Volume I, Number 1

MEGABRAIN REPORT

THE PSYCHOTECHNOLOGY NEWSLETTER

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INFORMATION AND THE ENRICHED ENVIRONMENT: EDITORIAL

"The enemy is unpredictability."

— George Bush, commenting on events in Eastern Europe

Its appearance has taken a couple of months longer than I originally predicted, but I think you'll find the first issue of MEGABRAIN REPORT well worth the wait: twice as large as we predicted, and full of truly new and truly useful information.

This is the first issue of a publication about mind-enhancement tools that I hope will itself become a tool for mind-expansion. I hope MEGABRAIN REPORT will not only serve as a tool for gathering and transmitting information, but as a tool for the actual creation, generation and production of new information. I thank you for joining me in this cooperative enterprise.

When I began gathering information about consciousness technology, initially for The Book of Floating, *then for* Megabrain, *I was surprised, first, by just how much information there was — literally thousands of relevant publications and studies — and second, by how hard it was to get my hands on much of that information. Much of what turned out to be the most fascinating and significant information was hidden away in obscure journals that were not available in most libraries; or was in papers that had not been published at all but rather copied and circulated among various special interest groups; or was available only in the form of anecdotes, gossip and rumors about research or devices that had been classified, suppressed, or lost.*

It was also surprising that so many researchers and others interested in consciousness technology were unaware of much of the research that had already been done. In part this is because most of us are only now becoming aware that the technology of brain-enhancement is a "field of study." Much of the existing research exists as seemingly unrelated fragments in such fields as neuroanatomy, electroencephalography, biophysics, education and so on. In this era of specialization, it's little wonder that so many investigators were unaware of highly important work done in disciplines they weren't familiar with.

One of our goals is to use MEGABRAIN REPORT to help bring together much of this research that has already been done. An example of one way we can do this will be our cooperative information-gathering project, "Abstracts of Research in Brain-Enhancement Technology." By gathering together hundreds and perhaps thousands of studies in the form of short summaries, and making them available in a publication or through an interactive computer bulletin board and indexed database, we hope to provide a valuable research and resource tool for scientists, clinicians and explorers. We will discuss this project in detail in an upcoming issue.

In addition to helping facilitate access to already existing research, we intend to be a true newsletter with the accent on new, by reporting on the latest research in the field, including ongoing projects. In fact, we intend to participate in such research in a number of ways. For example, both I personally and Megabrain have been assisting a number of different scientists and research organizations, with support ranging from help in obtaining research equipment and subjects to providing information and recommendatinos for project designs to lending equipment to be used for research purposes.

We also will participate in research by initiating our own research projects. One example is the questionnaire included in this issue, which we hope will provide us with information that can guide us toward the development of more focused and quantifiable measurement techniques in future issues. We want to enlist your help as participants and subjects in a number of such information-gathering efforts. We are eager, for example, to try to find if there are any correlations between personalities and response to specific types of brain stimulation: What is the difference in response to types of machines between introverts and extroverts, people with high levels of anxiety and those with low anxiety, highly visual and highly verbal people? What are the most common immediate and long term effects of specific devices? We are working with a skilled psychometrician to develop surveys and self-assessment tools that will provide information that is not only interesting but valuable for other researchers. By pursuing such questions, we hope to contribute

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HIGH VOLTAGE: THE BIOELECTRIC INTERVIEWS

"What is emerging is a new paradigm of life, energy, and medicine."

—Dr. Robert O. Becker

Talk about paradigm shifts. For much of the 20th century both the medical and the scientific establishments have been ruled by the "chemical-mechanistic model" of biological systems — the view that living organisms are simply chemical machines, complex systems of structures and mechanisms that work chemically. Now, as a result of groundbreaking research into the mysteries of cellular growth, healing and regeneration, and increasing evidence of the health risks of certain types of electromagnetic fields, a new paradigm is emerging, what one of the pioneering researchers in the field, Robert O. Becker, M.D., calls "a new vision of living things, one that has returned electromagnetic energy to a position of prominence."

This new vision, which draws upon concepts of information theory and solid-state physics, and is made possible by the development of extremely sensitive new detection and measurement devices, is a vision of what Dr. Becker calls "electronic control systems within the body that regulate such functions as growth and healing and that also serve as the substrate for our internal control and communications systems. Application of the same technology to the relationship between the external energies in the Earth's geomagnetic field and living organisms has revealed that living things are intimately related to this field and derive vital, basic information from it."

What is happening today in the field of bioelectricity, says Becker, constitutes a "revolution, which is providing us with a greatly expanded vision of the complexity and capabilities of living things." Medicine, he explains, "has come full circle, from the mysterious energies of the shaman-healer to the scientific understanding of the life energies of the body and their relationship to the energies of the environment. This scientific revolution has simultaneously enriched the concepts of technological medicine and supported the ideas of energy medicine. What is emerging is a new paradigm of life, energy, and medicine."

I tried to explore some of the cross currents of this scientific revolution in *Megabrain*, with discussions of cranial electrostimulation (CES), pulsed electromagnetic field generators (PEMFs), and the intriguing "secret electro-Manichean struggles for world domination" that some authorities assured me was underway. My investigations, I quickly realized, could only begin to scratch the surface. And since then an astonishing amount, much of it even more extraordinary and mysterious, has happened. And so, I eagerly seized the opportunity presented by the publication of this newsletter to pick the brains of many of the leading figures in this revolution.

During January and February, 1990, Terry Patten and I conducted interviews with these individuals:

Biographies

Robert C. "Bob" Beck, B.E., D.Sc., is widely known for his instrumentation of altered states, his development of state-of-the-art medical electrostimulators, and his investigation of Tesla electromagnetics. Bob has been a consultant to Sandia Corporation, the USN Office of Surface Weaponry on the subject of E.L.F. detection, and was a Senior Staff Scientist at Eyring Research Institute. He was Acting Chief of Radiological Defense, OCD, in Los Angeles from 1958 through 1963. He has designed and built extremely sensitive magnetometers for the Navy. He has been a senior lecturer in the graduate school, University of Southern California. Bob owns basic patents on low-voltage electronic flash and several other patents involving electro-optical systems. He is the developer and designer of the Brain Tuner, a CES device. Bob served on the board of directors of the U.S. Psychtronics Association for seven years, and was their national president for three. Bob resides in the Los Angeles area where he is active in energy, holistic medicine, and the effects of electromagnetic energies on health and consciousness.

Robert O. Becker, M.D. Perhaps the most important pioneer in the field of bioelectricity, his breakthrough research on regeneration and its relationship to electrical currents in living things has led to his nominations for the Nobel Prize. His work is best explained in his own books, particularly *The Body Electric: Electromagnetism and the Foundation of Life* (1985, with Gary Selden) and the new *Cross Currents: The Perils of Electropollution, The Promise of Electromedicine* (reviewed in this issue). He is a professor at the State University of New York, Upstate Medical Center, and Louisiana State University Medical Center.

Eldon Byrd, Ph.D., holds Master's degrees in both Electrical Engineering (Purdue) and Medical Engineering (George Washington University) in addition to his Ph.D. in Electrical Engineering (Brownell). He worked as an operations analyst for the Advanced Planning and Analysis Staff of the Naval Ordnance Laboratory in Silver Spring, Maryland, and in other capacities for the Navy over a period of many years. During this time he was responsible for advanced weapons analysis. He also conducted astonishingly wide-ranging research. His sophisticated measurement of plants' responses to threats (and intended threats) from humans is described in the book *The Secret Life of Plants*. During his tenure with the Navy, Eldon conducted and directed a large body of extremely precise, sophisticated and well-funded research into the interactions of electromagnetic fields and biological systems. In 1986-87 he left the Navy and began working privately as a consultant and researcher, concentrating on the interactions of electromagnetic fields with humans. During

HIGH VOLTAGE: THE BIOELECTRIC INTERVIEWS CONTINUED

this time he has worked extensively with some of the most sophisticated "Megabrain-type" devices in existence, and he himself has invented several new types of machines. Currently he is conducting research with dolphins involving extremely sensitive broad-range monitoring of their acoustic and electromagnetic signal emissions.

Daniel L. Kirsch, Ph.D. is Dean of the Graduate School of Electromedical Sciences at City University of Los Angeles, editor of the American Journal of Electromedicine, and author of *The Complete Clinical Guide to Electro-Acutherapy and A Selected Study of Electro-Acutherapy*, Dr. Kirsch has designed advanced TENS and CES devices, such as the Alpha Stim. He is chairman of the board of Electro-Medical Products, Inc., which manufactures the Alpha Stim.

Peter Lindemann is an authority on subtle energy and advanced technology. He studied with kahunas and healers in Hawaii and his Hawaiian teachers helped awaken certain extraordinary perceptual abilities. Equipped with this unusual sensitivity, Peter schooled himself in physics and chemistry and studied Wilhelm Reich, Nicola Tesla, Ruth Drown, Viktor Schauberger, and other pioneering geniuses of the early 20th century. He worked with Bruce DiPalma and became an authority on "free energy" technologies in the United States. Peter has innovated major advances in biocircuitry and he is highly adept in the field of Radionics, both as an operator and as an equipment designer. He has had a private and clinical practice in holistic healing for 15 years. Peter is the developer and designer of the BioPacer series of magnetic pulse generators as well as the Centron and Spacecrafter devices. He is currently Vice President and Science Advisor for Borderland Sciences Research Foundation.

Glen Rein, Ph.D. obtained his doctorate in neurochemistry from the University of London, is conducting research at Stanford University, and, with a recent grant from the Fetzer Foundation, has begun to set up his own research organization with a special interest in investigating the effects of "scalar" fields on biological systems. He is one of the foremost investigators of bioelectromagnetics and psychoneuroimmunology, he is performing groundbreaking research in the effects of electromagnetism on the human body.

We originally intended to publish these discussions as separate interviews, complete with Qs and As, but it quickly became clear that these men needed no prodding or guidance. They all had things they wanted to say, and generally they all kept circling back again and again over the same questions, concerns and enthusiasms, which they addressed with authority, emotion and eloquence.

The subjects ranged widely, from the mysterious and perhaps paranormal properties of "scalar" fields to secret research projects in bioelectricity conducted by the U.S. and Russian governments, to the potential medical benefits of bioelectricity. But, since our experts came from many different scientific backgrounds, their ideas about each of the areas in question frequently added new dimensions — whether through disagreement, elucidation, or different perspective — to the ideas of the others.

And so we have decided to present their words not as separate interviews (as they actually took place), but as "group discussions," explorations of the most intriguing areas in the field of bioelectricity. Because of the wealth of information our experts had on these subjects (the transcripts run to many hundreds of pages), we have been forced to limit our excerpts, and to divide the discussion into two segments, the first presented in this issue, the second in the next issue.

The subjects our "virtual group" discusses in this issue include cranial electrostimulation (CES) — potential health benefits, evidence of its effects on mental performance, discussions of its safety — and the bizarre but real "scalar" fields — quantum, non-electromagnetic "information matrix fields" that some investigators believe may cast light on paranormal events such as telepathy and psychic healing. We found their discussion of scalars truly astounding, exciting, mind-expanding — perhaps the most potentially revolutionary information in this issue.

In the next issue of this newsletter we will continue with discussions of top secret research (some of which is revealed to the public for the first time) into the effects of electromagnetic and scaler fields on human behavior for use as "mind control," of a whole class of devices which emit pulsed electromagnetic fields (PEMF generators), of apparent attempts to suppress bioelectrical research, and of the most promising and exciting bioelectric and electromedical technologies on the horizon.

— Michael Hutchison

Cranial Electrostimulation

A Virtual Roundtable of Expert Opinion

Perhaps the most exciting area of brain-enhancement research is Cranial Electrostimulation (CES). Research has proven CES effective in alleviating anxiety, depression, insomnia and the anhedonia (or inability to experience pleasure) and discomfort that accompanies withdrawal from drugs or alcohol. Now evidence is accumulating from a number of researchers that CES can dramatically enhance cognitive functioning in a variety of ways. One recent study shows that subjects receiving CES while given a learning task learned more and showed more concentration and alertness than a control group. Other studies of subjects suffering cognitive deficits caused by brain damage

showed that CES treatments not only improved cognitive functioning but reversed the brain damage that caused it. Most recently, studies of patients suffering from "attention-to-task deficits" and impaired short-term memory as a result of head injuries showed that those receiving CES treatment had "striking and significant improvement" in such areas as mental speed, visual and auditory perception, concentration, and short-term memory.

Scientists are still uncertain as to how CES increases memory, learning and other cognitive functions, though they propose a number of mechanisms, ranging from the stimulation of neurochemicals associated with relaxation, pleasure, memory and learning, to influencing the reticular activating system. We begin our discussions of CES by asking the experts to discuss how it developed and speculate on how it might work.

BECK: Since about 1983 many laboratories have correlated addiction with measurements of the brain's available neurotransmitters or neuropeptides. For example, in one well-known study the researchers addicted rats to heroin. They would stop the supply of heroin to the addicted rats, and a day or so later they would cut off the rats' heads and run what is called electrophoresis or chromatography tests to find out what neuropeptides were present. And the rats that were addicted had been getting so much opiate that the little endorphin factories in the brain would shut down and say, "Look, our body's got too much of this. Quit manufacturing it." And it would take anywhere from a week to three weeks before their rat's brains would begin manufacturing beta endorphin again. Whereas, if you cut of the heads of one of the control rats who had never been addicted, you would find the normal, expected levels of beta endorphin. And then they would take a third group of addicted rats, cold turkey cut them off of the heroin, clip little electrodes to their ears, and within 20 minutes of electrical stimulation at a particular frequency the rat brain would start showing that the endorphin production had started up again. So, those rats wouldn't go through withdrawal symptoms.

"They all said to me that they had a personality alteration *as a result of using [CES]....That they had gone from an addictive personality to a non-addictive." —BECKER*

This was first discovered in humans by Dr. Wen of the Tung Wa Hospital in Hong Kong. And it was mentioned in one of the early articles in the January, 1983 *Omni* when Dr. Meg Patterson came to this country and was hoping to open up a market for her device, which she called NET, neuro-electric therapy. But, she failed to do that and millions of dollars of investors' money went down the tubes. They never got anything from this. No devices were delivered to the people who had bought franchises. And, although she was trying to do a good thing, a great deal of harm came from this. But that's another long story.

But they had been using similar devices in the Soviet Union since at least the 1950s. In the Soviet Union it was called "Electro-Sleep". It had nothing to do with sleep, but that's the term; they were thinking originally that they had a cure for insomnia, which they did, because that was one of the stress-related conditions which were alleviated. And the government sent a couple of our people over there to get the devices and test them, which they did at St. Elizabeth Hospital in about 1969. This work preceded Meg Patterson's by 10 or so years. They found that the Russian device worked, but the government would not allow the technology to be put into practice. And that's another long story.

BECKER: I knew Meg Patterson...oh, for the first time probably about 15 years ago when she first got started. She came into electrical stimulation from acupuncture. Auricular acupuncture. And, my contribution to this whole business was saying to her "Look I don't think it's the acupuncture system you are dealing with here, I think you could replace your needle electrodes with flat plate electrodes, put them on the mastoid process, and get basically the same effect with a lot less fuss and much less danger of producing a burn." She followed this advice and has followed it since. And she got very interesting results. The first of which was that the minute that you could put this on, the patient could stop taking the drugs and would not have any withdrawal symptoms.

When I was in England, I saw a number of her cases. I was impressed by one thing. They all said to me that they had a *personality alteration* as a result of using Meg Patterson's technique. That they had gone from an addictive personality to a non-addictive. That following six weeks of treatment with her device, not only were they able to be without the drugs but — even six months later — they didn't experience the craving for the drug that had inevitably followed in any of the other techniques for therapy.

When I gave a talk on this, I said that this to me was important because it suggests that this may be a new way we can look at personality. Can we get some more information on personality from these kinds of experiments?

KIRSCH: There's an enormous amount of anecdotal material about CES and personality transformation. In fact, I'll tell you

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COGNITION-ENHANCEMENT DRUGS AND PEAK PERFORMA

Potential Brain-Food and Mind-Machine Interactions

by Michael Hutchison and John Morganthaler

Picture this: You have a business meeting tomorrow with your Japanese distributor. This meeting requires that you be in top form for some critical negotiations. You have several reports to go over, many facts to memorize, and above all you have to get some rest.

Your first step? A trip to the drug store, of course. A meeting like this is much too important to take on without fine-tuning your biochemistry. You must create the optimal neurochemical conditions for learning and creativity. You ask the druggist, who then points you towards the shelf of cognitive enhancement compounds. You load up your basket with bottles of piracetam, vasopressin, hydergine, choline, DMAE, and maybe a little centrophenoxine.

After arriving home, and taking the appropriate doses of each of these you go into your study to slip on your cranial electric stimulator along with your light and sound device. You know from your experience and that of many pioneers in the consciousness revolution that this particular combination of chemicals and brain machines have a synergistic effect that will create the optimal psychobiological state for the tasks that lie ahead. You can be sure that your Japanese counterparts are engaged in a similar manner.

After an hour in your study you feel very different. You are relaxed, yet alert and creative. Your brainwave activity has altered, and an EEG would show that it has become more regular and has increased in amplitude in certain frequencies, causing you to feel simultaneously profoundly relaxed yet in a state of intense concentration, loose and creative as well as mentally quick and alert. A brain-mapping device would show that the two hemispheres of your brain were in a state of "superconnection," with an enormous increase in the amount of information flowing between hemispheres. At the same time, the rate of metabolism and the energy level of your brain cells has sharply increased. You are now in the optimal state to imprint new memories, to plan new and more creative strategies, to visually rehearse every detail of your upcoming meeting...

Sound far-fetched? Well, both the brain machines and the cognitive enhancement compounds already exist. *Megabrain* described a variety of devices that show evidence of enhancing cognition (for a summary of several recent studies suggesting that CES devices can have clear cognition-boosting effects see the "Research Update" elsewhere in this issue); and the book also mentioned the cognition-enhancing effects of such neurochemicals as vasopressin and MSH-ACTH 4-10. Since then other mind-magnifying drugs have emerged as well as even more astonishing evidence of their ability to amplify learning, memory and thinking. What we don't know is how to best use them together, or even whether they should be used together.

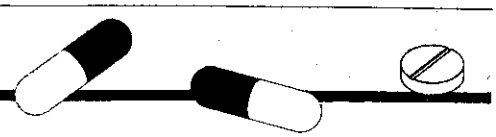
That's what we want to find out. The problem, as many of you are aware, is that it is extremely difficult for those interested in performing research into the effects of brain machines to obtain the necessary funding and support. Mainstream science, particularly those elements in control of doling out grants and funds to support research, and many of the universities and institutions engaged in research, seem to have little interest in investigating these machines. What research is done usually involves the therapeutic applications of the devices rather than the induction of peak performance brain states.

Since cognition-enhancement drugs could ultimately outsell antibiotics and tranquilizers, the competition is fierce.

On the other hand, huge amounts of money are being spent for research into cognition enhancing drugs. But much of the research is being done by the big pharmaceutical companies, who are racing with each other to develop patentable memory-enhancement drugs and to obtain FDA approval for these compounds. Since the FDA is primarily oriented toward treating diseases in a medical context, and has not shown much interest in giving its approval to drugs that simply improve people's memories or boost intelligence, the pharmaceutical companies are directing their efforts toward gaining approval for their cognition-enhancement drugs as treatments for medical problems such as Alzheimer's disease, multiple-infarct dementia and senility. Since financial analysts estimate that such cognitive drugs could quickly produce sales of well over a billion dollars a year in the U.S. alone, and ultimately outsell antibiotics and tranquilizers, the competition is fierce, and these companies are in no mood to investigate ways their substances might work synergistically or in combination with other substances or other mechanisms such as mind machines.

