and imagine neutrophils—a subclass of white blood cells activated in inflammatory conditions to ingest cells or particles—leaving the blood stream, moving to the blood vessel walls, becoming more adherent, changing shape, and moving out through the blood vessel walls. They were told that this was an immunocompetent response. Blood samples taken before and after visualization suggest that white blood cell count and particularly neutrophil adherence can be modulated by higher central nervous system activity.
Studies also suggest that natural killer cell activity (NK)-components of the body's immune system that can target and destroy cancer and virus cells may be influenced through psychological techniques. Scardino has reported increase in NK cell number following relaxation and imagery exercises, and Cousins has reported the same effect after self-induction of strong positive emotion. At the same time, Locke has found that good copers, that is, individuals characterized by high stress who did not report many symptoms or complaints, show high levels of natural killer cell activity, as compared with those who are under high stress but who complain a great deal, whose NK levels were significantly lower.

Other experiments, conducted by David McClelland and colleagues at Harvard University, have linked high need for power with excessive adrenalin release, lowered salivary and serum immunocompetence, and greater susceptibility to infection, particularly when their subjects were highly motivated for power but blocked in their efforts to dominate their environment. Using films to stimulate various psychological states, McClelland and Kirshnit also showed that salivary immunoglobulin A (S-IgA), a B-cell mediated function of the immune system—the body's first line of defense against viral infections that enter through the nose and mouth—rose among college students exposed to a film about Mother Teresa of Calcutta, whereas there was no comparable rise in S-IgA levels among students exposed to a film about the triumph of the Nazi in World War II.

What the precise mechanism of action is between mental states and immune competence has not been definitely established. It has long been held that the immune system operates in relative independence from fluctuations of electrochemical activity and hormone secretion, chiefly because immune function can be demonstrated for specific cells of this system in a test tube, independent of the internal environment of the tissues. However, scientists presently are busy mapping out previously unrecognized lines of interconnection between nerves, hormones, and immune cells. This search involves not only the laying out of direct neuronal connections to such areas as the bone marrow, the spleen, and the lymph glands, where synaptic circuits can be anatomically traced, but also an entirely new avenue of communication between the brain and body through the action of the neuropeptides.

Francis Schmitt, a neurobiologist at the Massachusetts Institute of Technology, has proposed the hypothesis that neurons may be functionally regulated not only by presently known neurotransmitters but by many other kinds of informational substances, which include
transmitters, peptides, hormones, "factors," and various proteins. He believes that alongside neuronal circuitry, which is the basis of conventional neuroanatomy and which operates through conventional synaptic junctions, there is a parasympathetic system, working in parallel with synapse-linked circuitry. In this alternate information system, chemical substances reach specific target cell receptors by diffusion from release points through the ambient extracellular fluids.

Consider, as an example, the neuropeptides—protein chains produced in the brain. In the center of the ordinary nerve cell, as in any cell, is the DNA, which stores the genetic information to make our bodies and our brains. A direct printout of the DNA leads to the production of a neuropeptide, which then traverses down the axons of the nerve cell to be stored in little balls at the end and waits for the right electrophysical events to release it. Throughout the body, hooked onto different cells or moving about the tissues, are receptors so specific as to attract or attach to only those neuropeptides that are their analogue.

Candace Pert, Chief of the Section on Brain Biochemistry at the National Institute of Mental Health, has conducted extensive experimental studies of the neuropeptides and their various receptor sites distributed throughout the body. She concluded that the largest portion of information coming from the brain is kept in order not by close physical juxtaposition of nerve cells, but by the specificity of the receptors, whose site may be far from the origin of neuropeptide release.

Among other important contributions, Pert and her colleagues propose that the massing of receptors in the limbic system, amygdala, and hypothalamus point to the likelihood that the neuropeptides are keys to the biochemical basis of the emotions. Other nodal points for the massing of receptors are also implicated in emotional modulation, such as the dorsal horn of the spinal cord, where sensory information first enters the central nervous system on its way to the brain. For virtually all the senses where the entry area into the nervous system is known, at those centers there is a massing of neuropeptide receptors. Another site for neuropeptide receptors is the lining of the gut, from the esophagus to the large intestines. A certain amount of experimental evidence suggests that each neuropeptide may evoke a unique "tone" that is equivalent to a mood state. Hence, there may be something to the colloquial expression of a "gut feeling." At the same time, moods that we self-consciously create, through music, fantasy, or other means, no doubt generate significant neuropeptide release keyed to specific receptor sites.