Also, since their efforts are directed toward drugs that are patentable, these companies have little interest in exploring the cognition enhancement properties of substances that cannot be patented. Vitamin C is a good example: in a controlled study in which healthy individuals were tested both for levels of vitamin C and IQ, those with higher levels of the vitamin averaged 5 points higher in IQ; when those with the lower levels of the

NCE PILLS



vitamin were given vitamin C supplements, their IQ scores increased by over 3.5 points. In some way, *Vitamin C is a cognition-enhancing substance*. But, of course no one can patent vitamin C, which is cheap and readily available.

In another example, one widely available and unpatentable substance (DHEA) is rumored to have demonstrated in a recent study some success in, among other things, treating AIDS, as well as cognition enhancement; however, the drug company involved in the experiments is now apparently trying to conceal the discoveries about DHEA until it can develop some variant that is patentable (i.e. has commercial value), and has obtained a court order forbidding the scientist in charge of the study to even speak with anyone about the matter.

We Have Met the Guinea Pig and It Is Us

And so. MEGABRAIN REPORT has concluded that if we really want more research into mind-machine mind-food interactions we'd better start doing it ourselves. Thus we ask you to join us in a series of surveys, tests and assessments designed to explore the interactions between brain machines and cognitive enhancement compounds. This is not to say we are advising you to take any of the cognition-enhancement substances we describe. No! We do *not* advise you to take these compounds, just as we do not advise you to use mind machines or do anything to enhance your mental functioning. High level mental functioning can be exceedingly dangerous and have frightening and unpredictable side effects, as individuals from Socrates to Jesus to Galileo have discovered.

High level mental functioning can ...have frightening and unpredictable side effects, as individuals from Socrates to Jesus to Galileo have discovered.

However, we do have reason to believe that many of you are by nature curious, given to exploration and even experimentation — that, in fact, many of you are already making use of some of cognition-boosting nutrients. This being so, it seems clear to us that you have information that would be of interest and value to the rest of us. It's also clear that if there are hundreds or even thousands of you with such information, then by gathering it together, we can synthesize it, analyze it, begin to search for trends, tendencies, proclivities, and perhaps even make some important connections.

The first part of the survey is intended to be an open-ended exploration rather than a rigorous scientific study or an attempt to confirm an existing hypotheses. We hope not for solid conclusions or hard data, but rather to discover and delineate some interesting avenues for future research.

In a later issue, we will report on the early survey results. It's possible — though we cannot guarantee it — that in investigating then subjective responses we hope to receive from MEGABRAIN REPORT readers we will discover some trends. We can use this information to guide us in designing a more focused study for part two of the survey.

For example, we might receive many reports that the effects of piracetam are amplified when used with the light and sound devices. Then we could plan to focus more deeply on this particular machine/compound interaction, investigating the interactive effects over differing periods of time, using different sound and light frequencies and modes, and in various areas, such as memory, reaction speed, creativity and so on.

In this issue, we will introduce some of the more interesting compounds for cognitive enhancement, provide information about how to obtain each of them, present some methods for assessing and evaluating your own brain state and tracing your progress, and present a simple questionnaire. These self-assessment methods and our initial survey appear at the end of this article. First we will describe a few of the most promising cognition enhancing substances.

Nootropic Drugs

Piracetam

"Last year a friend took me to hear Sun Ra and his Intergalactic Arkestra as a birthday present. I had just received a bottle of 800 mg tablets of Piracetam. My friend and I each took nine of the tablets (an "attack dose" they call it in the literature) before entering the hall. The music began 30 minutes later. I found myself able to concentrate as never before. I was completely lucid with absolutely no sense of intoxication. For the first time in my life I could hear each individual horn's timbre (Sun Ra has about 10 horn players, often all playing massed harmonies.) My friend has worked as a professional saxophone player. He, too, reported extraordinary hearing and concentration abilities. My ears felt as though they were being stimulated from all directions at once, but the feeling was entirely pleasant. I was enthralled."

Piracetam has been the subject of intensive research for over 15 years, and has not only proven to be a powerful intelligence booster and cerebral stimulant, but also, even in massive acute and chronic dosages, appears to be nontoxic and to produce no side effects (it's so nontoxic one FDA employee reportedly claimed that since even huge doses produce no toxic effects, it

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RESEARCH UPDATE

Since I finished writing the first American edition of MEGABRAIN (in 1985), there has been a worldwide explosion of interest in the development and use of mind-enhancing technology. Advances have been made in all the areas of science dealt with in the book, and a whole new generation of mind-enhancing tools has been developed and come into wide use. This is a brief summary of some of these developments.

Smart Rats With Big Brains: The Enriched Environment Saga Continues

In *Megabrain* I explored in some depth the fascinating research indicating that types of brain stimulation can lead to dramatic increases in brain size and intelligence. Studies in which laboratory animals placed in "enriched environments," (environments that provided brain stimulation in the form of novelty, challenge, change and stimulating interactions with fellow creatures) were compared with animals placed in normal environments or in boring, unstimulating, "impoverished" environments, proved that enriched environments produced bigger brains, more brain cells, bigger brain cells and facilitated faster and more accurate problem solving. Neuroanatomist Marian Diamond and her associates at Berkeley, for example, found that animals raised in enriched environments showed increased thickness of the cerebral cortex, a 15 percent increase in the size of individual neurons in the cortex, increases in the amount of dendritic branching, in number of dendritic spines, in number of synapses and the size of synaptic contact areas, and a sharp increase in the number of glial cells in the brain. Further investigation revealed that such brain growth can happen very quickly, in response to brief exposures to enriched environments and brain stimulation, and it can happen at any age. "The main factor," according to Diamond, "is stimulation. The nerve cells are designed to receive stimulation."

New evidence has emerged from Diamond's lab that enriched environments can produce growth not only in the brain's cortex, but also in the limbic system.

Since then, Dr. Diamond has described her work and its implications in an excellent book, *Enriching Heredity: The Impact of the Environment on the Anatomy of the Brain*, which I highly recommend. She and her associates have continued their investigations of the effects of sensory stimulation or enriched environments on the brains and intelligence of humans and laboratory animals, and her research has convinced her that "The environment can change the brain, and it can do so at any age."

Recently, evidence has emerged from Diamond's lab that enriched environments can produce growth not only in the brain's cortex, but also in the limbic system—that more ancient area of the brain (virtually the same in humans and primitive mammals, hence the nickname "paleomammalian brain") involved in emotions and memory. One of Diamond's graduate students, Alison York, reported recently in a report to the Society for Neuroscience that rats raised in an enriched environment sprout new cells in the *hippocampus*, the structure that is essential the the formation and recall of long-term memories, and which is involved in Alzheimer's disease.

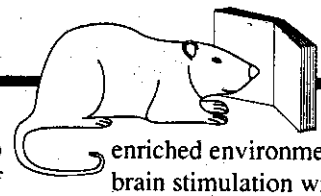
In one intriguing recent study, Diamond and her colleagues placed pregnant rats in an enriched environment. Astonishingly, when the pregnant rats gave birth, their *offspring* showed a distinct thickening of the neocortex. That is, *the mothers' enriched environment altered and enhanced the brains of their unborn fetuses.*

Equally fascinating was the fact that the females were impregnated by males who had also been exposed to an enriched environment. What's more, as the Brain/Mind Bulletin phrased it, "the enriched get richer": Each succeeding generation of rats raised in an enriched environment had increasingly thicker cortices.

In a related study, Japanese researchers have reported that the offspring of mothers kept in enriched environments (i.e. the mothers were in enriched environments while pregnant, not the offspring) were superior at maze-learning to the offspring of those mothers kept in impoverished or normal environments. This superiority was present *even when the offpring were reared by foster mothers in normal or impoverished environments*, thus eliminating the possibility that this superiority was a result of the environment of the newborn.

And recent research at the University of Illinois has revealed that rats kept in an enriched environment for 30 days after weaning showed a greater number of synapses. Synapses continued to increase in rats kept in the enriched environment for another 20 days. Significantly, one protein-producing substance that is usually present only when synapses are forming or new was present in the synapses of rats from enriched environments, even after they were removed from the enriched environment! "A possible implication," said the researchers, "is that the metabolism is changed relatively permanently... that some brain connections may be turned on (or turned up) permanently as a result of novel experiences."

In another exciting study, Robert Sapolsky of Stanford Univer-



sity and a group of Canadian researchers have found that rats who were given additional sensory stimulation in infancy were able to think and learn better in their old age. The scientists used two groups of infant rats, with both groups receiving identical care and treatment except that one group received a brief period of additional stimulation during infancy. Tests in maze-learning and autopsy examinations were conducted two and a half years later (which for rats is old age), and the results showed that the rats that got the additional stimulation were clearly able to think and learn more quickly than the other rats. The brains of the stimulated rats also showed that they suffered a smaller loss of neurons.

According to Sapolsky, the experiment proved that simply adding sensory stimulation at an early age enabled the rats to handle stress more efficiently throughout their lives. This, in turn, caused the rats to secrete fewer glucocorticoids, a type of hormones known to cause the loss of brain cells that are important in cognitive processes. "Lots of these hormones and lots of stress will accelerate neuron death in the brain," said Sapolsky. "And this happens in a part of the brain that has a lot to do with learning and memory." Sapolsky said the process would accelerate some of the learning deficits associated with aging. But the simple act of early stimulation, he said, creates "a very, very sharp, well-defined brake" on the stress response. Because the brake works, the rats secrete less brain-damaging hormone throughout their life.

Human infants that received extra sensory stimulation showed more highly developed brains six months later, and tested higher on a variety of intelligence tests.

Sensory stimulation, in other words, including even brief sensory stimulation, helped these rats stay smarter than rats that did not receive the same amount of sensory stimulation. This brain-enhancing effect of early brain-stimulation has now been verified in humans. In recent studies, researchers have stimulated some groups of premature infants with light massages while treating other premature infants in the normal manner. They found that the infants that received the extra sensory stimulation showed more highly developed brains six months later, and tested higher on a variety of intelligence tests. In other recent studies, infants who received sensory stimulation and a wealth of novel experiences—were raised in enriched environments—were not only more intelligent, but were physically more healthy than infants who were treated "normally."

These and a wealth of other studies that have emerged recently strongly support the proposition, advanced in *Megabrain*, that the human brain responds to enriched environments and the optimal types of brain stimulation with dramatic, rapid and longlasting growth.

Better Learning Through Electricity

In the last few years there has been an explosion of interest in the exploration of bioelectricity. It is as if the concept of "the body electric" is an idea whose time has come. The flood of research now underway is going far toward advancing our understanding of how some of the devices described in *Megabrain* can have such profound effects on the brain (for more information about advances in bioelectricity see the interviews featured elsewhere in this issue).

In this regard, since the writing of *Megabrain* there have been a number of studies and advances in the use and understanding of some of the devices I described. Toward the end of Chapter 9 I suggested that the proper type of electrical stimulation of the brain could "activate your brain's learning pathways and enhance your ability to think," which would mean that certain electrical stimulation devices "could be used as practical tools to increase learning." However, I pointed out that little hard scientific evidence of such electrical learning enhancement existed. Several experts in bioelectricity and electromedicine, having read that chapter, decided to perform such experiments.

In perhaps the most impressive study (whose preliminary findings I could only briefly mention in the Afterword to the paperback edition), published in the *American Journal of Electromedicine*, Dr. Daniel Kirsch and his associate Richard Madden discovered that low-intensity CES dramatically improved human learning of a psychomotor task. "After reading *Megabrain*," Kirsch says, "Richard decided to do a rigorous study to see if cranial electrostimulation (CES) really could improve learning." Kirsch and Madden took 78 subjects matched for age, education and their pre-experiment performance scores on a computer typing task. All subjects then had an Alpha Stim 350 attached to their earlobes. It was a double-blind study: neither the experimenters nor the subjects knew when or if stimulation was being given to them (the stimulation was so low, at 125 microamps, that most of those who did receive stimulation were not aware of it). The results astonished even the experimenters: the group receiving the brain stimulation learned much more and much more quickly than the other group.

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BIG THINGS IN SMALL PACKAGES: NEW PRODUCTS

The Dreamer, The Courier, The Alpha Stim CS

The Dreamer

Before discussing the quality of the Dreamer I have to say that this new sound and light machine represents a breakthrough: to my knowledge it's the first truly mass-produced mass-market brain machine. Welcome to the new world of consumer brain technology. The Dreamer's tiny, weighs only a few ounces, provides six different preprogrammed sessions using four different modes of stimulation (i.e. alternating the sound and light between left and right, eyes and ears, stimulating both eyes and ears simultaneously), and is so simple to operate you only need to press one button for a full session.

The European manufacturer has invested in totally automating the assembly of this device — the factory is tooled up so that hundreds of the devices are stamped out and put together simultaneously, without any hand assembly (which is where quality control problems can creep in). The whole thing is sealed together and sold at an attractive $250 with a one year warranty on parts and workmanship.

This is a significant advance. Those of you who remember the first hand-held calculators from Texas Instruments in the mid-70s recall that they were big, clunky, and cost more than $150. Now thanks to mass produced circuitry and other advances far more sophisticated calculators the size of a credit card cost only a couple of bucks, and are given away for promotional purposes like balloons and calendars used to be.

Similarly, I think the mass-production of the Dreamer represents an important step toward making mind-enhancement technology simple, attractive, unthreatening and inexpensive enough to appeal to (and be cheap enough to be bought by) those millions and millions of wonderful humans we call The Mainstream.

That said, we can turn our attention to the quality of the device and the experiences it provides. The first thing most users comment on is the lights, and their comments are usually something like, "Wow!" The lights, four red LEDs in front of each eye, are super-bright (the LEDs on most current sound and light devices produce about 500 millicandles of light each; these produce some 2000 millicandles each), and stimulate extremely intense and colorful visual imagery. Too intense for some users. Fortunately The Dreamer provides a high/low light intensity regulator, but even so these lights may be too strong for some.

The sounds, basically the combination of a single tone and white noise, which can be adjusted (but only to loud or soft), are very basic. Some users find the sound quality irritating. There is an input jack for an external sound source, such as a cassette player.

Most users I've compared notes with have found the six preprogrammed sessions effective. Generally they begin with a sweep that goes down to alpha, back up to high beta and then ramps down (or up) toward the target frequency. The sessions are: Sleep (a 30 minute session that leaves you in delta at 3 Hz); Concentration (30 minutes that takes you up to a stimulating 25 Hz); Meditation/ Learning (a 40 minute theta induction at 5 to 7 Hz); Anti-Stress (15 minutes at 9 Hz alpha — ideal for a "stress-break" at work); Relaxation (40 minutes, much of it at 9 Hz alpha); and Creativity (30 minutes mixing alpha and beta).

The above description points up some of the drawbacks of the Dreamer: while it's delightfully simple, it's also very limited. While I haven't used it long enough yet to have become accustomed to each program, I suspect that those who like new experiences might become bored with the six sessions. There are numerous sound and light machines on the market that are far more sophisticated (such as THE COURIER, reviewed next). These devices are also more costly and, to certain would-be users, dauntingly complex.

"To my knowledge it's the first truly mass-produced mass-market brain machine."

What we face, as mind machines enter the mainstream, is the same divergence of tastes and interests that personal computers encountered. Some people are explorers, experimentalists and hackers, and they want advanced and sophisticated devices that permit them to design and store a large array of their own programs. Other people don't care about the technology at all, they just have certain things they hope the device can help them accomplish: they don't care what kind of computer they have as long as it's easy to use for word processing; they don't care about how the mind machine works, as long as it's simple to operate and puts them to sleep, relaxes them, or is fun. You don't need a mainframe to play Nintendo games.

The Dreamer is fun and effective, and the best device to come along so far for those who seek utter simplicity. It's not sophisticated, but that doesn't mean it can't provide even the most experienced mind-machine aficionado with an exciting experience. One friend who makes a multi-modal mind-enhancement system that costs thousands of dollars and incorporates a sound and light system tried out the Dreamer when I first received it and loved the lights so much he actually wondered if there was some way he could use the goggles with his own system! This is the first of what I expect will be a succession of well-designed, mass-produced, user-friendly mind machines.

The Courier

This dynamite little portable is made by computer expert Robert Austin, the same guy who makes the superb MindsEye Plus, and contains many of the features of the Plus at less than half the price. The Courier is completely self-contained: the tough plastic case, about the size of a small book, opens up to reveal the keypad and a storage compartment for the specially molded goggles and headphones. It's powered by a rechargeable battery good for about five hours of use between charges.

There are two superbright red LEDs (2000 millicandle power) over each eye, flashing with a short duty cycle and providing crisp and intense visual effects. It produces *eight* different stereo sounds, and also has an input for an external audio source. But perhaps the most significant audio feature of the Courier is that it can act as a binaural signal generator, producing a number of beat frequencies, or what Austin calls "HemiTone sounds." The combination of beat frequencies with sound and light brainwave entrainment opens up a whole new range of experiences.

The device includes 16 preset sessions that range from 15 minutes to an hour in length. The preset sessions are well-designed and effective, but the parameters of any of them may be modified and saved by the user.

The entire unit weighs about a pound, and, in a nice touch, the volume and brightness control

knobs are on the outside of the case, making it easy to adjust the system even when it's in use, with the case closed. The price of $395 is not cheap, but in comparison with the top-of-the-line models such as the MindsEye Plus and the DAVID Jr. Plus, which sell for about $895, this machine delivers a lot of bang for the buck. As with all of Austin's products, the Courier is well-made, and uses high quality electronic components. It "feels" good. It's almost as simple to use as the Dreamer, but is far more versatile and sophisticated. In this price range (and even compared with devices costing hundreds of dollars more) the Courier is the best thing yet.

"While the 2000 is the size of a large typewriter, the 350 about the size of a small shoebox, the CS is tiny — under 2 1/2 by 3/12 inches — and weighs just 3 ounces."

The Alpha Stim CS

I wrote about the Alpha Stim (clinical model 2000 and home model 350) in *Megabrain*, but now those devices have been superseded (at least for purposes of cranial electrostimulation [CES]) by the brand new CS. While the 2000 is the size of a large typewriter, the 350 about the size of a small shoebox, the CS is tiny — under 2 1/2 by 3/12 inches — and weighs just 3 ounces.

But the step down in size does not mean a step down in power or effectiveness. Inventor Dr. Daniel Kirsch has enhanced the waveform used in earlier Alpha Stim models, and everyone I know who has experimented with the CS so far finds it an extraordinary experience. (See our discussion of the CS with Kirsch elsewhere in this issue.)

It clips to your earlobes (Kirsch claims that the points on your earlobes closes to your jaw are the "Valium points"), and delivers a complex biphasic DC nonsinusoidal modified square waveform. One difficulty with CES has been that most CES devices deliver a repetitive and therefore predictable waveform — the human body quickly becomes accustomed to that stimulus and effectively ignores or rejects it. At that point the CES is no longer effective. The CS has been designed to avoid habituation by the nervous system by incorporating random factors into its modified square waves: the pulses (you can select pulse repetition rates of either 0.5 Hz or 80 Hz) change polarity at 0.4 second intervals.

The current of the CS is adjustable from 10 to 600 microamperes — this is far less than some of the dangerously high current TENS devices: it delivers its weak microampere current for milliseconds, rather than bludgeoning the brain with milliampere current delivered for microseconds. At lower settings it's imperceptible, turned up high it produces a mild tingling in the earlobes. But for me and others who have used the device the mental effects have been impressive, ranging from mild euphoria combined with heightened alertness to deep relaxation, deeper sleep, alleviation of pain, and long-lasting feelings of well-being.

In another advance on the older versions, the CS is powered by a simple 9 volt battery, has a timer that permits you to choose a session that ranges from three minutes to continuous, and has two channels, thus permitting two people to use it at once in the CES mode, or one person to use four electrodes for localized pain treatment and other applications. It's attractively designed (except for one feature — you have to slide open a small side panel to adjust the frequency and timer and to switch it on, but replacing the panel can require dexterity), can be carried in your pocket or clipped to a belt. It comes with a five year warranty.

The price is steep: $795. But then this is, at least in the U.S., a "medical device", and thus its purchase is usually approved for benefits by medical insurers. Since CES has proven effective in the treatment of anxiety, drug addiction, depression, inability to concentrate, pain, TMJ problems, memory loss, tinnitus and much more, most people who seek to use it for cognition-enhancement purposes should be able to find either an appropriate medical reason for seeking a prescription, or a medical practitioner who will prescribe it for "unapproved" uses (as reported in our article on cognition-enhancement drugs in this issue, the FDA recognizes that "unapproved" uses for drugs are quite legal and in fact an important means of therapeutic innovation).

The question that arises, as always, is whether CES is truly safe enough to be used by healthy people for mind-enhancement purposes. Proponents point out that CES has now been used for over 40 years by millions of people without apparent ill effects — no appearances of brain tumors, leukemia, brain damage, psychological problems etc. Opponents argue that in light of evidence that *some* kinds of electromagnetism can be harmful, there's still not enough known about how CES works, what it does to the brain and body, to pronounce such devices as the CS harmless. For a discussion of this question by experts, see the interviews on bioelectricity elsewhere in this issue.

"The mental effects have been impressive, ranging from mild euphoria combined with heightened alertness to deep relaxation, deeper sleep, alleviation of pain, and longlasting feelings of well-being."

— MH

Coming Soon!

The MEGABRAIN REPORT Computer Bulletin Board

We are now working to set up a computer bulletin board that will allow subscribers to participate in MBR studies; to contribute to and get access to our data base of information about research in brain-enhancement technology and consciousness; to respond to our MEGABRAIN REPORT FORUM directly; to participate in freewheeling, ongoing discussions related to consciousness technology with other MBR subscribers and contributors; to get access to more detailed information about articles published in the newsletter, and much more.

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something I hear quite often: A spouse often says "this is the person I married come back again." You know, they may have been married for twenty or thirty years. It's an extremely interesting observation that I've recently started paying attention to because I hear it over and over again.

MBR: Some sort of personality change takes place when people use CES, would you say?

KIRSCH: Yes, they're happier, they're less concerned about their problems. They still have their problems, but they're less concerned. I was interviewed last Friday by the *Los Angeles Daily News* and the reporter was a bit skeptical about trying CES. The interview went for a little over a half hour. Then the reporter tried it. Within about two minutes she tossed her pad on the floor and said, "I don't feel like doing this interview anymore," and started telling us all about her life, her problems. She just was a completely different person. It was an amazing transformation and you could just see it. I mean, I've seen it a lot but I never get tired of seeing a person become calm, happy and relaxed. It focuses their mind and relaxes their body.

MBR: Dr. Becker told us that when he talked with some of Meg Patterson's patients who were being treated by CES, he noticed that they had seemed to have undergone some sort of personality change — they felt that they were no longer addictive personalities.

KIRSCH: Yes, people are transformed. People get into patterns of behavior as a result of their state of consciousness, but most people aren't even remotely aware of their state of consciousness. For example, biofeedback practitioners are starting to use the Alpha-Stim quite a bit to actively take the person to the same place they're trying to learn how to go. Once they're there, it's easier to get back there on their own. Anyone who's driven around California's freeway systems knows that it's both easier to get someplace the second time and it also seems a lot easier to get home usually. Just familiar pathways.

For example, Dr. Charles Stroebel has been doing some work treating depressives using CES in combination with his EEG brainmapping device, the CAP Scan, which was described in *Megabrain*. When he's hooked up to the CES device, the depressive subject sees his EEG patterns normalize during the session and can feel the effect. Chuck is a great advocate of biofeedback and so he also sees the benefit of having the patients view their own change objectively on the EEG. This is a big breakthrough. Biofeedback has limited results in a large percentage of the population because it is a very active process, you have to work at it, whereas CES is a passive process which doesn't bore you so it is a lot easier. The combination is ideal because you can take someone to where they want to go and then show them how to get there by themselves, because there are an awful lot of demands or stressful situations in our lives and one does not effect a "cure," so to speak — it's an ongoing process. So if somebody can learn how to do it themselves, that's fine. I also find that by doing CES on a regular basis, say two or three times a week, for ten to twenty minutes, you can get the same benefits as if the subject learned to do it using biofeedback — you can shortcut the whole biofeedback process.

"The group getting CES had undergone a big personality change — their levels of self-sufficiency, dominance, assertiveness and ego strength, for example, had more than doubled, in some cases more than tripled!"

—KIRSCH

Several recent studies are interesting in this context. In one study they were treating people with back pain using electrical stimulation, and they'd measured their depression levels using a psychological test, and they found that simply receiving the electrical treatment reduced their depression. They didn't have to "learn" anything at all.

MBR: But this wasn't CES, it was just TENS in the back.

KIRSCH: Well, it wasn't just TENS, because whenever your treat the body, you're treating the *whole* body through the area you're treating.

MBR: So, you think the effects on depression had to do with the signal being scattered into the spinal area, up into the brain when the back was being treated?

KIRSCH: Yes, I mean the back is part of the central nervous system. We think of our brain in our head, but it's connected. Everything is connected actually. . . But about the personality transformation, there was another study in which subjects were being treated for drug addiction, and one group received CES from the Alpha Stim, the other didn't. Again, they were given personality tests, before and after. And they found that the group getting CES had undergone a big personality change — their levels of self-sufficiency, dominance, assertiveness and ego strength, for example, had more than doubled, in some cases more than tripled! The control group didn't show any changes of that sort.

MBR: How does CES work? Does it alter neurochemistry?

KIRSCH: I think the key is that there's a direct stimulation of the autonomic nervous system. In substance abuse cases, for example, I don't know how much of this is neurochemical and how much of it is a matter of activating the parasympathetic nervous system to counterbalance the withdrawal symptoms, which are really a list of sympathetic nervous system activity — tearing and sweating and the cold shakes. All the symptoms of withdrawal are a list of sympathetic nervous system activity. By stimulating in and around the vicinity of the ear, you're affecting the vagus nerve which is a part of the parasympathetic system . . .

MBR: Sort of electrically switching on the relaxation response, would you say?

KIRSCH: Yes, and I don't know how much of that is chemical. I think it might just be a matter of balance between the two nerves, the two aspects of the autonomic nervous system. When we talk about neurochemical, in general, I like to say that medicine has been based on chemistry for a long time and yet medicine has failed in the treatment of functional and degenerative diseases. When we look at chemistry, it's basically molecules composed of elements composed of atoms and the atoms are held together by *electrical* bonding. There are negatively charged electrons moving around a positively charged nucleus and movement of electricity, known as current, is simply the passage of electrons in a specific

manner. And the specificity of that manner, which we call the *wave form*, produces a different biological effect — just like the different chemicals in the drug.

Obviously we still have a great deal to learn about this but overall we can definitely see some profound changes and I think that rather than looking at the electricity as affecting the chemistry in the body, I think that we've gone *beyond* the chemistry to the next level of structure.

MBR: Are you familiar with Becker's theories about the DC analog network and the body?

KIRSCH: Yes. Becker's a genius.

MBR: Do you see electrostimulation influencing that electrical system?

KIRSCH: Yes, the Alpha-Stim works by using a biphasic DC current that goes in one direction and then goes in the other, very slowly compared to the speed of biological reactions. If I may personify cells, they're sitting around there watching this thing slowly go by and then slowly go by the other way. We varied the pulse and other aspects of the wave shape to produce a full range of harmonics or frequencies within each six second period. In this way we are activating what I believe Becker calls the current of injury. Becker has shown, unequivocally, that by augmenting the electrical field you can produce regenerative growth in humans. I don't know if that can be transferred from an electrical model to a chemical model. I think that some of the mechanisms that we need to learn more about here are purely electrical. Obviously chemistry plays a role in it. It will affect the chemistry, but a lot of it is purely electrical.

Wave Forms and Frequencies

BECKER: I've had no personal experience with direct electrical brain stimulation. All I can say is that the parameters that are important when you are talking about the effect of currents or fields upon cells are the *power* inherent in whatever you are applying, the *frequencies* that would be involved, and the *wave forms*. I think frequency is somewhat more important, but I am not certain about that.

MBR: When you say frequency do you mean the pulse repetition rate?

BECKER: Well, if you have a pulse that is composed of a number of other individual pulses of a higher frequency, then it's going to depend upon the relationship between these two parameters as to which one the body is most likely to see. And, if you have a pulse that is, let's say, of fairly low frequency, like 15 Hz, which is used in the bone-growth stimulators, and you're at a couple of hundred Hz or even higher in the individual pulses within each pulse burst, I don't think you are having much of an effect from the high frequency but your effect is due to your body rectifying the whole business and looking at it as a 15 Hz signal. But that is an opinion, it's not backed up with data.

"The parameters that are important when you are talking about the effect of currents or fields upon cells are the power *inherent in whatever you are applying, the* frequencies *that would be involved, and the* wave forms." *—BECKER*

MBR: Dr. Beck, how does CES work?

BECK: Man is an extremely complex biocosmic resonator, and we're just now discovering some of the effects electromagnetic storms on the sun are having on our own earth's animal forms and human subjects. You cannot create a simple mechanistic description of how these processes operate. People ask me occasionally why this or that works and I tell them the truth, that although I'm a physicist, I don't know what electricity is. Neither does anybody else. But we can certainly build a lot of marvelous things with it, from toasters to television sets to computers. And it will be quite a few years before even the effect of some of these simple stimulation type devices are well understood, much less fully understood.

Now CES will have frequency components up to several thousand hertz. And these "beat" or heterodyne in the brain with other frequencies to produce third order harmonics, and a lot of this work has been done by Voll — known for EAV, or "electroacupuncture according to Voll" — who mapped the effects of beneficial frequencies versus non-beneficial. Many of these electromedical devices similar to the resurrected Royal Rife technology use square waves. And, by definition the square wave has an infinite number of odd harmonics, and there might be "bad guys" in that mix, as well as good, and you can't tell until you look at it in a spectrum analyzer, and most of the people who build these don't own a $50,000 spectrum analyzer.

In the last six or seven years I have seen perhaps a hundred to two hundred devices come through my lab, usually sent by people who have purchased them and then want to know a little more about them. I'm absolutely horrified at some of the units that come through that have bad guy frequencies in the mix along with the good guy.

Example: Everywhere you eat you'll find a container of sodium chloride, table salt. But, sodium is a poison and chlorine is a poison, and if you separate that sodium chloride into its elements, they're both lethal. But your body is physiologically a saline mixture. It's in your blood and in all of your body fluids. Potassium/sodium balance is quite critical to life. But, the elements are poisonous individually. And the same thing is an absolute fact in electromedical devices.

I've been following this for many, many years, and many of the devices which are copies or counterfeits of other devices have the wrong frequency mix because nobody has bothered to look at them on a spectrum analyzer. They'll look at them on an oscilloscope, which is a *time domain* display. It will show you the wave forms and the frequency of the pulse repetition rate, but it cannot show you what the harmonics of those wave forms are actually producing in the way of frequencies. Many engineers today confuse *pulse repetition rate* with *frequency*. They are two entirely different things.

"CES will have frequency components up to several thousand hertz. And these "beat" or heterodyne in the brain with other frequencies to produce third order harmonics." —BECK

Example: How many taxi cabs are going by a specific corner per hour in New York City? That would be the repetition rate of taxis passing. But you don't know what's inside of

HIGH VOLTAGE: THE BIOELECTRIC INTERVIEWS CONTINUED

those taxicabs until you look at that wave form on a spectrum analyzer, which is a *frequency domain* display — an entirely different thing from time domain. And many of the devices that are being sold today as electromedical, either cranial electrostimulators or generic TENS devices produced after the "rage" kind of stuck after the 1983 article in *Omni*, have got the wrong frequency spectra. And they don't bother to get a spectrum analyzer and find out what their frequencies are.

For example, many of them put out simple square waves. And a square wave, by definition in your text book, is a wave that's made from "an infinite number of odd harmonics." The infinite number of odd harmonics show on the spectrum analyzer as a long series of lines across the screen, each one of them representing one of those infinite numbers. But, if you modify a square wave into a triangular wave, you'll find that you have an infinite number of even, not odd, but even harmonics. Now the way to get the good guy frequencies in there is to modify a rectilinear wave in certain ways that can be done by a computer using special chips, that will give you the good guys and not the bad guys. You eliminate the sodium and the chlorine from your product and you have only the sodium chloride.

"Many engineers today confuse pulse repetition rate *with* frequency. *They are two entirely different things." —BECK*

So, yes, there are frequencies that will give you the marijuana high, or the crack high, or even emulate LSD to a degree. And there are other frequencies that will make you paranoid and anxious and depressed and nauseous and all of the bad stuff. But you have to know what those are. And they are in the open literature. But many, many, many instrument designers don't want to go to that much work. They want to copy something and they count taxicabs and they don't count the contents of the taxicabs.

MBR: Can you be a little more specific about those various frequencies?

BECK: One example is that beta endorphin is released at 111 hz. Enkephalins at about 4 hz. And catacholamines at about 10.2. These things are fairly well known.

MBR: This brings us to the CES device you've invented, the BT-5 which you've described as containing within its rectilinear wave over 250 beneficial frequencies.

BECK: 250 plus or minus whatever window your spectrum analyzer happens to catch a pulse at. There's another trick to this: you have to catch only a single pulse, because if you catch a number of pulses in your window of the spectrum analyzer, they might be out of time phase with your Fast Fourier Transform program, and it will indicate false reads. So we put out a little bulletin to the people who have designed these, we felt a social responsibility, to tell them that it is necessary to use an anti-aliasing hertzer on their spectrum analyzer to avoid that problem.

MBR: Well, can you then describe the BT-5 and how it seems to stimulate the "beneficial spectral windows" and what windows those are, over what range?

BECK: Well, they range from approximately 3 hertz to up to 14 *kilo*hertz. Now we believe that we can disregard some of the higher frequencies because of the limited penetration. But we believe, as many of the researchers have found, that the beneficial frequencies are those which stimulate, for example, beta endorphin — that frequency is in the neighborhood of 111 hertz — and enkephalins, catacholamines . . . now these have been well-known for decades, and the way that these frequencies were discovered was trial and error. A great deal of study has been done in England, by holding the wave form constant and varying the pulse repetition rate and varying the spacing between pulses, etc. So this is fairly well-known if you know how to go to an adequate library and dig out the research papers.

MBR: Bob, we've talked about how some specific frequencies can influence neurotransmitters. Some research indicates that certain frequencies of electrical stimulation influence the cell membranes to facilitate a process called "long-term potentiation," that is essential to memory formation. . .

BECK: One CES device has been proven to restore memory in subjects with Korsakoff's Syndrome, which is the loss of short-term memory found in chronic alcoholics. In a matter of a week or two the memory was restored, whereas it took several *years* of total abstinence before the memory was restored in the average chronic alcoholic.

MBR: Could electrical stimulation in those optimal frequencies, or beneficial frequency windows have memory enhancement effects on people who are already healthy?

BECK: One of the universal pieces of data that have come in from our clients is — they don't need a phone book any more, they can remember from many years ago, and current numbers. My own friend, Diane, had been given a spinal block when her daughter was born about 34 years ago. When she came back from the hospital, she had forgotten all of the phone numbers she knew. She worked in aerospace, and had a photographic memory. She even had to write her own phone number down. And after her first exposure to the BT-5 in 1983 all of these old memories started flowing back, and she could remember all of the extensions and the numbers at the aircraft plant where she had worked as a secretary. It was just absolutely amazing.

There's no question that it tends to restore memory. We can't make medical claims, but I just love to brag about eight or so Alzheimer patients who have experienced reversal and are now functional again, and recognize their husbands or wives and don't wander off and are able to go back to work if they want to. And that was a complete miracle. We had no expectation whatsoever that that was in the cards.

"There are frequencies that will give you the marijuana high, or the crack high, or even emulate LSD to a degree. And there are other frequencies that will make you paranoid and anxious and depressed and nauseous." —BECK

But this is purely "anecdotal." I emphasize that while our thrust is in cranial electrostimulation — and I hope you mention this repeatedly in this article — we make absolutely no medical claims, expressed or implied, for CES devices. They're purely for experimental work.

KIRSCH: Memory and learning... well, based on the speculation of Michael Hutchison,

Richard Madden did his doctoral dissertation studying the effects of the Alpha Stim on memory and learning in a so-called "well/normal" population *[Ed.: for a description of this study see the "Research Update" article in this issue]*. He used a computer typing game that teaches you how to type by measuring your speed and accuracy, and had *significantly* improved results with the people who had real

"I emphasize that while our thrust is in cranial electrostimulation we make absolutely no medical claims, expressed or implied, for CES devices." —BECK

CES compared to the placebo stimulation. Basically, the CES group learned more and they learned faster and they kept learning more over repeated trials. In fact, about 30% of the people who had the placebo (the false stimulation) did *worse* in successive trials, which was attributed to inattentiveness or fatigue... I don't know if Nintendo has completely replaced the video arcades, but you used to throw a lot of quarters in those things and think that you would get better on each game.

MBR: So maybe with CES attachments...

DK: Yes, have electrodes on the video games! [laughter] You'd do better, you'd be more motivated, you'd throw in more quarters!

MBR: In addition to frequency, what are the essential quality or determinants of the quality of electrical stimulation?

KIRSCH: Well, the quantity, known as current or intensity, and how much voltage pushes that through. Primarily it is the shape of the wave form, it's the timing. How much current is delivered and at what time and how it is released, what kind of a shape it is in and how much time there is for recovery between the pulses.

I might be the only one who doesn't feel that frequency is as important as others do, but I do believe that some of these concepts come from the early devices where you didn't have a lot to vary and the electrical output was rather crude so they played with the frequency.

MBR: Could you get specific here and give us a description of the wave form that's produced by the Alpha-Stim?

KIRSCH: It's actually hard to be specific on that because it is a somewhat randomized wave form. We use two frequencies, .5 and .4 Hz which interact, .4 Hz would be called the beat frequency, and between them produce a wide multiple of resonant or harmonic frequencies. We do it within a modified square wave with a spike to break through the skin resistance preceding the square and then we vary each pulse so that it's as if you're making it longer and then you are making it shorter. It's as if you're moving your fingers down the frets of a guitar, one at a time, while you're strumming all of the chords, not just a single note.

MBR: You mean you change the duty cycle?

KIRSCH: We change everything including the duty cycle. At .4 Hz it rectifies the other wave forms so regardless of what's happening in the timing chain, the .4 puts in a random factor and creates a non-repetitive stimulus that the body can't recognize — because any kind of repetitive stimulation we would fight against. We have defense mechanisms for that sort of thing but if you can't recognize them, our hope and intention is that the body would recognize it as its own natural current and the cells, again to personify cells, the cells would believe, if there is such a thing, that the cells around them are functioning normally and they would begin functioning normally. This is an offshoot of Becker's theory of the "current of injury" amplifying the signal with the correct current characteristics so the area around the stimulated point will go to a homeostatic state.

MBR: Are there wave forms that are less desirable than others?

KIRSCH: I would be cautious by putting a sinusoidal wave through the head. There are indications that at least at certain frequencies, sinusoidal waves can be carcinogenic and I don't think our bodies function in a sinusoidal manner. It's probably a good idea to stay away from sinusoidal currents. It would have to be a square because you can only put a range of frequencies in a square. We call it a "square wave envelope" meaning that within the parameters of the square wave the current's no higher than this and it's not going on any longer than that. Thus, you can have full range of frequencies.