Further, Pert maintains that every neuropeptide receptor identified so far can be found on mobile cells of the immune system, that immune cells also produce peptides, which send information to the brain, and that these neuropeptide links may be the main route by which the brain, the emotions, and the immune system are connected. Monocytes, for example, which ingest foreign organisms, heal wounds, and activate tissue repair, start life in the bone marrow, and then diffuse out and travel through the veins and arteries, deciding where to go by following chemical clues. When it comes within "scenting" distance of a neuropeptide, its receptors for that neuropeptide are activated, and the cell begins to "chemotax," or literally to crawl, toward that chemical. The routing of
monocytes throughout the body appears to be controlled by these emotion-effecting biochemicals, which in turn allows communication between B- and T-cells. It helps distinguish between self and not-self when a tumor cell is destroyed and mediates such vital functions as tissue repair.

Pert concludes that it is no longer tenable to talk as if consciousness were localized in the brain. Due to the two-way nature of the communication between receptors and neuropeptides, she suggests, consciousness may be diffused throughout the body as an electrochemical network that masses at particular nodal points, where entry into any part of the network leads to all other parts. While only speculation, it is likely that, through these routes, cyberphysiologic techniques may have their greatest effect through the conscious alteration of moods.

That we are influenced by the state of the immune system is certain; that we may consciously influence it is less sure. As yet, no direct and incontrovertibly causal link has been experimentally established between mental states, specific illnesses, and compromised immunity, although there is much provocative but circumstantial evidence. To establish such a link, or—its corollary—to gain conscious, systematic, and instrumental control over immune functioning, is a potential goal of cyberphysiology that may well constitute one of the next major breakthroughs in medical science.

BIBLIOGRAPHY


**CYBERPHYSIOLOGY:**
The Science of Self-Regulation

No. 2 in a series, Time, Mind, and Medicine

No. 1: CHRONOBIOLOGY: A Science in Tune with the Rhythms of Life (1986)

writing

Eugene Taylor

Associate in Psychiatry, Harvard Medical School, Harvard University; Consultant in the History of Psychiatry, Massachusetts General Hospital

We would like to thank all the authors and publishers who have given us permission to reproduce their text quotations and illustrations. Most of all we would like to acknowledge the assistance of our advisors:

Stephen E. Locke, M.D.
Herbert Benson, M.D.
Karen N. Olness, M.D.
David C. McClelland, Ph.D.
Francis O. Schmitt, Ph.D.
Otto Marx, M.D.

for **ARCHAEOUS PROJECT:**

Editor
Dennis Stillings

Mnaging Editor
Gail Duke

Design
Cathryn Stewart
Philosophy of Archaeus Project

SCIENTIFIC INVESTIGATIONS over the last two centuries have indicated that the phenomena of life are associated with various field phenomena—electric, magnetic, and others of an undetermined nature. Instrumentation and techniques that exploit some of the well known bioelectric and biomagnetic field phenomena have been shown to be effective in the diagnosis and treatment of disease.

It has become apparent that field phenomena exist that have resisted traditional attempts at modeling, and which may hold potential for developing new diagnostic and therapeutic approaches based on the capabilities of modern instrumentation. It is possible that these bioenergetic fields can be modified so as to induce alterations in the corresponding physical structures. Further, there is every indication that consciousness produces profound changes in the physical condition of the human body. Whatever the mechanism by which consciousness affects the body, it is reasonable to assume that it does so by inducing changes in the body's physiological processes. These changes should be measurable. These fields should then be subject to manipulation by the use of field-altering modalities, including consciousness, or by combinations of approaches to alleviate underlying disease conditions.

Archaeus Project has been instituted for the purpose of researching these ideas through experimentation and dialogues among leaders in the field.

Published by ARCHAEUS PROJECT
2402 University Avenue
St. Paul, MN 55114

Copyright © 1988 by ARCHAEUS PROJECT
All rights reserved. Printed in U.S.A.