This is only possible with microamperage, because only with the longer bursts can you get the resonance. Milliampere current would burn you terribly if it was kept on for a millisecond, so it is used only for microseconds in milliampere TENS. Thus there is not much resonance from milliampere devices because they're very quick, short bursts. Otherwise they would be extremely dangerous.

MBR: So they're high powered and delivered for very short bursts and on the other hand the Alpha-Stim is low-powered current delivered for a longer burst?

KIRSCH: Right, a very long time, comparatively speaking. We have a random duty cycle. Eventually the pattern will come close to repeating itself, but it takes a long time.

MBR: Can you describe for us the new Alpha-Stim CS model? What features differentiate it from the Alpha-Stim 350?

KIRSCH: The main feature is that it is small and convenient. Frankly, I never thought that was a problem with the 350, because I figured you could always sit down for ten or twenty minutes. But right now there's only one CS production model in existence and people around my office keep taking it. They have been walking around with it, going about their business, using it for ankle pain or for cranial stimulation. It is very convenient if you can just walk around and go about your business while you use it. It seems that ten or twenty minutes out of a day is more significant than I had previously imagined; that is its major convenience. Also, it will run off a nine volt battery for about a year which is much nicer than the old rechargeable gel cells which have to be replaced at a cost of about $100 every couple of years.

"There are indications that at least at certain frequencies, sinusoidal waves can be carcinogenic. I don't think our bodies function in a sinusoidal manner. It's probably a good idea to stay away from sinusoidal currents." —KIRSCH

Most importantly, we have noticed that the Alpha-Stim 2000 was more effective than the Alpha-Stim 350. This wasn't supposed to have been the case. There was a minor difference between their signals so we studied the difference in the wave form and determined

HIGH VOLTAGE: THE BIOELECTRIC INTERVIEWS CONTINUED

that it was significant. By expanding it just a little we were able to open the resistance window in the skin better, therefore allowing for a better treatment. So we have taken the Alpha-Stim CS beyond the Alpha-Stim 2000 in terms of its output. In addition to that, it's 20% more powerful. It goes up to 600 microamps instead of 500. Plus, it has two channels rather than one. Four pads are better than two pads. You can use it for TENS while you do CES. Or you and your wife can do CES at the same time.

MBR: What about some of the other CES devices that are being used, for example, Bob Beck makes one — the BT5 or Brain Tuner — that he claims has a beneficial wave form.

KIRSCH: I'm not familiar with Bob Beck's most recent model. I've heard about some good effects from the Brain Tuner. Some of the devices that are being promoted for CES, according to my best understanding at this time, are rather strong. The FDA considers the effect of CES in more of milliampere range, as if it is not that different from TENS, but I certainly wouldn't put that kind of current through my head. I wouldn't be comfortable at all with that.

"I've played around with every electrode location imaginable on the head and I have found the earlobes the most effective for producing the desirable results we've discussed." —KIRSCH

Electrode Placement

MBR: What is the best places for electrodes? Do you ever use four electrodes or only two?

BECK: I'm using only two electrode devices. At one time Soviet scientists were putting electrode pads over the closed eyelids, two at the back of the head, and two at the temples. They had used anything from two electrodes up to six. But, much later on when the technology became more sophisticated, they found that LI 17 in the acupuncture system was far more effective and rapid, so they stopped putting the electrodes on all of the other sites. Those points are beneath the mastoid process and behind the ear. That has worked for almost everyone. So, like every other technology, the approved sites evolved after a great deal of trial and error.

KIRSCH: I have experimented with different electrode placements and I've determined that the ear clip electrodes seem to produce the best effect. If you put them at the topmost part of the lobe closest to the head, you are over an auricular therapy point that's called the "Valium analog point," which is an interesting coincidence if you believe in that sort of thing. Yet if you put them on the temples, they are not as effective. I don't think it's so much a cortical response as a brain stem response, a sub-cortical response, and I think it's best effected with ear-clip electrodes. The mastoid-to-mastoid location has created some problems. I avoid it — with any device. I wouldn't recommend it even with the Alpha-Stim.

MBR: And you are not interested in frontal electrodes?

KIRSCH: Look at it this way, the Russians put it on the eyes and then above the eyes to the occipital lobe. Sighted people are visually oriented and by putting it on the eyes and down by the mastoids — since the visual cortex is in the occipital lobe — you're giving a lot of stimulation to the visual system. Especially because the early Russian devices were rather strong current. So you would see flashing lights because the current would stimulate the optic nerve. If you close your eye and press on your eyelid, you would see flashing lights because your optic nerve only picks up light and so that is creating a sort of pattern in the brain. But why are we focusing on the visual field pattern and why would we go up on the forehead, which is more directly related to the cortex? I mean, I've played around with every electrode location imaginable on the head and I have found the earlobes the most effective for producing the desirable results we've discussed.

MBR: What do you think of ear clip stimulation, Dr. Beck?

BECK: It works. It's a little more difficult. It's slightly uncomfortable and it doesn't look very pretty, but the beauty of electrical stimulation as opposed to classical acupuncture is that it doesn't require precision. Acupuncture needles have to be within about a third of a millimeter of the correct site. They have to be put in at a 30° angle, and it takes an expert to do this. But, with electroacupuncture, or ESB (that's electro stimulation to the brain) or CET, (which is cranial electrotherapy) or NET — there are about a dozen acronyms for this identical process — the electricity spreads outward. Like charges repel and you can be within 3/4 of an inch of the site and still get good results, instead of a third of a millimeter from the site.

KIRSCH: CES is not auricular therapy. And auricular therapy does not work unless you are extremely accurate. I think that the size of the electrodes that are used for CES would be too big for effective auricular therapy. It's well established that you have to be extremely site-specific. If I do auricular therapy, I'm using a spring-loaded probe so I don't get any false readings around the ear. The tip of the probe is small, it's about the size of a fine point ball pen, and if you move it the width of the point away from the spot, you won't get a good effect.

Yet auricular therapy is dramatic in its effects when you are in the right spot. In true auricular therapy you stimulate a series of points, not just one. You can do a modified form of auricular therapy with CES using longer term stimulation if you're fairly precise. I have seen results, as an example, in back pain where we could not get a satisfactory effect by working on the body part, but just by putting the ear electrodes over the points corresponding to the area of the spine that has the problem, for ten minutes, and I've seen people who couldn't move suddenly be able to get up. However, this is not the best way to do auricular therapy. You can't get to the organ with any CES electrode that I've ever seen. You can only get to the muscular/skeletal system. I have seen results with that.

"When you get dizzy, you're actually following the current going back and forth with sense organs that you don't need to use.... Consider that an indicator you have the current up too high." —KIRSCH

MBR: One thing that I've noticed from some CES devices, including using the Alpha-Stim 350, is that there will be a surge of lightheadedness or dizziness for a period of time.

KIRSCH: When you get dizzy, you're actually

following the current going back and forth with sense organs that you don't need to use. It should be below that level. Consider that an indicator you have the current up too high.

MBR: In the milliampere range would there be effects such as electrolysis?

KIRSCH: Well, it depends on the polarization of the wave form. If they are using a DC current it would be harmful. Dr. Robert O. Becker found there is a DC current in the white matter, I believe, and that it controls the nervous system as we classically look at it in traditional neurophysiology, and which is essentially an electrochemical phenomenon.

On the most basic level, all atoms have an electrical bonding and also every cell in the body has a membrane potential across the cell membrane. Each cell in the body functions like a little battery. In the simplest metaphorical explanation of electrotherapy, it seems that if we can charge up those batteries, they work better. I say that only partially in jest, because we take measurements and we see that there is a capacitance in the tissues that are stimulated. If they are stimulated correctly and long enough, we can correlate the higher post-treatment reading with a successful result. It's certainly been observed by numerous practitioners.

MBR: With what devices would you measure that?

KIRSCH: Take for example the Alpha-Stim 2000 which is no longer on the market but is in use by many doctors. If they have a pain related complaint they can just locate the problem by finding a low area of conductivity compared to the surrounding tissue. A baseline is set for that area and by stimulating the less conductive tissue until it holds a charge (what we call the "post-treatment response") we consistently see good clinical results. I could take someone with a back pain that is spread out over a large area of their back and work on

BOOK REVIEW

Cross Currents: The Promise of Electromedicine, The Perils of Electropollution by Robert O. Becker, M.D. Jeremy Tarcher, Inc., Los Angeles, 1990. 336pp. Hardback. $19.95

Twenty years ago, Dr. Robert O. Becker was a lonely dissenting voice, insisting on researching the body's subtle electrical control systems and calling for systematic investigation of the sometimes alarming interactions between electromagnetism and biological systems. He suffered for challenging the established dogma, but he has been proved prophetic, and he is now widely hailed as the father of contemporary bioelectromagnetic research.

Dr. Becker played a key and central role in the discovery of the body's natural electrical and magnetic control systems, sounded the alarm about electropollution as the invisible environmental emergency of tomorrow and helped to place bioelectromagnetism at the cutting edge of the medicine of the future. He is almost universally regarded as a genius by electromedical researchers (see the interviews in this issue, including the interview with Dr. Becker himself) and he has been twice nominated for the Nobel prize. His book, *The Body Electric* is a classic work, generally regarded as "required reading" for anyone interested in this field.

Thus, the appearance of *Cross Currents* is a major publishing event, eagerly awaited by Becker's growing group of admirers. *Cross Currents* summarizes the discussions contained in *The Body Electric* and goes on to discuss electromedicine and electropollution in much greater detail. It is readable, engaging, and intelligent, and it provides a sane and balanced survey of the whole field of bioelectromagnetism.

Becker begins with a summary overview of the whole history of medical science, criticizing the various dogmas that historically have held power, each inhibiting the next phase of research and understanding which has advanced real medical knowledge. His discussion culminates with the emergence of what Becker calls "energy medicine." He reviews important scientific experimentation that has led to our still-fragmentary understanding of the body's electrical and magnetic control systems. This discussion builds to Becker's fascinating suggestion that most living beings have a "dual nervous system." Becker presents the scientific evidence that suggests that our brains have a second, hidden dimension, based not upon digital nerve impulses but upon simpler, analog transmission of DC currents. This hitherto undiscovered analog component of our nervous system is a more primitive and basic control system than our digital system of neuronal impulses, one that Becker believes appeared earlier in our evolution.

Becker goes on to outline a clear and insightful system for categorizing the new therapeutic possibilities of electromedicine: In what he calls "Minimal-Energy Techniques," no external energy is administered to the body (as, for example, with hypnosis and visualization), and treatment methods attempt only to activate preexisting energetic control systems. In "Energy-Reinforcement Techniques," external energies are administered to the body, but in amounts similar to those that the body itself uses in its energetic control systems (including modalities such as acupuncture and "probably" homeopathy). In "High-Energy Transfer Techniques" energy is administered to the body in amounts greater than those that occur naturally (examples include TENS, electroacupuncture and magnet therapy). Becker suggests these three categories of the emerging "Energy Medicine" may transform and revolutionize the practice of medicine in the future.

Becker's book climaxes with a disturbing and thoughtful survey of the myriad sources of "electropollution" to which all of us are exposed every day. He begins with a discussion of our bodies' mechanisms of biological attunement to the earth's natural geomagnetic environment. He goes on to discuss the "mechanism of action" by which non-thermal electromagnetism may affect biological tissues. You may find it a scary and transforming experience to follow Becker's scientific, rational, yet impassioned call for minimizing our exposure to man-made electromagnetic fields, from microwaves to power lines to home appliances. He points out that we are all unwitting guinea pigs in a grand and dangerous large-scale experiment in which large numbers of people are exposed to extremely high levels of a wide variety of man-made electrical and magnetic fields. He goes on to suggest ways that we can minimize our exposure to these unnatural influences.

The book is important, clear, thought-provoking, and directly relevant to your life and health. It is also an opportunity to meet one of the most important figures in contemporary science. Highly recommended.

— Terry Patten

HIGH VOLTAGE: THE BIOELECTRIC INTERVIEWS CONTINUED

them for a few minutes until I find an area that has a poor post-treatment response, meaning that it doesn't hold a charge; there's no capacitance after the treatment. Once I get that charged up I can ask the patient to reevaluate their pain and it will generally be less or be gone. Whereas, prior to that, if I asked the patient to reevaluate their pain I would hear that it had not changed, even if I stimulated the area a lot, if I hadn't found the right spot and I hadn't gotten that correct reading. Even if I find the right spot, I may have to stimulate somewhere else and go back and re-measure that initial spot to effect a positive change. Once I see that change, then I know — I don't even have to ask the patient: I know.

Are There Potential Dangers to CES?

BECKER: When Meg Patterson used CES it was for a serious medical condition that was potentially life-threatening, namely addiction to hard drugs. On a risk/benefit ratio basis I have absolutely no problem with that. I'd say "go ahead and use it." But when you're saying, "I'm going to put this on your head and you'll do your homework better," I part company. There, my risk/benefit ratio is skewed heavily toward the risk. Bob Beck is an engineer and he makes interesting devices. The BT-5 is only one of them. But his fund of knowledge, when you get into the biological area, is understandably not as complete as someone who's worked in the biological field for a lot of years. His knowledge of the rest of the information on pleasant side effects of frequencies on the brain, long-term, is similarly fragmented. So if Beck is going to use his Tuner for the treatment of drug addiction, I don't have any objections. If he is going to use it to make people smarter, I have lots of objections.

MBR: You've mentioned your impression of the people who had used Meg Patterson's so-called black box had undergone personality changes. One of the things people have expressed interest in when they are approaching CES devices is that there is some anecdotal evidence that people do experience personality changes, that they experience what they call heightened states of consciousness or high-efficiency brain states, peak-performance states. Many people are interested in using the devices for that purpose explicitly. What would you say about the cost/benefits ratio in that case, given that some people are willing to, for example, climb rock faces and mountains to achieve peak experiences?

BECKER: There isn't an awful lot of risk in meditational techniques, which I'm told will get you to the same state too.

There is another set of phenomena known as brain tumors — that's with an "M." And the evidence gets clearer with each report that the brain is one of the target organs for abnormal electromagnetic fields and that a result of this is precisely the development in the incidence of malignancies of the central nervous system. That's an unpleasant fact that I think people have to keep in mind.

MBR: One of the things that makers of CES devices claim is that their devices are using fields and frequencies that have been found to be beneficial or not harmful. Are you aware of any evidence?

"Each cell in the body functions like a little battery. In the simplest metaphorical explanation of electrotherapy, it seems that if we can charge up those batteries, they work better. I say that only partially in jest, because we take measurements and we see that there is a capacitance in the tissues..." —KIRSCH

BECKER: I don't have any evidence.

MBR: Does that evidence exist at all?

BECKER: I don't think it does. I will agree that the frequencies that are involved are those that one normally encounters in the brain, so to a certain extent, this is a mitigating circumstance. It says, well the probability of a bad effect is probably not as great as it would be with a 60 cycle or a 1000 cycle or something in that nature. Something far removed from what you can normally expect to find and from what you find in the earth's geomagnetic environment. On the other hand, what about the power density? And therein I'm not so sure. I think before you can say that these have been proven to be beneficial and non-harmful, you should have some data to back it up and I don't see that data.

I would trust that no one is going to put the Brain Tuner on a young child; however, knowing how people are, I wouldn't be too surprised to find out that it has happened. We have a couple of studies that to me are very frightening that indicate that exposure of the newborn for a relatively short period of time, a week, two weeks, to a 60 cycle field doesn't result in any overt alteration immediately or for some time after the exposure. These animals look the same, act the same, eat the same amount, gain the same weight, don't have any cancer. But, if you wait until they reach what we would call, in human terms, late adolescence or young adulthood, and then test them in their ability to learn, they are statistically significantly slower. So, the moral of that story is, don't fool around with the kids because we really don't know what we are dealing with here.

I just feel that enthusiasm is fine in research, and research carries with it risks, and as long as your subjects are aware of the risks and have the choice of doing it or not doing it, fine and dandy. And as long as good solid data are going to be compiled, I don't have any problem with doing this sort of study. I do have a problem though when you begin to talk, like Bob Beck does, of all the great benefits that you are going to derive from sticking his electrodes on your head. I'm not sure and I don't advise it.

BECK: Robert O. Becker has suggested that a certain type of electromagnetic energy could accelerate the growth of cancer cells. And this got into the general culture. Now I have tremendous respect for Dr. Becker. I consider him No. 1 on the Nobel Prize list forever — he's been nominated several times, and I think he deserves it. But I'm in disagreement with him on this because I don't believe there is any clinical study to show that Becker's claim is an actuality. Although, I certainly made sure that the BT-5 instructions take a conservative position. They contain a prohibition, "Do not use with pregnant women, do not use with epileptics, and do not use with anyone who has any indication of brain tumors."

But there has been no evidence that electrical stimulation has caused brain cancer. I was tremendously worried about this back in 1983, when I took apart a lot of the Soviet and Danish and Oriental devices, and back

engineered them for the maximum production of neurotransmitters. But my fears appear to be unfounded. So I don't know, I think that it's theoretically possible, but we haven't seen a lot of evidence of that. I'd really like to see some good studies that address that problem.

MBR: So, in your view, then, the rewards that are very well documented outweigh vague fears of long-term risks from certain kinds of exposure, although other kinds of exposure clearly do have negative effects?

BECK: Yes. The primary exposure that causes skin cancer is in the electromagnetic spectrum in the shortwave ultraviolet. Now that clearly causes skin cancer — sunlight. There are many other things that can cause skin cancer. But I don't believe that the electrical, which is down at the bottom of the basement — a long, long, long way from the ultraviolet — can cause it.

Since a lot of neurotransmitters are stirred up, God help me, this type of stimulation can cause spontaneous remissions of a number of disease conditions.

I remember when people wouldn't eat tomatoes, they were considered poisonous. I think that time will show that, yes, it's good to be cautious, but this position was an over-precaution.

MBR: Which position?

BECK: Becker's warning that *all* electrical fields can potentially cause cancer.

We know that magnetic fields in the low frequency end . . . for example, 60 Hz power lines appear to correlate with leukemia clusters. I believe that's been established in spite of the entrenched "scientific establishment" viewpoint which Dr. Becker has challenged for decades.

But that's a *magnetic* vector. They've tried putting the *electrical* vector in, and nothing happens. When they put it in the magnetic field, yes. Cranial electrostimulators, of course, put out an electrical signal. There is no solenoid coil there like in a Mood Pacer that could cause a magnetic field — although there would be an extremely weak magnetic component to the microamperage current going into the skin, with about *one-thousandth* of that reaching the brain cells because of the conductivity and resistivity of the brain tissue — but that's an extremely weak magnetic field, far below even the levels that concern Dr. Becker from what I understand.

MBR: In his book *Cross Currents*, Dr. Becker expresses some fears about direct electrical stimulation, including the concern that it might produce electrolysis in the cells.

BECK: Well, it most certainly can in a direct current device. In the late sixties the bright and shining hope of the anesthesiologists was electroanaesthesia. They used about a 700 Hz square wave at 35 milliamperes, directly through the brain. And there was a direct current component there, which naturally caused electrolysis of the sodium potassium membranes and other tissue.

A good metaphor is to imagine a troop of soldiers marching across a bridge. The soldiers that start out at one end of the bridge will get to the other side and go wherever they're going. That causes electrolysis. But if you use bi-phasic or alternating or self-canceling direct current, which means that the algebraic sum of the positive going wave is exactly the same as the negative, it would be like the soldiers just marching halfway down the bridge, reversing, marching halfway down the bridge in the other direction. Nobody would ever get to the other side. So there could be no electrolysis.

There is no electrolysis except in many TENS units where there is a direct current component in the output. Of course there is no direct current output in the BT-5. But if you used a TENS unit which is designed to cause electrolysis, say in the lumbar area, and applied it above the neck, you could very definitely cause damage. In a properly designed CES, they're all bi-phasic. I haven't seen one yet that had any DC in it. So you're talking about two entirely different things.

"The medical model...says, in the absence of disease or injury, "We don't have a problem." But my feeling is that the quality of life has a great deal of value. If you can raise that a point or two on an imaginary scale, that's miraculous!" — KIRSCH

Dr. Becker is totally correct if you're dealing with non-biphasic DC. Even if you're dealing with AC, there's no electrolysis. If it electroplates a molecule in one direction, then, one-thousandth of a second later it electroplates it in the opposite direction so there's no net movement, no migration, no electrolysis.

MBR: Dr. Kirsch, what about effects such as electrolysis?

KIRSCH: Well, it depends on the polarization of the wave form, with a DC current it would be harmful. But as I said before, the Alpha-Stim works by using a biphasic DC current that goes in one direction and then goes in the other, resulting in a zero net polarity. This won't cause electrolysis. And to my knowledge very few currently available CES devices would cause electrolysis.

I have a few comments about Dr. Becker's general cautions as well. The medical model in which Dr. Becker was trained says, in the absence of disease or injury, "We don't have a problem." But my feeling is that the quality of life has a great deal of value. If you can raise that a point or two on an imaginary scale, that's miraculous! That's the reason that this whole "Megabrain movement" has attracted so much interest. Obviously people *do* want to improve the quality of their lives. That's what it all boils down to.

Dr. Becker is a basic science researcher, and as I've mentioned, a brilliant one. But you have to understand that when you hang around a laboratory wearing a white coat, you're looking to dissect problems down to their discrete answers.

My degree is in neurobiology and I have a very similar risk/reward criticism of neurosurgery on the brain. With every theory we have of brain function, there are clinical exceptions. Yet in this legal system we have scientific theories which are nothing more than working hypotheses on the basis of which we perform major invasive procedures like surgery on the brain. To me, that's pretty amazing.

On the other hand, when you are talking about passing a few electrons that have a zero net polarity through the brain, I think you are talking about a *very minor* possibility of change. Additionally, cranial electrostimulation has been around for a long time. In crude form, it's been around since the turn of the

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COGNITION ENHANCEMENT DRUGS CONTINUED

can't possibly have any pharmacological effects and must be physiologically inert). It is so remarkable in its effects and safety that its discovery by UCB Laboratories in Belgium sent virtually every other major pharmaceutical company scrambling to develop its own cerebral stimulant. This "smart pill race" has resulted in the creation of a new drug category called the *nootropics*, from the Greek words

Piracetam has proven to be a powerful intelligence booster and cerebral stimulant.

noos (mind) and *tropein* (turn), meaning "acting on the mind".

Some of the nootropic drugs being tested now on humans include *vinpocetine* (being developed by Ayerst Laboratories), which speeds up learning, improves memory and recall and seems to block the action of substances that disrupt memory; *aniracetam* (Hoffman-La Roche), which appears to be about ten times more potent in improving and protecting memory than piracetam, *pramiracetam* (Warner-Lambert/Parke Davis), which seems to improve learning and memory by enhancing the firing of neurons in the hippocampus (a key to the formation of long-term memories), and *oxiracetam* (Ciba-Geigy), apparently two to three times as powerful as piracetam (intriguingly, research shows that when oxiracetam is given to pregnant rats their *offspring* proved more intelligent than control groups — similar findings have been reported for the offspring of pregnant rats kept in "enriched environments," as described in the "Research Update" elsewhere in this issue). All of these substances seem remarkably nontoxic and free of side effects.

As yet, there is no nootropic drug that is approved by the FDA for sale in the US, but, keenly aware of the multi-billion dollar potential of nootropics, the drug companies are pouring big bucks into research that will satisfy FDA requirements by proving how they work (still not well understood), and by proving their effectiveness in treating medical problems such as Alzheimer's disease and senility. In this article we will focus on the most extensively tested and widely available nootropic compound, piracetam.

Piracetam has been proven to boost learning and memory in normal subjects as well as those who suffer cognitive deficits, and is also a cognitive enhancer under conditions of hypoxia, or too little oxygen (recent expeditions to climb Mt. Everest have included piracetam as an "essential" medication to treat frostbite and memory lapses caused by altitude). A variety of clinical studies with human subjects, including studies of young healthy volunteers, healthy middle-aged subjects with some memory decline, elderly subjects, elderly subjects with senility, and alcoholics, have proven that piracetam enhances cortical vigilance, improves integration of information processing, improves attention span and concentration, and can produce dramatic improvements in both direct and delayed recall of verbal learning.

It's effective in the treatment of dyslexia, stroke, alcoholism, vertigo, senile dementia, sickle-cell anemia, and many other conditions, enhances the brain's resistance to various injuries and boosts its ability to recover from injuries, protects the brain against chemicals such as barbiturates and cyanides, and is widely used throughout Europe and Latin America (where it is sold over the counter).

The subjective effect described by a lot of people is that it "wakes up your brain". In fact, it selectively stimulates the anterior or frontal part of the forebrain — that part of the brain that has evolved most recently, rapidly and remarkably in the course of our evolution from ape to human, and which is the seat of our "higher functions."

When oxiracetam is given to pregnant rats their offspring *proved more intelligent than control groups.*

Piracetam works in a number of ways to increase energy within the brain. First, it steps up the production of adenosine triphosphate (ATP), the energy storage and energy generating molecules within our cells. It also boosts cerebral metabolism by improving cerebral microcirculation (blood flow), increasing the brain's use of glucose, and increasing the brain's oxygen utilization. It also seems to enhance protein synthesis in the brain (it's been proven that protein synthesis is an essential step in laying down long-term memories).

SUPERCONNECTING THE BRAIN. Perhaps the most intriguing aspect of piracetam is that it has been proven to increase the flow of information between the right and left hemispheres of the brain. As a result of experiments with human subjects one researcher concluded that piracetam causes the hemispheres to become "*superconnected.*" Since there's increasing evidence that high level brain states — brilliance, insight, creativity, flow, peak performance, being "in the zone" — are a product of the integrated and synergistic functioning of both hemispheres simultaneously, we might suspect that

Expeditions to Mt. Everest include piracetam as an "essential" medication to treat frostbite and memory lapses caused by altitude.

piracetam enhances not only simple learning and memory but creative or synthesis thinking.

Piracetam's capacity to superconnect the hemispheres becomes even more intriguing in light of the evidence indicating that many of the most widely used mind machines and techniques for brain enhancement (such as binaural beat frequencies and the sound and light machines) function in part by facilitating integrated hemispheric functioning. This raises the possibility that since both the machines and piracetam seem to facilitate interhemispheric communication, there might be a potentiating or synergistic effect when such mind machines are used in combination with piracetam, resulting in a quantum leap in brain-enhancement effects.

PRECAUTIONS: Piracetam may increase the effects of certain drugs, such as amphetamines and psychotropics. Adverse effects are rare but include insomnia, psychomotor agitation, nausea, headaches and gastrointestinal distress.

DOSAGE: Piracetam is supplied in 400mg or 800mg tablets. The usual dose is 2400-4800 mg per day in three divided doses. Some literature recommends that the first two days a high "attack" dose should be taken. We have noticed that when some people first take

piracetam they do not notice any effect until they take a high dose. Thereafter, they may notice that a lower dosage is sufficient. The drug takes effect in 30 to 60 minutes.

SOURCES: Piracetam is not sold in the US. It can be purchased over the counter in Mexico or by mail order from the address below.

Other Cognition-Enhancing Substances

Nootropics are exciting and fascinating, partly because of their lack of toxicity, but they are not the only substances that increase intelligence. There are over 30 chemicals that have been demonstrated to improve animal and/or human intelligence (including xanthinol nicotinate, idebenone, ginkgo biloba, acetyl-l-carnitine, DMAE, pyroglutamate, RNA [ribonucleic acid], isoprinosine, phenylalanine, amphetamines, pemoline, ritalin, vitamin B-12, ACTH 4-10, L-prolyl L-leucyl glycine amide, caffeine, niacin, vitamin C, ginseng, GH3 [Gerovital], PRL-8-53, R-58-735, ISF-2522, and THA). We will describe several we find most interesting.

One researcher concludes that piracetam causes the hemispheres to become "superconnected."

Centrophenoxine (Lucidril)

Centrophenoxine, more commonly known by its trade name Lucidril, is an intelligence booster and also an effective anti-aging therapy. It has been shown to produce a 30% increase in the life span of laboratory animals.

Perhaps the most obvious sign of aging is the appearance of brown "age spots" or "liver spots" on the skin. This pigmented material is known as lipofuscin, from the Greek *lipo* (fat) and the Latin *fuscin* (dusky), and it is the result of the progressive buildup of toxic waste by-products of cellular metabolism, or "cellular garbage." It accumulates with age not only on the skin but also in the muscle and nerve cells. The buildup of lipofuscin in brain cells is accompanied by a decline in mental functioning, and can ultimately lead to the death of the affected neurons. Centrophenoxine removes lipofuscin deposits from brain cells (as well as from skin). That is, it actually seems to *reverse* the aging process and have a rejuvenating effect on brain cells. It also reduces the rate of lipofuscin accumulation in young brain cells and rejuvenates the synaptic structure — the area where the actual transfer of information takes place between nerve cells. This suggests that the clinical rejuvenation effects of centrophenoxine in humans may be produced by the actual regeneration of parts of the neuron.

It is used widely throughout Europe for its anti-aging properties, but studies of both animal and human subjects show that it produces improvements in alertness, learning and memory as well.

PRECAUTIONS: Centrophenoxine should not be used by persons who are easily excitable, people with severe arterial hypertension, or those subject to convulsions or involuntary musculoskeletal movements. The drug also should not be used by nursing mothers. Adverse effects are rare but include hyperexcitability, insomnia, tremors, motion sickness, paradoxical drowsiness and depression. In therapeutic doses it has proven to be nontoxic.

The dosage in clinical trials ranges from about 3000 to 8000 mg. per day based on body weight, but many self-experimenters take 1000 to 3000 mg per day. Centrophenoxine takes effect very quickly, producing an increase in alertness and a slight stimulating quality.

SOURCES: Centrophenoxine is not sold in the US. It can be purchased over the counter in Mexico or by mail order from the address below.

Choline/Lecithin

"When I take a choline compound, I am more awake when I am awake, more sound asleep when I am asleep. Not only does my memory improve, but I have an easier time day dreaming when I want to, and concentrating on real world tasks when I want to."

As these words suggest, choline seems to optimize mental functioning in a global way. An explanation is that choline is the nutrient that is used by the brain to manufacture acetylcholine, which is a principal component of brain cells and the major neurochemical messenger responsible for the processing, storage, and retrieval of information. Acetylcholine must be in abundant supply throughout the brain, and when acetylcholine levels drop (as happens as a result of poor nutrition, alcoholism and aging) the result is memory loss and a decline in thinking ability. Since choline passes through the blood-brain barrier into the brain and is transformed into acetylcholine, consuming choline directly increases levels of acetylcholine in the brain, and has been proven to prevent memory loss associated with aging and improve memory in young, healthy adults.

There is also evidence that choline can improve mental functioning by actually strengthening neurons in the brain's memory centers and slowing down the age-related loss of dendrites of those neurons.

Choline can be found in several forms including choline bitartrate, choline chloride, or phosphatidyl choline. Phosphatidyl choline (PC) is the active ingredient of lecithin. All of these forms of choline will produce memory boosting effects.

Choline strengthens neurons in the brain's memory centers and slows down the age-related loss of those neurons.

DOSAGE: The studies that used dietary choline to improve memory in young, healthy adults used at least 3 grams of choline per day in three or four divided doses (doses every 4 to 6 hours insure that blood levels of choline will remain in the effective range). Those taking lecithin may need to take more than three grams because only part of the lecithin is choline. Often the label will provide information on the quantity of choline per tablespoon. All forms of choline should be taken with one gram per day of pantothenic acid (vitamin B-5), which is essential for the conversion of choline into acetylcholine.

SOURCES: Choline and lecithin are considered nutritional supplements and can be found at health food or drug stores. Commercial lecithin usually contains other oils and phosphatides besides phosphatidyl choline. Look at the label before you buy and make sure the product contains more than 30% phosphatidyl choline. Also, you should taste your lecithin and make sure it does not taste bitter (this indicates rancidity).

PRECAUTIONS: Any compound that acts as a

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precursor to acetylcholine such as choline, PC, or DMAE should not be used by manic depressives, since it can deepen the depressive phase. Choline bitartrate and choline chloride can sometimes cause a fishy odor or diarrhea. Lecithin and PC, however, are metabolized differently and do not produce these effects.

Choline and Piracetam

Researchers have discovered that the combination of choline and piracetam has a synergistic effect that produces a greater improvement in memory and learning than the sum of each when taken alone. In one study of learning, animals receiving both substances scored four times higher than the control groups and those taking choline alone, and three times higher than those taking piracetam alone. Clinical studies of humans given piracetam and choline alone and in combination have shown similar extraordinary synergistic effects. One of the researchers, Dr. Raymond Bartus of Lederle Laboratories, suggests that in many cases (such as aging) brain metabolism is too low for optimal conversion of choline to acetylcholine; adding piracetam, which is known to boost brain metabolism, could thus produce dramatic increases in acetylcholine levels in the brain.

Individuals taking piracetam may want to supplement it with choline in any case as a safeguard, since there is some evidence that piracetam causes acetylcholine to be used up more quickly, and could deplete levels of choline inside the brain cells. We know of one person who claims she feels slightly agitated and depressed if she takes piracetam for more than a week without a choline supplement. This feeling is alleviated for her with a single dose of choline.

DHEA

"I started taking DHEA in order to build up my muscle mass and to decrease my weight. I found that within two months I was able to lift 70 pound weights during weight training — twice the amount I'd been able to lift previously. I lost the extra ten pounds I'd been working to take off for the past year. I like the increased feeling of strength and energy when weight lifting. As a woman, I had found it was difficult to do much more than just light muscle toning, so I was pleased by such obvious results."

Dehydroepiandrosterone (DHEA), a steroid hormone produced in the adrenal gland and related to the male hormone testosterone, is the most abundant steroid in the human bloodstream. It seems to trigger the release of growth hormone and is a powerful booster of immune function. Research has found it to have significant anti-obesity, anti-tumor, anti-aging, and anti-cancer (particularly anti-breast cancer) effects. DHEA production naturally drops by as much as 95 percent as people age (the average drop is from about 30 mg per day at age 20 to less than 6 mg per day at age 80).

According to Dr. William Regelson of the Medical College of Virginia, DHEA is "one of the best bio-chemical biomarkers for chronologic age," and there's good reason to think that taking a DHEA supplement may extend your life and make you more youthful while you're alive. In animal studies, it's extended lifespans up to 50 percent. In a 12 year study of hundreds of aging humans, researchers found that DHEA levels were inversely correlated with mortality: The lower the levels, the higher the probability of death, from any cause.

The lower the levels of DHEA, the higher the probability of death, from any cause.

Additionally, DHEA may be an important player in cognitive enhancement. It plays a key role in protecting brain cells from age-related degenerative conditions like Alzheimer's disease. Not only does neuronal degeneration occur most frequently when DHEA levels are lowest, but brain tissue contains more DHEA than is found in the bloodstream. In a recent experiment with brain cell tissue cultures, Dr. Eugene Roberts has discovered that even very low concentrations of DHEA will "increase the number of neurons, their ability to establish contacts, and their differentiation." He concludes that DHEA plays "a significant role in normal function of neuronal cells" and that supplementation with it "may prevent neuronal loss and/or damage." DHEA also enhanced long-term memory in mice, and raised the learning and memory of middle-aged and old mice to the high levels found in young mice. Perhaps it plays a similar role in human brain function.

DOSAGE: Dosage of DHEA ranges from 50 mg to 2000 mg per day. There is no solid information indicating optimal dosage for humans but, those serious about self-experimentation can have their DHEA levels tested every few months (for about $65), each time raising the dosage of DHEA until reaching an optimal level — what is normal for a 20 year old human. Some women have reported a slight increase in the hair on their faces or bodies with the use of DHEA. Little is known about this effect, so caution should be exercised by women considering using DHEA. Since it's a steroid with testesterone-like effects, it probably has the same risks as testesterone.

SOURCES: DHEA is now being used by many people with AIDS because of its immune enhancement and antiviral effects. AIDS buyers groups sell DHEA to their members. Among the buyers groups selling DHEA are: Alliance 7, 619-281-5360, in San Diego, and Healing Alternatives Foundation, 415-626-2316, in San Francisco.

Dilantin

This extraordinary prescription drug, also known by its generic names, phenytoin and diphenylhydantoin (DPH), was discovered in 1938 and has long been used for the treatment of epilepsy. But it's clear that it is much more than just a simple anticonvulsant. There are literally thousands of scientific studies documenting its effectiveness in treating a multitude of medical problems, including, Parkinson's disease, angina, headache, high blood pressure, hypoglycemia, asthma, diabetes, ulcers, alcohol and drug withdrawal, pain, cardiac arrhythmias and much more.

More interestingly for our purposes, Dilantin has proven to be extremely effective in treating nervous disorders involving emotions and behavior: depression, moodiness, compulsive eating, violent behavior, chronic anger, irritability, fear, impulsiveness, hostility, insomnia, impatience, agitation, worry, anxiety, pessimism.

And, even more interesting, the drug has proven to have remarkable cognition-enhancing effects. It can dramatically improve concentration abilities, boost long-term

memory and comprehension, and produce sharp increases in IQ scores.

What's more, DPH increases the regeneration of tissue and speeds up the healing of wounds by promoting the growth of collagen (the most abundant protein in the body, which acts as connective tissue to hold our bodies together), and has even shown evidence of extending life-span (in one study of laboratory mice DPH prolonged their mean life-span by 25 percent).

The secret of DPH's wide range of beneficial effects seems to be that it functions by stabilizing and optimizing electrical activity throughout the body and brain. Among the ways it does this is to regulate the activity of the sodium, potassium and calcium ions, which produce bioelectric activity; to regulate the

The secret of DPH's wide range of beneficial effects seems to be that it stabilizes and optimizes electrical activity throughout the whole body bioelectrical system—the "body electric."

neurotransmitters that mediate bioelectric activity; and to influence the hormones (such as vasopressin, insulin and cortisol) that function in response to bioelectrical impulses. Epileptic seizures are a product of electrical disruptions — a sudden "kindling" or firing of masses of neurons which spreads through the brain — which DPH counteracts by normalizing the brain's electrical activity. But what this implies is that all the other disorders mentioned above, including mood and behavioral problems such as compulsive eating, moodiness, anxiety and so on — are somehow linked to bioelectrical activity.

The idea that virtually all our capacities and functions from healing to cognition are dependent on the activity of a bioelectrical control system — a still little-understood semiconducting DC *analog* communication system that links and regulates every cell in the human body, functioning independently of the more obvious and well-understood *digital*, nerve-impulse operated "central" nervous system — is one that is being advanced by increasing numbers of scientists, in large part as a result of the groundbreaking research and thinking of Robert O. Becker (interviewed elsewhere in this issue). The extraordinary range of beneficial effects of DPH are perhaps a product of its capacity to normalize or optimize the functioning of this whole body bioelectrical system — the "body electric."

PRECAUTIONS: Epileptics have been taking DPH for nearly 50 years with few problems. Side effects, which are fairly infrequent, can include nausea, headache, dizziness, insomnia, tremor, and a reduction in the body's absorption of Vitamin D and folic acid.

DOSAGE: Epileptics generally take between 200 and 600 mg per day, but those using DPH for cognition-enhancement or life-extension purposes use from 100 to 300 mg a day, taken in two or three divided doses.

SOURCES: DPH is available in the USA with a doctor's prescription, and approved by the FDA as an anticonvulsant — your doctor may not be familiar with the uses we discuss. It can also be purchased by mail order from overseas.

Hydergine

"I first tried Hydergine six years ago during a visit to see my Dad at Christmas. He and I started taking 9 mg per day. The results were apparent to us both within two days. He was in his 40s, and began to remember events from when he was in his 20s as clearly as if they'd happened yesterday. What was interesting was that the events were nothing outstanding — just ordinary times. In other words, the everyday events had been stored away all these years, it just took some chemical prodding to jog them loose into the conscious mind. I was in my early 20s and had similar memories going back to my childhood years. A unique opportunity had been presented to us to sit down and really share in the joys that our life had brought us. What a gift!"

A wealth of research going back over 20 years

Hydergine may be "the ultimate smart pill."

suggests that Hydergine may be what psychologist-pharmacist Ross Pelton calls "the ultimate smart pill." The substance, whose generic name is ergoloid mesylates, is made from a natural, organic source: the ergot fungus of rye plants (it was discovered at Sandoz laboratories by the visionary chemist Dr. Albert Hofmann, also known for his discovery of another ergot derivative, LSD 25). It increases mental abilities, prevents damage to brain cells, and may even be able to reverse existing damage to brain cells.

Hydergine acts in several ways to enhance mental capabilities and to slow down or reverse the aging processes in the brain. A few of the huge number of beneficial effects scientists have attributed to Hydergine include: increased protein synthesis in the brain; reduced accumulation of lipofuscin in the

Disclaimer/Warning

This article is not intended to provide medical advice. It is intended to be educational and informational only. Please consult with a health professional for medical advice.

The authors and MEGABRAIN REPORT are not recommending that anyone use any of the substances described, but rather are presenting and seeking information. We emphasize that adequate studies of both long and short term effects of some of these substances have not been performed, that some of them can have adverse side effects, and that all humans have different biochemical natures and sensitivities, so that safe dosages of some of these substances may vary enormously from individual to individual. Also, some of these substances may be dangerous for individuals not in sound mental and physical health. As a result, we strongly recommend that anyone interested in experimenting with these substances do so with caution and under the supervision of a medical professional. We strongly recommend that children and pregnant or lactating women should not experiment with these substances under any circumstances.

MEGABRAIN REPORT does not have any financial interest in any of the drugs or nutrients or suppliers of such substances mentioned in this article.

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brain; increased quantities of blood and oxygen delivered to the brain; improvement of memory, learning and intelligence; beneficial improvements in brainwave activity; increased metabolism in brain cells; normalization of blood pressure; and increased production of such neurotransmitters as dopamine and norepinephrine (neurochemical messengers essential to the formation of memory, and also associated with arousal, alertness, elation and pleasure). Hydergine also functions as a powerful antioxidant and thus protects the brain against the damage caused by those infamous rascally free radicals (unstable and extremely reactive molecules produced by normal metabolism, which cause damage associated with aging, cancer and cardiovascular disease).

One way that Hydergine may enhance brain functioning is by mimicking the effect of a substance called nerve growth factor (NGF). NGF is an essential component of protein synthesis in the brain, which we have noted is a key to the formation of long term memory. NGF promotes the growth of dendrites — the long branching fibers by which neurons receive information from other neurons. Scientists studying the effects of learning on the brain have found it is directly related to dendritic growth. Hydergine seems to work by the same neurochemical pathway as NGF to produce neural growth.

While Hydergine is widely used for the treatment of senility, scientists have also studied its effects, both short term and long term, in normal healthy humans; these studies noted significant improvements in a variety of

The US recommended dosage of 3 mg per day may be insufficient for significant cognition-enhancement effects.

cognitive functions, including alertness, memory, reaction time, abstract reasoning and cognitive processing ability.

PRECAUTIONS: If too large a dose is used when first taking Hydergine, it may cause slight nausea, gastric disturbance, or headache. Overall, Hydergine does not produce any serious side effects, it is non-toxic even at very large doses and it is contraindicated only for individuals who have chronic or acute psychosis.

DOSAGE: The US recommended dosage is 3 mg per day, however, the European recommended dosage is 9 mg per day taken in three divided doses. Most of the research has been done at levels of 9 to 12 mg per day or higher, and there is some evidence that 3 mg per day is

"The longer I use vasopressin, the more I can rely on my mind to be a portable note pad."

simply insufficient for significant cognition-enhancement effects. It may take several weeks or even months before Hydergine produces noticeable effects. Hydergine (though not its generic counterpart) is available in a sublingual form, and there's evidence that sublingual doses reach the brain in greater quantity.

SOURCES: Hydergine is available in the USA with a doctor's prescription, and approved by the FDA for the treatment of senile dementia and insufficient blood circulation to the brain — your doctor may not be familiar with the uses discussed. It can also be purchased over the counter in Mexico or by mail order from overseas. (see below) In many cases these mail order companies sell the generic form, Ergoloid Mesylates. The FDA has rated the generic as biologically equivalent to the Sandoz product. More testing needs to be done on this question.

Sulbutiamine

Sulbutiamine, also known as Arcalion, is a new compound that has been described as being like Hydergine, only better. It has been shown to facilitate wakefulness, improve long-term memory, decrease reaction time, reduce fatigue, decrease anxiety, and increase overall resistance to stress.

DOSAGE: Those who use this substance to combat fatigue generally take two 200 mg tablets per day, with breakfast or an A.M. meal, for a period of 20 days. They warn users not to exceed three tablets per day, as this very powerful substance may cause severe headaches.

SOURCES: Sulbutiamine is not sold in the US. It can be purchased by mail order from the address below.

Vasopressin

"The most immediate result I get from using vasopressin is increased clarity and alertness. I can be logical without the usual speediness associated with caffeine use. After five minutes I've noticed that I'm busily accomplishing tasks that I'd been putting off for a week. The duration is about two hours for the energetic feelings. Overall, I feel my short-term memory recall improving over the past two weeks of using vasopressin. It seems that the longer I use it, the more I can rely on my mind to be a portable note pad."

"I have smoked pot on a more or less (usually more) daily basis for 20 years. When I read that vasopressin is inhibited by pot, I found a source for buying some. Now I notice I that when I use vasopressin with marijuana I still get stoned, but I have little or none of the 'dummying down' effect of the pot. And what a surprise to find that vasopressin intensifies orgasms!"

Vasopressin, called "the memory hormone," is

"What a surprise to find that vasopressin intensifies orgasms!"

a natural brain peptide, stimulated by acetylcholine and released in the pituitary. It actually helps create, imprint, and store memories, and is essential to remembering. Apparently vasopressin is involved in picking out and chunking together related bits of information from the stream of consciousness, integrating these chunks into coherent structures, and then "imprinting" these images or concepts into long-term memory by transforming electrical impulses into complex proteins that contain memories and are stored away in the brain. The act of remembering the stored information is also mediated by vasopressin.

Over 20 years ago scientists discovered that vasopressin had extraordinary effects on the memory of laboratory animals — preventing chemically and electrically induced amnesia, actually reversing amnesia, and dramatically boosting the memory and intelligence of

normal animals. These findings spurred much research into the cognition-enhancement effect of vasopressin on humans. Among the key findings are that small doses of the hormone can have striking success in quickly reversing traumatic amnesia (amnesia caused by injuries such as car crashes), can reverse age-related memory loss and actually restore lost memories, and can produce sharp improvements in learning and memory using measures such as abstract and verbal memory, organizational capacities, recall, attention, concentration, focus, short-term memory, optical memory, and long-term memory. It also boosts performance in such areas as reaction speed, visual discrimination, and coordination.

Vasopressin pours out during moments of trauma or extreme arousal, which may explain why those times seem to be so deeply imprinted in our brains, and are remembered with such clarity. Vasopressin is also released by cocaine, LSD, amphetamines, Ritalin, and Pemoline (Cylert). Those who make frequent use of these drugs deplete their brain's vasopressin supply. The result is depression, and a decline in cognitive function. The frequent user's response to this depression is to take more of the drug, thus trying to wring more vasopressin out of their depleted brain: ultimately the well runs dry. Vasopressin, however, is not a drug but the actual brain hormone that has been depleted, so it can produce dramatic and virtually instantaneous improvements in mood and mental functioning.

Unlike stimulants, alcohol and marijuana do not deplete but actually suppress the release of vasopressin, which could account for the loss of memory many have noticed when drunk or stoned, or when trying to remember events that occurred while they were high. Vasopressin can reduce the harmful effects of these drugs and enhance alertness, reaction speed and concentration.

Anecdotal evidence suggests that vasopressin can produce a state of euphoria accompanied by self-confidence, energy, assertiveness, and a sensation of extreme mental clarity. Many believe it is ideal for situations in which lots of new information needs to be processed and remembered — such as studying for an exam, learning a language, ploughing through difficult or complex works. Some use it for more mundane purposes, such as when they have to drive late at night and want to remain alert.

PRECAUTIONS: Vasopressin can occasionally produce the following side effects; runny nose, nasal congestion, irritation of the nasal passages, headache, abdominal cramps, and increased bowel movements. Angina pectoris sufferers should not use vasopressin, since it can trigger angina pains. Vasopressin has not been proven to be safe for use during pregnancy.

"I found myself on an incredible cosmic amusement ride, flying in vast circles around the solar system."

DOSAGE: Vasopressin usually comes in a nasal spray bottle. Most studies showing memory improvement have been done with a dose of 12 to 16 USP per day, which is one whiff in each nostril three to four times per day. Vasopressin produces a noticeable effect within seconds.

SOURCES: Vasopressin (known as Diapid and produced by Sandoz) is available in the USA with a doctor's prescription, but keep in mind that your doctor may not be familiar with the uses we have discussed (it is approved by the FDA for treatment of diabetes insipidus). It can also be purchased over the counter in Mexico or by mail order from overseas (see below).

Potential Mind-Machine Brain-Food Interactions

"I took four 800 mg tablets of piracetam at a recent holistic health expo. After an hour, I sat down at a booth and donned the MC2 glasses and headset and put on a tape of space sounds. Within minutes, I was in theta state and out there in outer space, oblivious to the crowd. I found myself on an incredible cosmic amusement ride, flying in vast circles around the solar system. I imagined the sounds and dolphins and alien super-intelligences. I had to hold back to keep from screaming with delight. Ideas for inventions and solutions to problems poured into my brain effortlessly. After 20 minutes the program ended and I leaped up, refreshed. I'd been exhausted but now I had boundless energy. A previously boring expo became a magical discovery experience."

Writer/networker Wes Thomas has provided us with a good description of one type of brain-machine cognitive-drug interaction. It makes sense that if these substances heighten our senses by turning up the volume control knob in our brains (making us more alert, heightening our perceptions), then our perceptions of the sensory stimuli and sensual experiences provided by the mind machines will be made even more intense (and therefore more memorable) by the drugs.

But Thomas mentions another level of potential interaction that could be even more significant: dramatically enhanced creativity and problem-solving capacities. As we've noted, there's evidence that some of the cognition-enhancement substances influence brain activity in ways that are similar or parallel to the mind-machines, or selectively stimulate specific areas of the brain that are also stimulated by brain machines. Piracetam, for example, produces what has been called "superconnectivity," facilitating the flow of information between hemispheres, and there's increasing evidence such hemispheric integration can facilitate creativity, problem solving, and original thinking. Some of the brain machines also seem to enhance hemispheric connectivity, for example some of the

Could the combination of piracetam and brain tools facilitate even greater hemispheric connectivity and greater creativity?

sound and light machines, and the binaural or "Hemi Sync" signal generators. Is it possible that the combination of piracetam and such brain tools could be potentiating, and facilitate even greater hemispheric connectivity and greater creativity?

Vasopressin's intriguing ability to eliminate post-traumatic amnesia becomes even more intriguing when we consider recent research using cranial electrostimulation (CES) devices to treat post-traumatic amnesia (such as the work of Dr. Allan Childs, mentioned in the "Research Update" elsewhere in this issue). The success of vasopressin (also Hydergine) in reversing memory loss associated with aging is also interesting in light of evidence that CES devices can have similar effects. Is it possible that CES is interacting with vasopressin or with those parts of the brain — the hypothala-

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mus, pituitary, hippocampus — that are also affected by vasopressin or Hydergine? Could vasopressin or Hydergine enhance the effects of CES and vice versa, possibly leading to far more effective treatments for memory loss and the decline with age of other cognitive functions?

Hydergine, Dilantin and other cognition-enhancement substances alter or optimize electrical activity in the brain. There is also evidence that many of the brain machines, including sound and light devices, CES, vestibular stimulation machines, ganzfelds, and binaural beat frequencies, alter the brain's electrical activity. Again, could there be potential synergistic effects, leading to more rapid and powerful alterations in bioelectrical patterns? Dilantin's ability to regulate

Could a combination of Dilantin and sound and light machines "train" the brain to avoid epileptic seizures?

electrical activity makes it extremely useful for treating epilepsy — is it possible that a combination of Dilantin and, say, sound and light at selected frequencies, could be an effective way to "train" the brain to avoid epileptic seizures? If so it would constitute a significant medical breakthrough.

We are interested in learning more about such brain-machine cognitive-drug interactions. Perhaps you are interested too. If you are, we hope you will complete the questionnaire that we have included with this issue of the newsletter.

How to Obtain Cognition-Enhancement Substances by Mail Order

While some of the substances described above are not available in the U.S., or are available only by prescription, it is easy and quite legal to obtain these substances by mail order. One reason some of these substances are not available in the U.S. is that they have not yet gone through the extraordinarily expensive and lengthy process required to obtain FDA approval. This does not mean however that it is not quite legal to use these substances. And some of the substances have been approved by the FDA for limited medical applications. This does not mean that it is not quite proper to use these substances for "unapproved" purposes.

In the April, 1982 issue of the *FDA Drug Bulletin*, the agency included a policy statement clarifying the question of "unapproved" uses for drugs, clearly stating that "'unapproved' uses may be appropriate and rational in certain circumstances, and may, in fact, reflect approaches to drug therapy that have been extensively reported in medical literature. . . . Valid new uses for drugs already on the market are often first discovered through serendipitous observations and therapeutic innovations." In sum, the FDA clearly approves of the "unapproved" uses as an important means for innovation and discovery.

Also, though it is not widely known, a July, 1989 FDA ruling now makes it quite legal to import effective drugs used elsewhere but not available in the U.S. The FDA now allows the importation and mail shipment of a three month supply of drugs, for personal use, as long as they are regarded as safe in other countries. The new ruling, FDA pilot guidelines chapter 971, was made as a result of heavy pressure from AIDS political action groups, which insisted AIDS sufferers were denied access to potentially life-saving substances that were widely used abroad but were still unapproved for use in the U.S.

INTERLAB, a mail order pharmacy in England, is one of a number of companies established in response to this new FDA ruling. INTERLAB carries a wide variety of drugs for cognitive enhancement, life extension, and the treatment of AIDS which are not available in the US.

All of the drugs discussed here can be purchased without a prescription. You can request a full price sheet by writing to: INTERLAB, P.O. Box 587, Newport Pagnell, Bucks MK 16 8AA England. Those who want to order some of the substances described above right away may send a personal check for the amount of the item(s) plus $6 for shipping (or $10 for accelerated shipping). Some sample prices (in March, 1990) are:

- Centrophenoxine (60 X 250mg tablets) $29
- Hydergine (100 X 5mg oral tablets) $39
- Piracetam (60 X 800mg tablets) $30
- Sulbutiamine (20 X 200mg tablets) $11
- Vasopressin (12ml nasal spray) $22
- Phenytoin (Generic Dilantin, 250 X 100 mg tablets) $16

You must include the following signed statement with your order: "I hereby declare that the products I am purchasing are not for commercial resale. They are for my own personal use only. The supply ordered does not exceed three month's usage and they are used with the consent of my physician."

The MEGABRAIN REPORT Survey

This survey is being distributed only to subscribers of MEGABRAIN REPORT. We want to gather information that will be useful to other researchers, and believe you subscribers constitute an ideal subject population, one which can be relied on for accurate and honest self-assessment and conscientious reporting of findings.

Even if you have no intention of ever taking cognition-enhancement substances, we urge you to complete the questionnaire that accompanies this newsletter. It contains demographic and other information that will be

The FDA clearly approves of the "unapproved" uses of drugs as an important means for innovation and discovery.

useful in a variety of ways, and will help us establish a meaningful data base that will be valuable in other projected surveys and studies. This is an opportunity for you to join with MEGABRAIN REPORT so that we can not only communicate information, but also serve as active participants in the discovery of new information.

If you do choose to experiment with such substances, we hope you will share your information with us. The scientific and informational value of your experiences will be greater if you proceed with your experimentation systematically: you might want to make note of or measure your psychophysiological state before using any of the substances, using some of the guidelines and techniques described below. Then, having established a sort of baseline, you might choose to take a

single cognitive-enhancement substance for a period of two weeks or a month, after which you might again note or if possible measure any changes. Next, you might perform a similar procedure with one of the brain-enhancing devices, if one is available to you. Having done this, you might then experiment with systematically combining the machine with the cognition-enhancement substance, again noting your experiences and changes.

How to Know When You're Getting Smarter

"I was planning to start taking a drug called PRL-8-53 which has been reported to dramatically improve memory. Before taking PRL- 8-53 I took a standardized memory test which showed that I could memorize a string of about 8 digits at one glance. Then I began taking the drug and took it for two weeks. I did not notice any change in my state of mind or cognitive abilities and was somewhat disappointed. While still on PRL-8-53 I went in to take the memory test again and was shocked to find that I was now able to learn a string of 20 digits! That was a 150 percent improvement. The most surprising thing about this was that I had not noticed any difference in myself until taking the test."

A 1989 FDA ruling makes it quite legal to import effective drugs used elsewhere but not available in the U.S.

This person's story brings up an often overlooked issue for people embarking on a cognitive enhancement program. An increase in memory or intelligence is not necessarily accompanied by any measurable subjective experience. One reason for this lack of sensation of difference is that not only do certain aspects of yourself change, but also your reference points for measuring those aspects change.

One of the best ways for measuring changes in one's own behavior is to ask your friends and family. Tell them you are experimenting with some new technologies and you would like them to watch you a little more closely. This will get you a more objective measurement than you could get on your own.

There are subtle changes in the experience of life when taking brain foods or using brain tools. Even major shifts in mood, learning ability, and memory can go unnoticed. Since these changes are difficult to determine on your own, we have provided a few questions to ask your friends and family when you undertake your program of cognitive enhancement.

1. Have I become easier or more difficult to get along with?
2. Can you see me accomplishing more during an average day?
3. Have you noticed any shifts in my moods or energy level?
4. Have you been able to see an improvement in my short or long-term memory?
5. Have you noticed that I have altered my intake of stimulants such as coffee, cola, or tea? Of other mood-altering substances such as alcohol, pot, Valium, sleeping pills?

Another method to measure your cognitive abilities is with a psychological device, such as an IQ or memory test. There is a software package called "Mentor," which measures reaction time after different types of signals (both visual and auditory), eye-hand and ear-hand coordination, memory, and IQ. It is fun and a good way to establish a baseline and measure improvements. It works on IBM compatibles, and requires a color graphics adapter. Mentor has now ceased production,

[This is] an opportunity for you to serve as active participants in the discovery of new information.

but we have made arrangements to obtain copies for participants in this survey. The program costs $49.95 (for information, call (415) 332-8323).

For this and upcoming surveys, we are looking for useful tests of personality, memory, and so on that we can make available to wide numbers of subjects. We welcome your suggestions and guidance.

For Further Information

An excellent compendium of information about cognition-enhancement drugs is *Mind Food & Smart Pills*, by Ross Pelton, R.Ph., Ph.D., with Taffy Clarke Pelton, Doubleday (1989). *Life Extension: A Practical Scientific Approach* by Durk Pearson and Sandy Shaw, Warner (1983) is a rich source. For more detailed information, consult the books and scientific papers below.

John Morgenthaler has BA degrees in psychology and computer science and has worked in the field of artificial intelligence. He is the founder of the Cognitive Enhancement Research Institute (CERI) and the president of INTREND Incorporated, a marketing firm. He is the author of the forthcoming book, Brain Food. If you would like to receive a publication announcement please write to: CERI, POB 483, Santa Cruz, CA 96061.

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RESEARCH UPDATE CONTINUED

"An interesting unexpected finding," Kirsch told me, "was that about a third of the control [i.e. non-stimulation] group actually did *worse* as they went along over repeated trials. We expected them to do better with each trial, but their learning decreased, due to fatigue and inattention: they just got bored. But the electrical stimulation group continued to do better, to learn more, with each trial!"

The study is "extremely significant," says Kirsch, "because it proves that stimulation of the brain can induce positive changes." Electrical stimulation, Kirsch concluded, "is a safe, practical means of improving mental functioning." Should electrical stimulation be used by those interested in improving their own mental powers, I asked? "People are always searching for ways to improve themselves," Kirsch replied, "and if there's a safe and easy and proven method, then by all means, they should do it. Electrical stimulation is like a catalyst: once you start on the road to improvement, the brain is like a muscle, the more you work it the more you can learn, and the easier it is to learn."

Kirsch sees the most immediate importance of this study in its proof that electro-stimulation can reduce boredom and fatigue: "From this study alone, perhaps, corporations will pick up the possibility of stimulating executive problem-solving, improving workers' concentration, accuracy and speed. Maybe a study will be done on air traffic controllers, so there will be less crashes and more efficiency. It could also be important to police, automobile drivers, surgeons, pilots, athletes and others seeking increased alertness, concentration and performance."

Kirsch also pointed out that the learning-enhancement effects of electrical stimulation seem well suited for use in education, ranging from learning disabled children to colleges and business schools. In the long term, the exciting thing, says Kirsch, is that "as *Megabrain* proposed, the brain does respond to stimulations, you can improve mental functioning. This study is proof of that."

In an even more recent study, Dr. Stephen Overcash and his colleage Dr. Alan Siebenthall studied "The Effects of Microelectric Nerve Stimulation and Multisensory Cognitive Therapy on the Personality and Anxiety Levels of Substance Abuse Patients." In their study, published in *Medical Electronics*, a sample of 32 patients being treated for substance abuse were randomly assigned to two groups (a control group and an experimental group). All patients were given a series of psychological and psychophysiological tests. Each group was given regular biofeedback training and psychotherapy during their sessions, but the experimental group also was given 20 minutes of Cranial Electrostimulation (CES) from an Alpha Stim while receiving a series of positive affirmations and suggestions for behavior and personality change. Each group received ten sessions spread out over ten weeks.

The results of the study revealed that the group receiving CES showed extraordinary changes. The experimental groups attained a greater degree of relaxation (as measured by EMG) than the control group, and the personality tests revealed dramatic decreases

The most striking findings were that the experimental CES group underwent profound personality changes.

in nervous tension by the experimental group. But the most striking findings were that the experimental group underwent profound personality changes. As measured in pre- and post- scores on the widely used "16 PF" psychological personality test, the experimental group showed dramatic increases in Self-Sufficiency (the control group did not change), and in Dominance or assertiveness (the experimental group more than doubled its scores in this area, while the control group showed little change). And in the area of Ego Strength, which measures decisiveness in handling interactions with others, the experimental group nearly *tripled* its scores, becoming far more decisive, while the control group showed little change.

As for the substance abuse problem, the authors found that the experimental group "reduced their use more quickly and sustained for a longer period of time. This may have occurred because the microelectric nerve stimulation may have allowed the patients to become more relaxed and more open to the affirmations used."

Concluded the authors, CES at the very least is "a useful adjunctive therapy in assisting the patients in relaxing and becoming more open to the positive self-talk statements." Even more significantly, the researchers point out, "There are also strong implications for education," and "The implications for the use of this basic approach in business, expecially management training, are exciting."

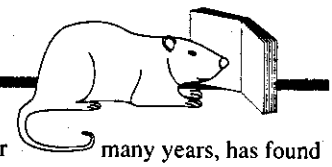
The fascinating but unspoken conclusion of this study is that somehow CES apparently can produce profound and longlasting personality changes in areas of the personality that usually do not change much, if at all, over a subject's lifetime. This supports assertions made by other CES researchers, such as Dr. Margaret Patterson (who is known for using CES to treat rock stars such as Peter Townshend and Eric Clapton for drug addiction), and numerous anecdotal reports, that CES treatment can result in dramatic personal transformations. This is intriguing, exciting, and mysterious (virtually nothing is known about how CES could effect such transformations), and calls for more research.

As a result of the new evidence of beneficial effects of CES on cognitive abilities, scientists have begun to "rediscover" earlier studies that had suggested such cognition-enhancing effects, including work by CES pioneer Dr.

The CES not only improved cognitive functioning but seemed to reverse the brain damage that caused it!

Ray Smith, who in the late 1970s and early 1980s had published a number of double-blind studies of alcoholics and narcotics addicts who had received neuropsychological and I.Q. tests that indicated clear cognitive deficits. These cognitive deficits seemed to be the result of cumulative brain damage caused by alcohol and narcotics abuse. Smith then gave these subjects a three-week course of 40 minutes daily CES treatments. The subsequent tests showed remarkable improvements in memory, learning and other cognitive and psychophysiological functions. The CES, that is, not only improved cognitive functioning but seemed to reverse the brain damage that caused it!

Aware of these studies, Dr. Alan Childs, executive medical director of the Healthcare Rehabilitation Center and assistant professor of pharmacy at the University of Texas, Austin,



decided to use CES on several of his patients who were suffering from amnesia as a result of accidents or trauma—patients whose short-term memory functions were significantly impaired. He found that the patients showed profound improvements in short-term memory. In other recently published studies, Dr. Childs, in association with Dr. M. Lynn Crismon and Dr. Lawrence F. Wilson, used CES for treatment of not only post-traumatic amnesia, but for treatment of "attention-to-task deficit" in cases of head injury (attention-to-task deficit, according to Childs, involves "a constellation of cognitive disturbances involving symbolic language processing, auditory and visual perception, memory processing, and mood modulation during performance of problem-solving tasks"). After three weeks of 50 minutes of CES per day, the patients were again tested for attention-to-task, with neurophysiological measurement of such components as "mental speed, visuomotor functioning, impulse control, response inhibition, visual and auditory perception, sensitivity to retroactive and proactive interference, mental control and concentration, and increasing mental speed with emotional modulation."

According to Childs and Wilson, CES "appears to be an effective non-drug alternative in a cognitive rehabilitation model for treating the apparent components of attention-to-task deficit. . . . The results showed striking and significant improvement in the post treatment scores and the associated extent of the deficit as described by these scores."

Theta: The Magic Rhythm.

New research also indicates that it is possible to enhance memory and learning by turning up the synaptic volume controls, or boosting their readiness to receive new information, which can be done by stimulating neural pathways in areas such as the hippocampus with bursts of electrical stimulation. Having once been stimulated, researchers found, the brain circuits would respond to subsequent electrical impulses much more vigorously. (Think of what happens the first time you listen to Beethoven's Ninth. Think of what happens the ninth time, the nintieth—at a certain point it seems as if some of the pathways between the external sounds and your internal response have already been cleared.) This, many scientists now believe, is what happens when a memory is recorded. It is a process they have called Long Term Potentiation (LTP). Scientists studying memory, such as Gary Lynch of UC, Irvine, have found that for the brain to form permanent (or extremely long-lasting) memories, the process of LTP is essential.

Recent research indicates LTP, and memory formation, involves a two part process including a voltage change in the neuron and then the release of a neurotransmitter, glutamate. Dr. John Larson, a researcher in Lynch's lab, recently cast new light on the process with research demonstrating that LTP is not only triggered by bursts of electrical stimulation, but that LTP is especially effective when one priming pulse is followed by a second pulse 200 milliseconds later. The effect is even stronger, Larson discovered, when 10 pairs of these 200 millisecond pulses are applied every five seconds.

Does it matter how you do it — through the discipline of meditation, the training of biofeedback, or via the "fast track" of mind machine technology?

This is most intriguing, since this is a frequency that corresponds to the theta rhythm, the brain wave frequency that has been found by a variety of researchers, ranging from Elmer Green of the Menninger Foundation to James McGaugh of UC Irvine, to be a key to learning and memory. The results were so exciting that Gary Lynch exclaimed, "We have found the magic rhythm that makes LTP. There's a magic rhythm, the theta rhythm—the natural, indigenous rhythm of the hippocampus."

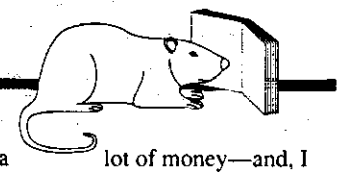
As Elmer and Alyce Green first reported in the mid-70s, simply causing your brain to generate theta activity for a few minutes each day seems to have enormous benefits, including boosting the immune system, enhancing creativity, and triggering or facilitating "*integrative* experiences leading to feelings of psychological well-being." Biofeedback pioneer Dr. Thomas Budzynski, who has investigated this realm of theta activity — what he calls "the twilight state" — for many years, has found that people who learn to enter theta experience expanded states of consciousness, hyperreceptivity to new information, and greater ability to "rescript" subconscious material. This being so, it makes sense that using a device such as a float tank or mind machine that has the capacity to speed and facilitate your entry into the theta state should help you in reaping those benefits of theta.

Now an impressive new study has been published demonstrating some of the enormous benefits and the transformational power of simply allowing your brain to enter the theta state regularly. Clinical psychologists Eugene Peniston and Roger Kulkowsky of the University of Southern Colorado tested a group of chronic alcoholics for levels of depression. Then they split the group in two and trained one of them (using biofeedback techniques) to generate alpha and theta activity. The others were treated using "traditional" therapy. After ten weeks, Peniston and Kulkowsky found that the group that learned to generate alpha/theta brain waves showed a far greater recovery rate from their alcohol problems. More impressively, after *thirteen months* they showed "sustained prevention of relapse," while the control group that used traditional treatment methods was, for the most part, unsuccessful in recovery.

And, in the most intriguing and astonishing findings of all, the "alpha-theta" group showed a total transformation of personality. Peniston and Kulkowsky were surprised to find that their scores on the test measuring depression showed "sharp reductions," while no such changes were found in the control group treated using traditional methods. In this they resembled the groups Elmer and Alyce Green trained to generate theta, which immediately began having life-transforming integrative experiences, and the drug treatment group of Drs. Overcash and Siebenthall described above, which used CES during a ten week treatment period and showed dramatic personality changes, including sharp rises in ego strength and self-sufficiency.

Peniston and Kulkowsky had to teach their subjects to generate slow brainwave activity using biofeedback techniques. Biofeedback requires lengthy training and discipline and effort. Mind machines seem to represent a much faster way of generating the much-to-be-

RESEARCH UPDATE CONTINUED



desired slow brainwave states. There is abundant evidence that they can rapidly induce such states. And the evidence keeps accumulating. One recent (1990) study, "EEG and Subjective Correlates of Alpha Frequency Binaural Beats Stimulation Combined with Alpha Biofeedback," by Dale S. Foster of Memphis State University, compared alpha brain wave production in four groups: one

In the most intriguing and astonishing findings of all, the "alpha-theta" group showed a total transformation of personality.

practiced alpha frequency brain wave biofeeedback, the second received alpha frequency binaural beats stimulation (which Foster produced with a Binaural Signal Generator, generating beats of the sort used in the Hemi Sync and High Coherence tapes), the third group received alpha binaural beats combined with alpha biofeedback, and the fourth, control group, received ocean sounds. Foster notes that "An interactive effect was found in which the group with both alpha binaural beats and alpha biofeedback produced more treatment alpha than the group with alpha biofeedback alone. Additionally, nine of the fifteen subjects with both binaural beats and feedback reported being able to control alpha production via their focus on the alpha binaural beats. The data suggest the possibility that binaural beats can be used to evoke specific cortical potentials through a frequency-following response." That is, Foster concluded, "the combination of alpha frequency binaural beats and alpha brain wave feedback resulted in significantly more alpha production than alpha brain wave feedback alone." There's little doubt that the use of a device like the Binaural Signal Generator or tapes that use binaural beats, such as the Hemi Sync and High Coherence tapes, can significantly speed up the process not only of entering the beneficial slow brainwave states, but also of *learning* to enter those brain states.

It seems clear, then, that if some of the mind machines are in fact effective in quickly putting users into slow brainwave states, and, in the "bicycle training wheels effect," can teach users how to enter those states themselves, then they can be invaluable in speeding up the healing and personal transformation process not only for alcoholics and drug addicts but for all of us who seek integrative experiences and increased creativity, health and well-being.

(In fact, word has recently filtered back to me through the grapevine that at least one organization is now working on speeding up the "Peniston/Kulkowsky effect" by adding active brain-wave entrainment devices to the process. With the billions of dollars now being spent for drug treatment, large amounts of it in traditional treatment programs that do not have high success rates, it's clear that a treatment that produced long-lasting recovery and beneficial personality transformations would have a tremendous impact, making its developers a lot of money—and, I suspect, would be vigorously resisted by some of those involved in traditional addiction treatment programs, who profit from the fact that most of their clients do *not* succeed, and come back to them over and over for their 30-day residential "cures.")

The question arises: perhaps what studies like those of the Greens and of Peniston and Kulkowsky are telling us is that simply *being there*, simply entering the theta state for a few minutes each day, is the key to the beneficial effects—it doesn't matter how you do it, whether through the discipline of meditation, the training of biofeedback, or via the "fast track" of mind machine technology. It would be valuable to investigate this by comparing long term effects of theta production among groups who learn by meditation, by biofeedback, and by regular use of brain machines. Such studies would not be difficult to design or conduct. I for one would sure like to know more.

Gary Lynch exclaimed, "We have found the magic rhythm, the theta rhythm—the natural rhythm of the hippocampus."

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HIGH VOLTAGE: THE BIOELECTRIC INTERVIEWS CONTINUED

century, if not before that. Certainly the Russians have used it actively for thirty years or more. There have been *no* reports of major problems, and it's probably gone through three generations — of *human* testing (as opposed to animals). With all drugs, there are side effects. Yet, with electromedicine we haven't seen anything *close* to the kind of side effects associated with most drugs.

MBR: Dr. Becker points to research, his own and others, showing that electrical stimulation seems to have the capacity to turn on growth in cancerous cells.

"You can't talk about electrical stimulation as one topic any more than you can talk about pharmacology as one topic. Nobody questions that Digitalis and Aspirin are different and have different effects and contraindications. And yet people frequently seem to think that all electrical stimulation is the same."
—KIRSCH

KIRSCH: And the opposite. It depends it on the type of electrical stimulation. You can't talk about electrical stimulation as one topic any more than you can talk about pharmacology as one topic. Nobody questions that Digitalis and Aspirin are different and have different effects and contraindications. And yet people frequently seem to think that all electrical stimulation is the same. To isolate one aspect of the electrical wave form (such as the frequency) from the entire wave form, is like isolating the color of the pill from the ingredients in the pill. All white pills are certainly not the same. There is no reason to suspect *all* forms of electrical stimulation of promoting the growth of cancer cells.

MBR: So you are not concerned about long-term effects?

KIRSCH: Well, in a very pure scientific manner, as is accepted in the medical model, one can express concerns about long-term effects that we don't see yet. That is legitimate, at least in principle. But I work with electrostimulation professionally and I've done extensive research with it. I've read almost all the literature and I've experienced lots of CES myself, and I don't think we are going to see harmful long-term effects. I think that the safety has already been established.

Scalar Fields

The Key to the Paranormal?

Perhaps the hottest topic in the field of bioelectricity is that of the mysterious, seemingly paranormal "scalar" fields, and the development of devices that generate such fields and use them to modulate and, it is claimed, to heal biological systems.

MBR: Could you explain what "scalar" means?

PETER LINDEMANN: Scalar is a terminology that's been popularized by the work of Thomas Bearden. It is used in the scientific vocabulary to denote the opposite of vector. A vector is something that has both velocity and direction. A scalar is something that has neither velocity nor direction. A crude way to suggest the nature of scalar phenomena is to compare wind and air. Wind is a vector phenomenon, because it has velocity and a direction. But air is a scalar phenomenon. It has neither. No matter what direction I go or how fast or slow, as long as I'm on the surface of the planet, there's air. So air would be analogous to scalar phenomena. A scalar is something that is direction-and-velocity *independent*.

ELDON BYRD: In this field there is a lot of controversy over what scalar is all about. My definition is very simple. A scalar is something that isn't a vector. As such it doesn't have a direction. A scalar field would be one which isn't moving either in time or space. Once you take something like an electrostatic charge and move it up and down space and time, it then becomes a vector. It's really tough to get scalars out of electromagnetic vectors. It's almost impossible.

I think a much better description of a scalar is that it is a piece of information. For example, consider voltage. Voltage doesn't have a direction. Current has a direction, but voltage doesn't have a direction. It's a potential, "scalar" quantity. And, if you can induce voltage at a distance, that's a scalar field. We have no instruments, for example, that will measure voltage directly. We have indications on meter faces that say so many volts, but what they are really doing is sucking current out of a source, or measuring current coming from somewhere, and running it through some kind of known resistance that enables the meter to calculate voltage. But it doesn't measure it directly. So, voltage is a scalar quantity.

"With scalars we are about where the Wright Brothers were with their flying box kite at Kitty Hawk."
—BECK

I gave a demonstration at a psychotronics conference a couple of years ago where I said, "I can take two scalar quantities and convert the scalar potential into an electromagnetic signal." I used voltage — two 9-volt radio batteries — and what I did was just put the terminals together, plus to minus, minus to plus, and in a few moments it got so hot you couldn't handle it. I said, "All the current is circulating internal to the batteries, but it is converting into heat which is radiating from the batteries as an electromagnetic wave. So I have two DC devices with a scalar potential, each one, and I just plug them together and I get an electromagnetic wave out of them." So you can convert scalars into waves.

I look at scalars strictly as information. I have written a theoretical paper on this which has been published now. It describes scalars straight out of the textbook. The scalar form of Maxwell's Equations. I just took this information and said, Could it be that we live in a sea of information? Not in the form of electromagnetic energy, not acoustic energy, but a whole *other* form of energy which we currently have no instruments to measure. It's a sea of information. It's just there, it is. It doesn't take any time for it to propagate from one point in time and space to another because it has nothing to do with time and space. Scalars are just information, and they are not bound by the same laws that govern matter or energy. It's just information. It has no mass; it has no direction: it's not a vector; it's not a physical quantity. It's information. I think this is a sea of information that we are floating in.

MBR: That sounds suggestive of Rupert Sheldrake's "morphogenetic fields".

BYRD: Yes, it does. Sheldrake's "morphogenetic field" might be a scalar type of field, an information field

BOB BECK: A scalar wave would be a first cousin to the terms in the Maxwell equations, "DC-DT" and "DA-DT". A stands for area, DA is a change of area of the propagation of the signal as it travels from the source. Now in electromagnetics as it is used in the Maxwell equations and in all radio communication, power transmission, etc., the terms DC-DT and DA-DT have long been considered imaginary, like the square root of -1, or the "J operator," which is an imaginary term in electrical engineering, but without which we could not have had streetcars or power transformers.

There is a component in electromagnetic technology which does not carry power, per se. You can't warm up a toaster with it. It carries information only. This is the scalar component. Scalars are a perhaps imaginary perhaps not imaginary vector that carries information without power. To get power you need voltage and current. The way that we measure power in watts is amperes multiplied times voltage. But the scalar has none of that at all. There is no energy in it,

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just information. It's a very rich field for exploration. With scalars we are about where the Wright Brothers were with their flying box kite at Kitty Hawk. I've read all of Tom Bearden's magnificent mathematically constructed speculations in this area. They're fascinating, but nobody knows quite what to make of it altogether. The jury is still out.

REIN: Conceptually we are talking about a more fundamental field than an electromagnetic field. Mathematically, electromagnetic fields are just derivatives of the scalar field, so that the scalar field is a more fundamental form of energy. The scalar field can be looked at as a component of the electromagnetic field which is always there but is swamped by the electromagnetic field, so we haven't noticed it in the past. It's traditionally considered much weaker in amplitude, but it's where *all the information* is carried. Because of this, experimentally, you can actually cancel out electromagnetic fields, eliminating the strong outer shell and leaving behind only this scalar information matrix field, which is the underlying field behind the electromagnetic field.

In theory, this scalar information field can be measured. Electrical engineers who are attuned to this way of thinking claim that we can measure them. But in practice we have problems being able to distinguish between measuring electromagnetic and measuring the scalar. My particular approach was to use biological systems as detectors for this kind of energy.

MBR: Do scalars have different biological effects than ordinary electromagnetic fields or waves?

LINDEMANN: I believe so. Most of the attention about these pulsed electromagnetic field devices has been focused on how the magnetic field is affecting the body. From my research I think that's the wrong question. I don't think it is the magnetic field that is keying the body. I think it's this scalar propagation that's keying the body, and when you take the magnetic components and you make them infinitesimally small, and these scalar propagations quite large, you get very large biological responses. The body feels very relaxed with it. You can get these types of propagations with ordinary coils, but the rise time on your wave — in other words, how fast the transition is between on and off — has to be very very large. So you get a very very sharp transition. And you can get biological responses with very very sharp transmissions in ordinary magnetic field propagations. But you tend get these irritating side effects along with it. And of course what I'm talking about is subjective. It's only an indication that there's something to look for. I think science is lagging pretty far behind in its understanding of these things simply because we can propagate these scalars very easily, but we don't have any way to measure them directly. So the instrumentation for the study of these phenomena haven't been developed yet.

MBR: Could we call your BioPacer and Centron devices scalar generators?

LINDEMANN: Yes. If you take a wire and wrap five turns around a core, clockwise, and you put a direct current pulse on this, it will propagate a magnetic field with a north pole at one end and a south pole at the other end. If you then turn the wire around and wrap five turns in the opposite direction

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and put a current through it, the first five turns produce one magnetic field in one orientation, and the second five turns create another magnetic field oriented exactly opposite the first. You can project these two magnetic fields in the exact same place. If you don't have a metal core, so there's no tendency to magnetize in either direction, the two magnetic fields can be made to propagate in exactly the same place at exactly the same strength, apparently cancelling each other out.

This creates what you might call a "compression wave in the inertial frame", or in the "life force". It can also be called a "scalar field" or a "third order effect". Simultaneous self-cancelled magnetic fields were studied pretty extensively in the 60s by a man named Hooper. He called this effect the "motional electric field". That is the field caused by the motion of electricity. And he said that it had a lot of characteristics which made it look similar to gravity, or a simulated gravitational field. I had studied a lot of these things and found that, when you pulse these motional electric fields, or cancelled magnetic fields, these third order effect gets very large very rapidly while the magnetic effects can remain very small.

In electrical science, if you have the simultaneous propagation of more than three fields in the same place you have what is considered by definition a scalar propagation. And in a flat backwound spiral coil of the kind that I have described, we have by definition four fluxes in the same area: The self-induction of the coil; the mutual induction between the windings; the self-capacitance of the coil; and the mutual capacitance between the windings. And these show up as four specific fields of either dielectric or magnetic field strength. In these flat wound coils (which Tesla was the first one to experiment with) you can get a high degree of interaction between the inductance and capacitance, creating what is called a scalar.

My devices put a DC pulse through the spiral, creating what would technically be called a "space scalar", which is AC, or alternating in time. So it's not a time scalar. It's a space scalar which is either there or not, depending what moment in time you're talking about. So it's alternating in time and scalar in space. That's the technical definition of the types of propagations which seem to have caused fairly large biological responses in these so-called pulsed electromagnetic field generators.

MBR: Are scalars fields then, or waves?

LINDEMANN: It's an area of influence, really. Waves, by definition, have velocity and direction, so waves are vector, not scalar. Some of the literature talks about the propagation of scalar "waves." This is an oxymoron. If you go back to the actual definitions of these terms, you can't have a scalar wave.

BYRD: What it takes to produce a scalar at a point in space is simply to take two signals and have them intersect and cancel each other out. If you have scalar information riding piggy-back on the electromagnetic information, when you cancel the electromagnetic signals, all you have left is the scalar information.

"Mathematically, electromagnetic fields are just derivatives of the scalar field, so that the scalar field is a more fundamental form of energy." —REIN

That is the way that we think the Soviets were communicating with their submarines. The Soviet "woodpecker" signal was really two transmitters (eventually they had up to 12) beaming information to a point in space. If they have the information riding on just one of the electromagnetic signals, where does that information go when they cancel the carriers? It just dumps right there locally where the cancellation occurs. If you have the right instrument, you can pick it up. It made their transmissions rather secure, because we had no idea what they were doing, and I don't think we understand it fully even now.

BECK: There is also a growing class of diagnostic devices that in the hands of a proper operator will do miraculous diagnostic routines on a computer. I have in mind the Interro, which was designed by a top scientist I worked with, Roy Curtin, who claims that the information is carried by means of a scalar, not current or magnetic line of force. There is another

The difference between all these three sources of subtle energy is in frequency, and, of course, healers are complex and I have some evidence that different states of consciousness can have different biological effects. We know that different frequencies cause different biological effects. Therefore it's logical to conclude that in different states of consciousness a healer can generate a different frequency spectrum, which then in turn affects the biological system differently. And you could even get an inhibition of a biological effect based on the kind of energy output. This applies to the electromagnetic fields as well. So we don't know that the frequency specificity is a big issue. And 60 Hz turns out to be not such a good frequency.

Conceptually, the work that I have been doing is the first application of these kind of quantum non-hertzian fields to biological systems. The implication from the research, aside from showing the fact that they *do* cause biological effects, is the fact that I've been able to show the same set of frequencies are more biologically effective in non-electromagnetic fields. In comparing a signal delivered through a conventional electromagnetic field using a Helmholtz coil, for example, versus the same sort of frequencies where the electromagnetic field is canceled out and you have the non-hertzian or scalar left behind, even using the exact same set of frequencies and keeping all other variables constant, the scalar fields turned out to be anywhere between *three and five times more biologically active.*

That's also the first time a direct comparison like that has been done. The critics of the bioelectromagnetics community have looked at the effects due to conventional electromagnetic fields and said, "These effects that are observed are so weak, and the body is in a state of homeostasis. If you give such a tiny bit of a push to the body, you're not really going to have any profound healing going on." Now the evidence is suggesting that these scalar fields are *much* more biologically active and could be what's causing the actual healing process, or activating the physiological changes!

In that regard I advanced a theory I call the "crystalline transduction theory," which proposes that electromagnetic fields in the environment can be converted into scalar fields in the liquid crystals of the cell membranes around each cell. Therefore, the electromagnetic fields are just a first line information carrier, and when that field hits the cell it gets converted to the scalar, and that's what in turn causes the profound physiological changes that are associated with my experimental data — as well as phenomena of psychic healing and psychotronics and radionics, and all of the devices which generate scalar fields.

MBR: Could you give us a brief summary of your research in that context?

REIN: Okay. The biological endpoints that I've been measuring are two types of cells, nerve cells and immune cells. I'm classically trained as a neurochemist, and came to Stanford to study neuroimmunology, the interaction between those two systems. In studying the response of biological systems to these subtle energy fields, the responses of just one isolated system are interesting, of course, but the body is a holistic, complicated interaction of many different systems. So it seemed to me that the interaction between the nervous system and the immune system was really a key way in which you could study *in vitro*, with tissue culture cells, the simulated events that occur in the body.

I am using the tissue culture model system because of the complicated problems that you get into when you work with clinical patients, placebo effects as being one of the main complicating factors, also diet and emotional states. It's hard to be able to definitively say that *this* subtle energy or even electromagnetic energy that you expose a person to is causing the effects, when we know that there are so many things that can also cause profound biological effects. So the advantage of working in tissue culture is that you can eliminate all of those variables. If you can measure an effect at the cellular level, you can certainly make some pretty definitive statements.

"The effect that we observed was a very, very pronounced stimulation of the growth of these lymphocytes or T cells — to the tune of twentyfold *with the scalar field!.... This is basically unheard of in the bioelectromagnetics community!" —REIN*

In practice, what I've actually done is to measure the ability of a nerve cell to "take up" a neurotransmitter. When extra neurotransmitter is released into the synaptic cleft, the nerve cell takes it back up and metabolizes it. It's a way of controlling the levels of the neurotransmitters. In previous work I had actually measured the levels of the neurotransmitters in healers, which led me to become interested in how the amounts of these neurotransmitters are regulated. One of the ways is by this uptake mechanism.

I was able to show that both electromagnetic fields and scalar fields inhibit the uptake of neurotransmitters into nerve cells. And the scalar fields were three to five times more biologically active than the electromagnetic. It's interesting to note that tricyclic antidepressants as a general class of drugs also work in the same way. In other words, if someone is depressed, they would very possibly have lower amounts of the neurotransmitter in their brain. So by preventing the uptake, you allow more neurotransmitter to be present in the nerves in the brain.

MBR: So it's stimulating or arousing.

REIN: Right. The circular system that I've been looking at is the noradrenaline or norepinephrine system. There are many different neurotransmitter systems in the brain, but these studies have been directed specifically at one particular neurotransmitter system. It's very complicated because they all interact with one another and obviously this kind of research has to be continued if we are to understand the interactive nature of the systems, but as a first step, it's certainly encouraging that we could observe effects of this magnitude in the first place!

The next experiments I did were with the immune system. In this case I took some human lymphocytes or T cells, which are a member of the white blood cell family that's primarily involved with fighting off infections and protecting the body from foreign invaders and is definitely involved with all kinds of depressed immune system diseases like cancer and AIDS. In both of those cases, there is a depressed amount of the lymphocytes and a decreased response. Normally these cells grow when the right stimulus comes along, and in the absence of the stimulus or with an altered, sick cell, they cannot rejuvenate themselves, so the amounts keep going down. So what I did in tissue culture was to activate these cells and add the natural substance which would normally cause them to divide and see whether or not I could enhance that process with an electromagnetic field and with a scalar field. These experiments were done with normal people, because I didn't have access to blood from diseased individuals. The first step was to see if there were any effects with normal blood. And the effect that we observed was a very, very pronounced stimulation of the growth of these lymphocytes or T cells — to the tune of *twentyfold* with the scalar field!

MBR: Twentyfold with the scalar field compared to the electromagnetic field?

REIN: Compared to nothing! The scalar field actually stimulated the cell growth to that kind of magnitude. This is basically unheard of in the bioelectromagnetics community, where typically you would get effects in the range of 20 or maybe 40 percent. Twentyfold is in another category entirely! So I was quite intrigued.

I was interested in knowing whether we might have just bumped across the right set of frequencies which really turn on the lymphocytes. Maybe everybody else in the bioelectromagnetics community was just looking at the wrong frequencies. There's a lot of work done with 60 Hz because the power line companies fund the research. There's a lot of work done with 16 Hz because Ross Adey had discovered that had an effect on calcium release from nerve cells. Maybe these people were just using the wrong frequencies, maybe we just happened to get lucky

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and find the right set of frequencies which trigger these cells to go crazy!

I therefore took the same frequency information and put it into a regular Helmholtz coil — which does not generate a scalar, but generated a regular electromagnetic field. In that case the biological response of the cells was very strong, but again three to five times less than the response to the scalar field. Obviously the electromagnetic field by itself will do some good, but when you add the scalar component, the biological system really takes off!

MBR: And what frequency were you working with?

R: The frequencies were actually designed and predicted by my colleague, Mr. Gagnon, but he ended up giving me a very complex series of sine waves in a RF kilohertz frequency range, a very complicated signal. The short answer is that it's a radio frequency modulated by very low frequencies, one to two cycles per second, so we have the best of both worlds.

MBR: What are the most intriguing implications of scalar theory?

REIN: The theoretical quantum physics has developed a very elaborate mathematical and physical description of scalar fields and their properties. The implications of the mathematics are very unusual and intriguing. Scalar fields have

"Scalar fields...travel faster than the speed of light; they're distance and time independent (unlike electromagnetic fields which fall off at one over the distance squared); they act at a distance; they can have negative energy; they even have the characteristic of being able to travel backwards in time!" — REIN

rather...*paranormal* properties. They travel faster than the speed of light; they're distance and time independent (unlike electromagnetic fields which fall off at one over the distance squared); they act at a distance; they can have negative energy; they even have the characteristic of being able to travel backwards in time!

Some of these concepts may seem a little far out, but quantum physics has started to address these kinds of questions, and it turns out that there is actual experimental evidence for time reversal, for example. Although these are theoretical, and the physicist has this complicated theoretical model to describe the properties of these fields, it turns out it's more than theory. They actually are beginning to be able to measure some of these bizarre properties.

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HIGH VOLTAGE: THE BIOELECTRIC INTERVIEWS CONTINUED

These same properties may well end up turning out to be the underlying mechanism that will explain things like telepathy and psychic healing.

MBR: And time travel, perhaps [laughter].

REIN: Yeah, well time reversal, going backwards in time, seems to be one of their characteristic properties. A skeptic would say, "these are occurring at a microscopic level, not at a macroscopic level; there's a big jump from saying that these properties apply at the atomic level to saying they apply at the macroscopic level." But recent results in quantum physics are actually showing that, "Yes, they can actually occur at a macroscopic level." That's where it gets really exciting — all you need is one example, and all of a sudden it's *"Oh boy, what's going on!"*

MBR: So this scalar research represents potential breakthroughs, and potentially new visions of reality, in a number of different ways?

"The scalar energy may be the bridge between the spiritual and the electromagnetic. The Buddhists talk about the "one primordial energy". By tapping into the scalar energy, we're one step closer to that ultimate source of energy." —REIN

REIN: Right. This idea of scalars has been applied to the study of consciousness and other healing mechanisms. The problem has been that there has been very little direct experimental evidence in terms of biological systems. There's even a very little bit of evidence that these kind of fields have macroscopic effects, although this is just beginning to show up. The government is doing some covert research in scalars, but we don't know to what extent they're doing biological experiments. But I believe that I'm one of the first, if not the first person to come up with some direct experimental evidence of the biological effects of scalar fields.

MBR: Your experimental evidence indicates that these scalar fields might have beneficial effects. But then we would have to surmise that by the same token there could be harmful effects.

REIN: Yes, that's right.

MBR: At a different frequency perhaps, or different intensity?

REIN: Absolutely. Some of the properties of the electromagnetic field and their interactions with cells may also apply. In that case different frequencies and amplitudes can have opposite effects. Tom Bearden has been talking a lot about the potential hazards of these kinds of fields. That's why the whole field is completely wide open, and it's very exciting.

According to the theory, one reason that the scalars are so powerful in their biological effects is because they can affect the nucleus. Electromagnetic fields predominantly affect the electrons. The nucleus is not really altered. It may be shaken up a little bit when electromagnetic fields are absorbed and radiated in an interaction between energy and matter. Generally speaking, the nucleus is not altered in any way. This is theoretical, but if it turns out to be true that the scalars can actually modify the nucleus, you can potentially cause very profound biological effects. Powerful effects have already been observed, but this suggests *transmutation of matter*, being able to make very, very profound manifestations in our three-dimensional world.

MBR: So this leads us back to alchemy.

REIN: There we go. Exactly. There's a link there for sure. Another theory proposes that the scalar energy is coming from higher dimensions and that it interacts with ours. In fact this is the model in traditional physics, though physicists don't use the word "scalar", they use words like *zero point energy*, and *quantum energy* to describe these kind of forces which, some models describe as being *embedded* in our normal three-dimensional space. But the point is that when this energy manifests in our three-dimensional space it can have very profound effects.

MBR: So the old alchemical tradition of the philosopher's stone or elixir that can transmute matter from base elements into gold, and so on, may represent one model of manipulating scalar energies? Or represent the same sort of interface between two different worlds, two different aspects of reality?

R: Yes. One way to look at it is in terms of esoteric traditions in which there are descriptions of energy levels with varying degrees of subtleness. The physical body is the most dense, and the electromagnetic field which is around the body is slightly less dense or more refined, and then of course, we have cosmic energy, or spiritual energy or God energy, which is the most refined energy in the universe. And ultimately, all transmutations and healings occur from the spiritual energy. This is really a unified field theory, like so many scientists such as Einstein have long been looking for. It's just that the esoteric model has never been considered scientific. Well, the scalar energy may be the bridge between the spiritual and the electromagnetic. The Buddhists talk about the "one primordial energy". By tapping into the scalar energy, we're one step closer to that ultimate source of energy.

Coming in our next issue:

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ANNOUNCING: THE MEGABRAIN FORUM!

The goal of MEGABRAIN REPORT is to increase the free flow of information regarding consciousness technology. In **THE MEGABRAIN FORUM, we will facilitate this process by inviting readers to share their knowledge or information about a specific question that seems to us to be of particular importance.** In future issues we will print selections from the responses we receive, together with discussions of the question by prominent researchers or authorities in the field. We hope that the convergence of information from many sources, the striking together of ideas, will create some sparks of insight, and, in the process, produce new information.

In this inaugural issue, THE MEGABRAIN FORUM poses a question raised at the end of the "Research Update" article. Various "tools and techniques" can be used to attain optimal or peak performance brain states. Some machines (such as light and sound devices, beat frequency audio tapes or binaural signal generators and certain cranial electro-stimulation devices) show evidence that they can directly *induce* such states. Biofeedback devices have proven effective as a technological *assist* to the autoregulation of such states. Various forms of meditation represent traditional methods of *self-generating* these same optimal states. Or are they the same?

We ask for your ideas and information on this question: Is there a difference between the optimal brain states achieved through (a) meditation, (b) biofeedback, and (c) other "brain machines."

Please send your responses to:

THE MEGABRAIN FORUM
P.O. Box 2744
Sausalito, Ca 94965

We welcome your responses to this question, brief or extended. Your response will become a part of our Megabrain Report Archives, and responses which are particularly focused and quotable will find their way into the pages of MEGABRAIN REPORT. We hope to hear from you!

EDITORIAL CONTINUED

important information to the field and provide foundations for research by others.

We also intend to facilitate the flow of lots of other types of information — information about new books and machines, consumers' guides to products, interviews with leading thinkers, discussions about important questions. We're reminded that Claude Shannon, the father of information theory, discovered that information is inversely related to predictability: any sequence of signals that is 100 percent predictable by definition contains no information (examples of this kind of "information-free expression" are TV sitcoms and the public statements of George Bush). Interestingly, the key characteristics of an "enriched environment," of the sort that Dr. Marian Diamond and others have found to be essential to brain growth and enhanced intellectual functioning, are novelty, challenge and unpredictability, i.e. information.

One way of stating this is that a healthy brain requires information (which means a steady diet of the sort of non-information found in TV sitcoms and the words of George Bush constitutes an "impoverished environment," and thus — read my lips, bub — can cause physical deterioration of your brain). We intend that each issue of MEGABRAIN REPORT will contain so much real information — big chunks of the stuff, unpredictable and challenging — that it will serve as a sort of enriched intellectual environment.

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